Queens Plaza Residential Development - Site C

Long Island City, Queens County, New York

Site Management Plan

NYSDEC Brownfield Cleanup Program
Site No. C241169

Prepared for:

LIC Development Owner, L.P.

c/o Tishman Speyer Properties

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New York, New York 10111

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&

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Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

JULY 2016

CERTIFICATION STATEMENT

I, Arnold F. Fleming, certify that I am currently a New York State registered professional engineer and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

050411 — NYS Professional Engineer #

7/29/16 — Date

Signature

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LIST OF ACRONYMS

ASP	Analytical Services Protocol
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
ft-bg	feet below grade
BHC	Benzenehexachloride
BMS	Building Management System
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAMP	Community Air Monitoring Plan
cfm	cubic feet per minute
COC	Certificate of Completion
CWS	Capture Well System
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
EC	Engineering Control
ELAP	Environmental Laboratory Approval Program
FER	Final Engineering Report
FLS	Fleming Lee-Shue, Inc.
FDNY	Fire Department of New York
ft	feet
ft^2	square feet
gal	gallon
gpm	gallons per minute
HASP	Health and Safety Plan
HVAC	Heating, Ventilation and Air Conditioning
IC	Institutional Control
LIRR	Long Island Railroad
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$µg/m^3$	micrograms per cubic meter
NAVD88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OER	Office of Environmental Remediation
ORP	Oxidation-Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
PRR	Periodic Review Report

LIST OF ACRONYMS (continued)

PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QPRD	Queens Plaza Residential Development
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
ROD	Record of Decision
RRSCO	Restricted Residential Soil Cleanup Objective
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOE	Support of Excavation
SoMP	Soil Management Plan
SSDS	Sub-slab Depressurization System
SVOC	Semi-volatile Organic Compound
SWPPP	Storm Water Pollution Prevention Plan
TAL	Target Analyte List
TCL	Target Compound List
TOGS	Technical Operational Guidance Series 1.1.1
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WC	Water Column

ES EXECUTIVE SUMMARY

LIC Development Owner, L.P. (the BCP Volunteer) has remediated a 0.309-acre property known as Queens Plaza Residential Development (QPRD) Brownfield Cleanup Program (BCP) Site C (BCP Site Number C241169) located in Long Island City, Queens County, New York. BCP Site C (hereafter referred to as the Site C) is identified as Block 264, Lot 17 on the New York City Tax Map. Site C was a de-mapped City Street with an area of approximately 13,456 square feet (0.309 acres) formerly known as West Street. The remedial activities at Site C were conducted from February 2015 through February 2016 and all remedial actions are documented in the Final Engineering Report (FER). The BCP Volunteer achieved a Track 2 remedy over all of Site C. After completion of the remedial work, soil above Unrestricted Use Soil Cleanup Objectives (UUSCOs) remains; therefore, Institutional Controls (ICs) are incorporated into the Site C remedy to control exposure to soil above UUSCOs.

The following provides a brief summary of the ICs implemented for Site C, as well as the inspections and reporting activities required by this Site Management Plan (SMP):

Site Identification: BCP# C241169
Queens Plaza Residential Development – Site C

Institutional Controls:	1. The property may be used for restricted residential, industrial and commercial use only.
	2. Environmental Easement.
1. Periodic Review Report	Every 10 years.

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

1.0 INTRODUCTION

1.1 General

This SMP is a required element of the remedial program for the QPRD Site C currently under construction in Long Island City, Queens County, New York (hereinafter referred to as the Site C). A Site Location Map is provided on Figure 1. Site C is currently in the New York State (NYS) BCP (Site No. C241169), which is administered by New York State Department of Environmental Conservation (NYSDEC).

LIC Development Owner, L.P. LIC Phase I, L.P.; LIC Phase I (REIT), L.P.; LIC Phase II, L.P.; LIC Phase II (REIT), L.P.; LIC Phase III, L.P.; and LIC Phase III (REIT), L.P. were added to the BCA as volunteers in 2015 and entered into a Brownfield Cleanup Agreement (BCA) on March 19, 2015 with the NYSDEC to remediate Site C. The Site C location and boundaries are provided in Figure 2. The boundaries of Site C are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, contamination remains, therefore, Institutional Controls (ICs) are incorporated into the Site C remedy to control exposure to any potential remaining contamination. to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Queens County Clerk, requires compliance with this SMP and all ICs placed on Site C.

This SMP was prepared to manage the ICs at the Site until the Environmental Easement is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This SMP has been approved by the NYSDEC, and compliance with this SMP is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC or successor agency managing environmental issues in NYS.

It is important to note that:

- This SMP details the Site C-specific implementation procedures required by the Environmental Easement. Failure to properly implement the SMP is a violation

of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of ECL, 6 New York Codes, Rules and Regulations (NYCRR) Part 375 and the BCA (Index # C241169-03-15; Site #C241169) for Site C, and thereby subject to applicable penalties.

All reports associated with Site C can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with Site C is provided in Appendix B of this SMP.

This SMP was prepared by Arnold F. Fleming, P.E. and Fleming-Lee Shue, Inc., (FLS) on behalf of LIC Development Owner, L.P., in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 3, 2010. This SMP addresses the means for implementing the ICs that are required by the Environmental Easement for Site C.

1.2 Revisions

Revisions to this SMP will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the Site C conditions. In accordance with the Environmental Easement for Site C, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in Site C use that are required under the terms of the BCA, 6NYCRR Part 375 and/or ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP).

Any change in the ownership of Site C or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of Site C, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 (below) includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of Site C-related contact information is provided in Appendix B. Responsibilities of owner and remedial party are detailed in Appendix H.

Table 1: Notifications*

Name	**Contact Information**
NYSDEC Project Manager Michael Haggerty	(518) 402-9767 michael.haggerty@dec.ny.gov
NYSDEC Regional Remediation Engineer Paul John	(718) 482-4995 paul.john@dec.ny.gov
NYSDOH Project Manager Wendy Kuehner	wendy.kuehner@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

Site C is located in Long Island City, Queens County, New York and is identified as Block 264, Lot 17 on the New York City Tax Map. Site C was a de-mapped City Street with an area of approximately 13,456 ft^2 (0.309 acres) formerly known as West Street. Site C is bounded by Jackson Avenue to the north and QPRD Site B (C241151) to the east, south and west (see Figure 2). The boundaries of Site C are more fully described in Appendix A – Environmental Easement. The owner(s) of Site C at the time of issuance of this SMP is:

LIC Development Owner, L.P.,
LIC Phase I, L.P.
LIC Phase I (REIT)
L.P.; LIC Phase II, L.P.
LIC Phase II (REIT), L.P.
LIC Phase III, L.P.
LIC Phase III (REIT), L.P.

2.2 Physical Setting

2.2.1 Land Use

Site C is currently under construction and will eventually consist of a multi-story high-rise residential building with retail on the first floor. Site C is zoned for Mixed-use Residential and Commercial development. Site C lies in an area containing a mixture of residential buildings, office buildings, parking and commercial enterprises consisting of warehouses, light manufacturing, retail, and shipping terminals. The Long Island Railroad (LIRR) Sunnyside Yard A is located to the south of Site C and is a major transportation hub consisting of numerous tracks and train service equipment.

2.2.2 Site History

Until recently, Site C was a demapped City Street located in an area designated as M1-6/R10 within the Long Island City Special Purpose District assigned by the Department of City Planning. The Long Island City Special Purpose District is a particular zoning provision to promote development and transformation of historical industrial/ manufacturing areas into mixed-use commercial and residential spaces.

Prior to development as a City street, Site C occupied an elevated area between two streams, an unnamed stream to the west and Dutch Kill to the east, both discharging into Newtown Creek (Beers, 1868, 1973). Both streams were flanked by a marsh south of Site C that now contains the LIRR Yard A. Site C is shown on historical Sanborn Maps as Barn Street from 1898 to 1936 and West Street from 1947 to 2006. Site C was owned by New York City until the BCP Volunteer acquired it on November 18, 2014.

Historically, chemical manufacturing/storage was the principal activity in the immediate vicinity of Site C, but there is no evidence that commercial activity occurred on Site C other than transportation, shipping, delivery, and handling of product and hazardous materials.

The properties surrounding Site C are, or were, primarily used for light manufacturing and/or commercial purposes, with sporadic residential use. To the south is the LIRR Yard A. To the north across Jackson Avenue are Two Gotham Center, a 700,000 ft^2 office building and undeveloped land between the office building and Jackson Avenue. West of Site C is Site B, formerly occupied by warehouse buildings and light manufacturing. East of Site C is a portion of Site B, more recently a parking lot but historically a commercial building and residential houses/buildings. Beyond Site B, across Queens Boulevard (Route 25 and the elevated No. 7 Subway Line), are a former gasoline filling station and an empty lot formally a bank converted to a drug re-habilitation facility. The area encompassing Site C was historically zoned as "M1-6 Light Manufacturing," until the 2001 Long Island City rezoning changed the classification to M1-6/R10 under the special Long Island City Mixed Use District, allowing high density commercial, retail and residential development

2.2.3 Geology

Site C is located on gently sloping land with the high point along Jackson Avenue sloping down approximately 6 ft. to the southern boundary. The generalized subsurface profile consists of three soil strata. The upper stratum is approximately 6 to 8 ft. of urban fill material consisting of fine to coarse sand, silt and gravel with brick. The stratum below the urban fill layer consists of 13 to 20 ft. of brown and gray fine to medium sand with traces of silt. This is underlain by a stratum of brown and gray silt with trace fine sand. Bedrock, a gneiss, was encountered at depths ranging from 32 to 49 ft. bg. (elevations of approximately -18 ft. to -30 ft. NAVD88). A bedrock elevation contour map is for the Site is shown in Figure 3.

2.2.3 Hydrogeology

Groundwater occurs within the unconsolidated geologic materials covering Site C. The upper surface of the groundwater reservoir is marked by the groundwater table, which fluctuates seasonally in response to precipitation. Depth to the groundwater table is approximately 6 to 8 ft. bg. at the southern side of Site C and the groundwater table elevation ranges from approximately 6 ft. to 9 ft. NAVD88. Groundwater flow on Site C diverges from a high point near the northern portion of Site C. Groundwater on the northern portion flows northwest toward Jackson Avenue. Regionally, groundwater flows to the southwest (USGS 1999).

There are no surface water bodies on Site C or on the surrounding properties. The closest surface water body is the Dutch Kill arising from Newtown Creek, located approximately 1,600 feet south of Site C, and the East River approximately 4,200 feet to the west. A groundwater contour map is shown in Figure 4.

2.3 Investigation and Remedial History

The following narrative provides a remedial timeline and a brief summary of the available project records documenting key investigative and remedial milestones for Site C. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

The SMP and all documents, including the Remedial Investigations (RIs) and Remedial Action Work Plan (RAWP), are maintained by the NYSDEC (or successor agency). These reports can also be found at the document repository, the Court Square Branch of the Queens Public Library (25-01 Jackson Avenue, Long Island City, NY).

Outlet City Soil and Groundwater Sampling Results, AKRF, 1990

AKRF performed a soil and groundwater sampling event in 1990. The sampling event consisted of the installation and sampling of five soil borings at Site C. A total of 12 soil samples were collected from the borings. Soil samples were analyzed for VOCs, SVOCs, metals, pesticides and PCBs.

The results found several metals in the shallow Site C soils at concentrations exceeding the 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs). Of these metals, lead and mercury were detected at levels also exceeding the 6 NYCRR Part 375 Restricted Residential SCOs (RRSCOs). No VOCs, SVOCs, pesticides or PCBs were detected in any of the soil samples above the UUSCOs.

QPRD Site C Remedial Investigation Report, Fleming-Lee Shue, January 2015

A total of four soil borings were installed, with 20 soil samples and two groundwater samples collected from existing groundwater monitoring wells onsite as part of this investigation. Results found one VOC, acetone, above the UUSCO in one sample. A handful of SVOCs were above UUSCOs and RRSCOs in shallow soil samples. Several metals were detected at concentrations above the UUSCOs, of which, mercury also exceeded the RRSCO in one shallow sample. No pesticides or PCBs were detected at levels exceeding the UUSCOs. Three dissolved metals including iron, manganese and sodium were detected in groundwater at levels that exceed TOGS. No VOCs, SVOCs, pesticides or PCBs were detected at concentrations exceeding TOGS.

QPRD Site C Supplemental Remedial Investigation Letter Report, Fleming-Lee Shue, July 2015

At the request of the NYSDEC, Fleming-Lee Shue, Inc. and Roux Associates performed a Supplemental Remedial Investigation (SRI) to collect additional data to gauge the depth of remedial excavation required to attain the desired cleanup levels and

investigate the presence of DNAPL. As part of the SRI four soil borings were installed to the top of bedrock and a total of 17 soil samples were collected. Bedrock was encountered at depths of 32 to 49 ft. bg. All borings were free of petroleum, chemical, or creosote odors, all soil cores were free of staining or other visual evidence of DNAPL or LNAPL; all soils similarly appeared free of staining in the interval immediately above bedrock. The analytical results for VOC and SVOC samples indicate that soils above the UUSCOs are confined to the interval from ground surface to 12 ft. bg. The analytical results for metals samples found most metals below the UUSCOs in soils deeper than 12 ft. bg. and nearly all metals sample results were below the UUSCOs in soils deeper than 23 ft. bg. Exceptions included chromium, copper, lead, and nickel, which were above the UUSCOs at four locations at depths ranging from 30 ft. bg. to 49 ft. bg.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for Site C as listed in the Decision Document dated March 2016 are as follows:

Groundwater

RAOs for Public Health Protection:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

Soil

RAOs for Public Health Protection:

- Prevent ingestion/direct contact with contaminated soil.

Soil Vapor

RAOs for Public Health Protection:

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at Site C.

2.5 Remaining Contamination

2.5.1 Soil

Site C soils were excavated from February 2015 to February 2016 to depths ranging from approximately 6 to 12 ft. below pre-remediation grade. All samples met Restricted

Residential Soil Cleanup Objectives (RRSCOs) and the intended use of Site C except for one soil sample, Site C TR4-1 at an elevation of 17 feet NAVD88. A demarcation layer composed of high visibility orange snow fencing was laid down at the environmental dig depth to separate any residual soils from the imported clean fill. Figure 5 shows the elevation and location of the demarcation layer. Further information and procedures regarding any future intrusive work are presented in Appendix C - Excavation Work Plan.

A total of 22 samples (18 endpoints, two sidewalls & two samples of the soil in the area of the Support of Excavation (SOE)) were collected on Site C. Of the 22 samples collected, only one soil sample (Site C TR4-1) contained a minor exceedance of RRSCOs for copper at a concentration of 501 mg/kg (RRSCO for copper is 270 mg/kg). Soil sample Site C TR4-1 is located at an elevation of 17 feet NAVD 88 (approximately 3 feet below grade of Jackson Avenue), just above the top of the SOE along Jackson Avenue. Because the depth of excavation in this area was limited by the SOE, soil samples Site C TR4-1 and Site C TR4-2 were collected to compare the soil in this area to the RRSCOs. The approximate dimensions of this area is 51 feet x 2 feet. Given this area only comprises 0.007% of the footprint of Site C (102 square feet/13,800 square feet) and this was the only minor exceedance of the RRSCOS, the Department allowed a Track 2 cleanup over the entire site.

Bottom endpoint samples were collected at a frequency of one per every 900 ft^2 with analytical results provided in Table 2. Locations of the endpoint samples are shown on Figure 5. Sidewall post-excavation samples were collected along the northern boundary of Site C at a rate of one sample every 30 linear ft., and were collected in the approximate center of the contaminated interval whenever possible. No excavation sidewalls were collected along the Site C/Site B boundary because the soil was excavated to approximately the same depths on both sites. Sidewall samples were collected for documentation purposes only since they were collected from the maximum feasible extent of the excavation.

All soil samples were analyzed by Accutest Laboratories of Dayton, New Jersey, a State certified Environmental Laboratory Approval Program (ELAP) laboratory. The analytical results were compared to the RRSCOs as defined in 6 NYCRR Part 375. Table 2 summarize the results of all soil samples collected. No VOCs, SVOCs, pesticides, or

PCBs were detected in any of the endpoint samples at concentrations above the RRSCOs. Of the 22 samples collected, one soil sample (Site C TR4-1) contained a minor exceedance of RRSCOs for copper. Laboratory results in exceedance of UUSCOs and RRSCOs are presented in Figure 7.

2.5.2 Groundwater

Prior to remediation and as part of the Remedial Investigation (RI), one groundwater sample was collected on site C. Several naturally occurring metals exceeded groundwater standards on Site C. Groundwater monitoring is not required because the exceedances are not Site related. A groundwater use restriction will be enforced by the environmental easement

2.5.3 Soil Vapor Intrusion Evaluation

Soil vapor intrusion evaluation not required.

3.0 INSTITUTIONAL CONTROL PLAN

3.1 General

Since soil exceeding UUSCOs remains beneath Site C after remediation, ICs are required to protect human health and the environment. This IC Plan describes the procedures for the implementation and management of all ICs at Site C. The IC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all ICs on Site C;
- The basic implementation and intended role of each IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs, such as the implementation of the EWP (as provided in Appendix C) for the proper handling of remaining soils above UUSCOs that may be disturbed during maintenance or redevelopment work on Site C; and
- Any other provisions necessary to identify or establish methods for implementing the ICs required by the Site C remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the RAWP to: (1) prevent future exposure to soils exceeding UUSCOs; and, (2) limit the use and development of Site C to restricted residential, industrial and commercial uses only. Adherence to these ICs on Site C is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement (Appendix A). The IC boundaries are shown on Figure 7. These ICs are:

- Site C may be used for restricted residential, commercial or industrial uses;

- The use of groundwater underlying Site C is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health (NYCDOH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining soils exceeding UUSCOs must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Access to Site C must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement; and
- Vegetable gardens and farming on Site C are prohibited.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy to reduce or mitigate contamination at Site C. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC.

This Monitoring and Sampling Plan describes the methods to be used for:

- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards;
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-wide Inspection

Site-wide inspections will be performed annually by building maintenance staff and a Professional Engineer. During these inspections, Site C inspection forms will be completed as provided in Appendix G. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site C usage;
- General Site C conditions at the time of the inspection;
- The Site C management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that Site C records are up to date.

A comprehensive Site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report (PRR). The inspections will determine and document the following:

- Compliance with requirements of this SMP and the Environmental Easement; and
- If Site C records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

4.3 Post-Remediation Media Monitoring and Sampling

No post-remediation media monitoring and sampling is required for Site C.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that Site C and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

A formal vulnerability assessment has not been prepared at the time of the SMP submission, but potential vulnerabilities, including storm water management, flooding, erosion, wind, and other hazards are discussed below.

Site C is currently served by the New York City combined sewer located in Orchard Street. The proposed storm drainage system will be adapted to Site C conditions as Site C is developed. Upon completion of the Site C development, a new storm water collection and control system will be constructed. The entire Site C will be covered with concrete or the new building, and proposed storm drains will collect storm water and divert it to the combined sewer on Orchard Street.

Site C is not located within a designated floodplain. The adjacent rail yard located south of Site C lies within the 100-year flood plain. No surface water bodies exist on-Site and the closest surface water body is the Dutch Kill coming from the Newtown Creek, located approximately 1,600 ft. south of Site C, and the East River approximately 4,200 ft. to the west. Due to the low risk of major flooding, a quantified risk assessment is not warranted.

The area surrounding Site C contains a mixture of residential buildings, office buildings, parking and commercial enterprises consisting of warehouses, light manufacturing, retail, and shipping terminals. Utility structures surrounding the east side of Site C have potential to cause damage during periods of high winds. Site C is potentially

susceptible to power loss and/or dips/surges in voltage during severe weather events, including lightning strikes, and the associated impact on Site C equipment and operations. However, the surrounding area is highly developed and power outages will be rectified as soon as possible by the electricity provider. Due to the variability in annual weather patterns, it is assumed that emergency weather situations will be infrequent and damages rectified by the appropriate relief agency.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including Site C management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. As discussed below, SMP-related activities will be conducted with an emphasis on minimizing waste generation, energy usage, emissions, and disturbances to land and ecosystems.

6.2.1 Timing of Green Remediation Evaluations

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

Prior to remediation, land use of the surrounding area was evaluated and did not identify vulnerable ecosystems at risk for disturbance. The remediation at Site C does not impact environmentally sensitive natural receptors in the area and there is no necessity for remedy or restoration. Any changes to surrounding land use will be presented in the PRR.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption in accordance with NYC sustainability regulations.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from Site C and use of consumables in relation to visiting Site C in order to conduct system checks and/or collect samples and shipping samples to a laboratory for analyses, have direct and/or inherent energy costs. The schedule and/or

means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

Site C has taken measures to reduce energy consumption in regards to periodic monitoring and sampling activities on-Site. The SMP responsible party will use mass transportation (subway, bus, etc.) whenever possible to reduce carbon emissions from transportation by car.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All Site management inspection, maintenance and monitoring events will be recorded on the appropriate Site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for Site C during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 5 and summarized in the PRR.

Table 5: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Annually
Periodic Review Report	Every 10 years

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Any observations, conclusions, or recommendations.

7.2 Periodic Review Report

A PRR will be submitted to the NYSDEC beginning 10 years after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted

annually to the NYSDEC or at another frequency as may be required by the NYSDEC. In the event that Site C is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses Site C described in Appendix A. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Any media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ICs required by the remedy for Site C;
- Results of the required annual Site C inspections and severe condition inspections, if applicable;
- All applicable Site management forms and other records generated for Site C during the reporting period in the NYSDEC-approved electronic format, if not previously submitted;
- A Site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the Site-specific RAWP dated February 2016;
  - The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in NYS, will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional control identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional controls required by the remedial program was performed under my direction;*
- *The institutional control employed at this Site is unchanged from the date the control was put in place, or last approved by the NYSDEC;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;*
- *Access to the Site will continue to be provided to the NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the environmental easement;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Arnold F. Fleming, of 158 West 29th Street, New York, NY, 10001, am certifying as Remedial Party I have been authorized and designated by all Site owners to sign this certification for the Site."

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which Site C is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure.

Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

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Radon Prevention in the Design and Construction of Schools and Other Large Buildings, 1994.

Outlet City Soil and Groundwater Sampling Results, AKRF, 1990.

QPRD Site C Remedial Investigation Report, Fleming-Lee Shue, January 2015

QPRD Site C Interim Remedial Measure Work Plan, Fleming-Lee Shue, January 2015

QPRD Site C Supplemental Remedial Investigation Letter Report, Fleming-Lee Shue, July 2015

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New York, Brooklyn. Beers, F. W. (Frederick W.), 1868

American Conference of Governmental and Industrial Hygienists. *Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices*. 2016.

Mayer, A., S. and Hassanizadeh. S. M., Editors. *Soil and Groundwater Contamination: Nonaqueous Phase Liquids.* American Geophysical Union, Washington DC. 2005

Buxton, H. T. and Shernoff, P. K. 1999. *Ground-Water Resources of Kings and Queens Counties, Long Island.* United States Geological Survey Water Supply Paper. 2498.

TABLES

Table 2 - BCP No. C241169
Sample Inventory
Queens Plaza Residential Development Site C, Long Island City, NY

Excavation Grid Cell	Soil Waste Characterization Grid Cell	Type of EP Sample	Client Sample ID	Date	Lab Sample ID	Sample Elevation (NAVD88)	*Final Depth of Excavation ft.-bgs.	Cleanup Track Achieved
88	W1	EP - bottom	EP-88 (7.50)	11/3/2015	JC7723-4	7.50	12.50	2
88	W1	EP - wall	EP-88(8.00)SN	11/10/2015	JC8225-6	8.00	12.00	2
88	W1	EP - bottom	SITE C TR4-1	3/4/2016	JC15422-1	17.00	3.00	2
89	W1	EP - bottom	EP-89(7.10)	2/12/2016	JC14192-1	7.10	12.90	2
89	W1	EP - wall	EP-89(9.5)SN	2/19/2016	JC14556-1	9.50	10.50	2
89	W1	EP - bottom	SITE C TR4-2	3/4/2016	JC15422-2	17.00	3.00	2
90	W1	EP - bottom	EP-90 (6.50)	11/3/2015	JC7723-5	6.50	13.50	2
91	W1	EP - bottom	EP-91(6.70)	2/10/2016	JC14118-1	6.70	13.30	2
92	W1	EP - bottom	EP-92(6.70)	11/4/2015	JC7903-3	6.70	13.30	2
93	W1	EP - bottom	EP-93(7.20)	2/10/2016	JC14118-3	7.20	12.80	2
94	W1	EP - bottom	EP-94(6.70)	11/4/2015	JC7903-4	6.70	13.30	2
95	W1	EP - bottom	EP-95(7.40)	2/10/2016	JC14118-4	7.40	12.60	2
94 S	W2	EP - bottom	EP-94S(4.90)	2/22/2016	JC14705-1	4.90	15.10	2
95 S	W2	EP - bottom	EP-95S(4.90)	2/18/2016	JC14555-1	4.90	15.10	2
96	W2	EP - bottom	EP-96(4.90)	2/22/2016	JC14703-4	4.90	15.10	2
97	W2	EP - bottom	EP-97(4.70)	2/22/2016	JC14703-5	4.70	15.30	2
98	W2	EP - bottom	EP-98(4.70)	2/22/2016	JC14703-2	4.70	15.30	2
99	W2	EP - bottom	EP-99(4.80)	2/22/2016	JC14703-3	4.80	15.20	2
100	W2	EP - bottom	EP-100 (2.90)	1/26/2016	JC13260-2	2.90	17.10	2
100	W2	EP - bottom	EP-100(1.52)	2/4/2016	JC13824-2	1.52	18.48	2
101	W2	EP - bottom	EP-101(4.70)	2/22/2016	JC14703-1	4.70	15.30	2
102	W2	EP - bottom	EP-102(3.00)	1/20/2016	JC13051-4	3.00	17.00	2
102	W2	EP - bottom	EP-102 (1.90)	1/28/2016	JC13389-1	1.90	18.10	2
103	W2	EP - bottom	EP-103(3.00)	1/20/2016	JC13051-1	3.00	17.00	2
103	W2	EP - bottom	EP-103(1.40)	2/4/2016	JC13824-1	1.40	18.60	2

Notes:

EP Endpoint samples

ft. bgs. Feet Below Ground Surface

***** Grade elevation, prior excavation, at Jackson Avenue, 20 ft. NAVD88

19 Total # of grids part of BCP C241105

Gray cells denotes sample where one or more compounds failed to meet RRSCOs; therefore, additional sample collected at deeper elevation and analyzed for those compounds that failed RRSCOs.

Table 2A - BCP No. C241169
Volatile Organic Compounds in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-88 (7.50)	EP-88(8.00)SN	EP-89(7.10)	EP-89(9.5)SN	EP-90 (6.50)	EP-91(6.70)	EP-92(6.70)	EP-93(7.20)	EP-94(6.70)	EP-94S(4.90)	EP-95(7.40)	EP-95S(4.90)	EP-96(4.90)
Lab Sample ID:			JC7723-4	JC8225-6	JC14192-1	JC14556-1	JC7723-5	JC14118-1	JC7903-3	JC14118-3	JC7903-4	JC14705-1	JC14118-4	JC14555-1	JC14703-4
Date Sampled:			11/3/2015	11/10/2015	2/12/2016	2/19/2016	11/3/2015	2/10/2016	11/4/2015	2/10/2016	11/4/2015	2/22/2016	2/10/2016	2/18/2016	2/22/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Volatiles (SW846 8260C), (ug/kg)															
1,1,1-Trichloroethane	680	100000	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.19)	ND (0.17)	ND (0.13)	ND (0.25)	ND (0.13)	ND (0.12)	ND (0.13)	ND (0.12)	ND (0.14)	ND (0.12)
1,1,2,2-Tetrachloroethane	-	-	ND (0.14)	ND (0.15)	ND (0.17)	ND (0.22)	ND (0.20)	ND (0.16)	ND (0.29)	ND (0.15)	ND (0.14)	ND (0.15)	ND (0.14)	ND (0.16)	ND (0.15)
1,1,2-Trichloroethane	-	-	ND (0.12)	ND (0.13)	ND (0.14)	ND (0.18)	ND (0.17)	ND (0.13)	ND (0.24)	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.14)	ND (0.12)
1,1-Dichloroethane	270	26000	ND (0.11)	ND (0.12)	ND (0.14)	ND (0.18)	ND (0.16)	ND (0.13)	ND (0.23)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.13)	ND (0.12)
1,1-Dichloroethene	330	100000	ND (0.48)	ND (0.51)	ND (0.58)	ND (0.74)	ND (0.68)	ND (0.53)	ND (0.98)	ND (0.51)	ND (0.49)	ND (0.50)	ND (0.49)	ND (0.56)	ND (0.49)
1,2,3-Trichlorobenzene	-	-	ND (0.14)	ND (0.15)	ND (0.17)	ND (0.22)	ND (0.20)	ND (0.16)	ND (0.29)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.17)	ND (0.15)
1,2,4-Trichlorobenzene	-	-	ND (0.14)	ND (0.14)	ND (0.16)	ND (0.21)	ND (0.19)	ND (0.15)	ND (0.28)	ND (0.14)	ND (0.14)	ND (0.14)	ND (0.14)	ND (0.16)	ND (0.14)
1,2-Dibromo-3-chloropropane	-	-	ND (0.44)	ND (0.47)	ND (0.53)	ND (0.68)	ND (0.63)	ND (0.49)	ND (0.90)	ND (0.46)	ND (0.45)	ND (0.46)	ND (0.45)	ND (0.51)	ND (0.45)
1,2-Dibromoethane	-	-	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.16)	ND (0.15)	ND (0.12)	ND (0.22)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.12)	ND (0.11)
1,2-Dichlorobenzene	1100	100000	ND (0.099)	ND (0.10)	ND (0.12)	ND (0.15)	ND (0.14)	ND (0.11)	ND (0.20)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.11)	ND (0.10)
1,2-Dichloroethane	20	3100	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.17)	ND (0.15)	ND (0.12)	ND (0.22)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.11)
1,2-Dichloropropane	-	-	ND (0.19)	ND (0.20)	ND (0.23)	ND (0.30)	ND (0.27)	ND (0.21)	ND (0.40)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.22)	ND (0.20)
1,3-Dichlorobenzene	2400	49000	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.20)	ND (0.18)	ND (0.14)	ND (0.26)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.13)
1,4-Dichlorobenzene	1800	13000	ND (0.18)	ND (0.19)	ND (0.22)	ND (0.28)	ND (0.26)	ND (0.20)	ND (0.37)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.21)	ND (0.19)
1,4-Dioxane	100	13000	ND (13)	ND (13)	ND (15)	ND (20)	ND (18)	ND (14)	ND (26)	ND (13)	ND (13)	ND (13)	ND (13)	ND (15)	ND (13)
2-Butanone (MEK)	120	100000	ND (1.6)	ND (1.6)	ND (1.9)	ND (2.4)	ND (2.2)	ND (1.7)	ND (3.2)	ND (1.6)	ND (1.6)	ND (1.6)	ND (1.6)	ND (1.8)	ND (1.6)
2-Hexanone	-	-	ND (1.1)	ND (1.1)	ND (1.3)	ND (1.7)	ND (1.5)	ND (1.2)	ND (2.2)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.3)	ND (1.1)
4-Methyl-2-pentanone(MIBK)	-	-	ND (0.37)	ND (0.39)	ND (0.45)	ND (0.58)	ND (0.53)	ND (0.41)	ND (0.76)	ND (0.39)	ND (0.38)	ND (0.39)	ND (0.38)	ND (0.43)	ND (0.38)
Acetone	50	100000	ND (1.8)	ND (1.9)	ND (2.2)	ND (2.8)	ND (2.6)	5.3 J	ND (3.7)	11.1	9.4	37.4	10.1	ND (2.1)	5.0 J
Benzene	60	4800	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.17)	ND (0.15)	ND (0.12)	ND (0.22)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.13)	ND (0.11)
Bromochloromethane	-	-	ND (0.25)	ND (0.26)	ND (0.30)	ND (0.39)	ND (0.36)	ND (0.28)	ND (0.51)	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.25)	ND (0.29)	ND (0.26)
Bromodichloromethane	-	-	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.20)	ND (0.18)	ND (0.14)	ND (0.26)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.13)
Bromoform	-	-	ND (0.19)	ND (0.20)	ND (0.23)	ND (0.30)	ND (0.27)	ND (0.21)	ND (0.39)	ND (0.20)	ND (0.19)	ND (0.20)	ND (0.19)	ND (0.22)	ND (0.20)
Bromomethane	-	-	ND (0.30)	ND (0.31)	ND (0.35)	ND (0.46)	ND (0.42)	ND (0.33)	ND (0.61)	ND (0.31)	ND (0.30)	ND (0.31)	ND (0.30)	ND (0.34)	ND (0.30)
Carbon disulfide	-		ND (0.19)	ND (0.20)	ND (0.22)	ND (0.29)	ND (0.26)	ND (0.21)	ND (0.38)	0.52 J	ND (0.19)	ND (0.19)	ND (0.19)	0.43 J	ND (0.19)
Carbon tetrachloride	760	2400	ND (0.19)	ND (0.20)	ND (0.22)	ND (0.29)	ND (0.26)	ND (0.21)	ND (0.38)	ND (0.20)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.22)	ND (0.19)
Chlorobenzene	1100	100000	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.19)	ND (0.18)	ND (0.14)	ND (0.26)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.15)	ND (0.13)
Chloroethane	-	-	ND (0.39)	ND (0.41)	ND (0.47)	ND (0.60)	ND (0.55)	ND (0.43)	ND (0.80)	ND (0.41)	ND (0.40)	ND (0.41)	ND (0.40)	ND (0.45)	ND (0.40)
Chloroform	370	49000	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.19)	ND (0.17)	ND (0.13)	ND (0.25)	ND (0.13)	ND (0.12)	ND (0.13)	ND (0.12)	ND (0.14)	ND (0.12)
Chloromethane	-	-	ND (0.21)	ND (0.22)	ND (0.26)	ND (0.33)	ND (0.30)	ND (0.24)	ND (0.44)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.25)	ND (0.22)
cis-1,2-Dichloroethene	250	100000	ND (0.63)	ND (0.67)	ND (0.76)	ND (0.98)	ND (0.90)	ND (0.70)	ND (1.3)	ND (0.67)	ND (0.64)	ND (0.66)	ND (0.64)	ND (0.73)	ND (0.65)
cis-1,3-Dichloropropene	-	-	ND (0.096)	ND (0.10)	ND (0.11)	ND (0.15)	ND (0.14)	ND (0.11)	ND (0.20)	ND (0.10)	ND (0.097)	ND (0.099)	ND (0.097)	ND (0.11)	ND (0.098)
Cyclohexane	-	-	ND (0.26)	ND (0.27)	ND (0.31)	ND (0.40)	ND (0.36)	ND (0.28)	ND (0.53)	ND (0.27)	ND (0.26)	ND (0.27)	ND (0.26)	ND (0.30)	ND (0.26)
Dibromochloromethane	-	-	ND (0.17)	ND (0.18)	ND (0.20)	ND (0.26)	ND (0.24)	ND (0.18)	ND (0.34)	ND (0.18)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.19)	ND (0.17)
Dichlorodifluoromethane	-	-	ND (0.29)	ND (0.31)	ND (0.35)	ND (0.45)	ND (0.42)	ND (0.32)	ND (0.60)	ND (0.31)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.34)	ND (0.30)
Ethylbenzene	1000	41000	ND (0.13)	ND (0.14)	ND (0.16)	ND (0.20)	ND (0.19)	ND (0.15)	ND (0.27)	0.33 J	ND (0.13)	ND (0.14)	ND (0.13)	ND (0.15)	ND (0.14)
Freon 113	-	-	ND (0.36)	ND (0.38)	ND (0.44)	ND (0.56)	ND (0.52)	ND (0.40)	ND (0.74)	ND (0.38)	ND (0.37)	ND (0.38)	ND (0.37)	ND (0.42)	ND (0.37)
Isopropylbenzene	-	-	ND (0.086)	ND (0.091)	ND (0.10)	ND (0.13)	ND (0.12)	ND (0.095)	ND (0.18)	ND (0.090)	ND (0.087)	ND (0.089)	ND (0.087)	ND (0.10)	ND (0.088)
m,p-Xylene	260	100000	ND (0.29)	ND (0.30)	ND (0.34)	ND (0.44)	ND (0.41)	ND (0.32)	ND (0.59)	0.95	ND (0.29)	ND (0.30)	ND (0.29)	ND (0.33)	ND (0.29)
Methyl Acetate	-	-	ND (0.70)	ND (0.74)	ND (0.84)	ND (1.1)	ND (0.99)	ND (0.77)	ND (1.4)	ND (0.73)	ND (0.71)	ND (0.72)	ND (0.71)	ND (0.81)	ND (0.72)
Methyl Tert Butyl Ether	930	100000	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.19)	ND (0.18)	ND (0.14)	ND (0.25)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.13)	ND (0.14)	ND (0.13)
Methylcyclohexane	-	-	ND (0.18)	ND (0.19)	ND (0.22)	ND (0.29)	ND (0.26)	ND (0.20)	ND (0.38)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.21)	ND (0.19)
Methylene chloride	50	100000	ND (0.80)	ND (0.84)	ND (0.96)	ND (1.2)	ND (1.1)	ND (0.88)	ND (1.6)	ND (0.84)	ND (0.81)	1.4 J	ND (0.81)	ND (0.92)	ND (0.82)
o-Xylene	260	100000	ND (0.22)	ND (0.23)	ND (0.27)	ND (0.34)	ND (0.32)	ND (0.25)	ND (0.46)	0.52 J	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.26)	ND (0.23)
Styrene	-	-	ND (0.14)	ND (0.15)	ND (0.17)	ND (0.22)	ND (0.21)	ND (0.16)	ND (0.30)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.17)	ND (0.15)
Tetrachloroethene	1300	19000	ND (0.24)	ND (0.26)	ND (0.29)	ND (0.38)	ND (0.35)	ND (0.27)	ND (0.50)	ND (0.26)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.28)	ND (0.25)
Toluene	700	100000	ND (0.17)	ND (0.18)	ND (0.20)	ND (0.26)	ND (0.24)	ND (0.19)	ND (0.35)	0.38 J	ND (0.17)	ND (0.18)	0.23 J	ND (0.20)	ND (0.17)
trans-1,2-Dichloroethene	190	100000	ND (0.48)	ND (0.51)	ND (0.58)	ND (0.75)	ND (0.68)	ND (0.53)	ND (0.99)	ND (0.51)	ND (0.49)	ND (0.50)	ND (0.49)	ND (0.56)	ND (0.50)
trans-1,3-Dichloropropene	-	-	ND (0.14)	ND (0.15)	ND (0.17)	ND (0.22)	ND (0.20)	ND (0.16)	ND (0.29)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.15)	ND (0.17)	ND (0.15)
Trichloroethene	470	21000	ND (0.12)	ND (0.13)	ND (0.14)	ND (0.18)	ND (0.17)	ND (0.13)	ND (0.24)	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.12)	ND (0.14)	ND (0.12)
Trichlorofluoromethane	-	-	ND (0.20)	ND (0.21)	ND (0.24)	ND (0.31)	ND (0.29)	ND (0.22)	ND (0.41)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.23)	ND (0.21)
Vinyl chloride	20	900	ND (0.16)	ND (0.17)	ND (0.19)	ND (0.25)	ND (0.23)	ND (0.18)	ND (0.33)	ND (0.17)	ND (0.16)	ND (0.17)	ND (0.16)	ND (0.19)	ND (0.16)
Xylene (total)	260	100000	ND (0.22)	ND (0.23)	ND (0.27)	ND (0.34)	ND (0.32)	ND (0.25)	ND (0.46)	1.5	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.26)	ND (0.23)

Legend:
Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:
Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2A - BCP No. C241169
Volatile Organic Compounds in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-97(4.70)	EP-98(4.70)	EP-99(4.80)	EP-100 (2.90)	EP-100 (2.90)DUP	EP-100(1.52)	EP-101(4.70)	EP-102(3.00)	EP-102 (1.90)	EP-103(3.00)	EP-103(1.40)	SITE C TR4-1	SITE C TR4-2
Lab Sample ID:			JC14703-5	JC14703-2	JC14703-3	JC13260-2	JC13260-3	JC13824-2	JC14703-1	JC13051-4	JC13389-1	JC13051-1	JC13824-1	JC15422-1	JC15422-2
Date Sampled:			2/22/2016	2/22/2016	2/22/2016	1/26/2016	1/26/2016	2/4/2016	2/22/2016	1/20/2016	1/28/2016	1/20/2016	2/4/2016	3/4/2016	3/4/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Volatiles (SW846 8260C), (ug/kg)															
1,1,1-Trichloroethane	680	100000	ND (0.14)	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.14)	-	ND (0.13)	ND (0.15)	-	ND (0.20)	-	ND (0.15)	ND (0.14)
1,1,2,2-Tetrachloroethane	-	-	ND (0.16)	ND (0.14)	ND (0.16)	ND (0.18)	ND (0.16)	-	ND (0.15)	ND (0.18)	-	ND (0.23)	-	ND (0.17)	ND (0.17)
1,1,2-Trichloroethane	-	-	ND (0.14)	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.14)	-	ND (0.13)	ND (0.15)	-	ND (0.19)	-	ND (0.14)	ND (0.14)
1,1-Dichloroethane	270	26000	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.14)	ND (0.13)	-	ND (0.12)	ND (0.14)	-	ND (0.19)	-	ND (0.14)	ND (0.14)
1,1-Dichloroethene	330	100000	ND (0.55)	ND (0.48)	ND (0.52)	ND (0.59)	ND (0.55)	-	ND (0.52)	ND (0.61)	-	ND (0.78)	-	ND (0.58)	ND (0.58)
1,2,3-Trichlorobenzene	-	-	ND (0.16)	ND (0.14)	ND (0.16)	ND (0.18)	ND (0.16)	-	ND (0.15)	ND (0.18)	-	ND (0.23)	-	ND (0.17)	ND (0.17)
1,2,4-Trichlorobenzene	-	-	ND (0.16)	ND (0.14)	ND (0.15)	ND (0.17)	ND (0.16)	-	ND (0.15)	ND (0.17)	-	ND (0.22)	-	ND (0.16)	ND (0.16)
1,2-Dibromo-3-chloropropane	-	-	ND (0.51)	ND (0.44)	ND (0.48)	ND (0.54)	ND (0.51)	-	ND (0.48)	ND (0.56)	-	ND (0.72)	-	ND (0.53)	ND (0.53)
1,2-Dibromoethane	-	-	ND (0.12)	ND (0.11)	ND (0.12)	ND (0.13)	ND (0.12)	-	ND (0.11)	ND (0.13)	-	ND (0.17)	-	ND (0.13)	ND (0.13)
1,2-Dichlorobenzene	1100	100000	ND (0.11)	ND (0.10)	ND (0.11)	2.7	2.2	-	3.2	3.6	-	0.29 J	-	ND (0.12)	ND (0.12)
1,2-Dichloroethane	20	3100	ND (0.13)	ND (0.11)	ND (0.12)	ND (0.13)	ND (0.13)	-	ND (0.12)	ND (0.14)	-	ND (0.18)	-	ND (0.13)	ND (0.13)
1,2-Dichloropropane	-	-	ND (0.22)	ND (0.19)	ND (0.21)	ND (0.24)	ND (0.22)	-	ND (0.21)	ND (0.24)	-	ND (0.31)	-	ND (0.23)	ND (0.23)
1,3-Dichlorobenzene	2400	49000	ND (0.15)	ND (0.13)	ND (0.14)	ND (0.16)	ND (0.15)	-	ND (0.14)	ND (0.16)	-	ND (0.21)	-	ND (0.15)	ND (0.15)
1,4-Dichlorobenzene	1800	13000	ND (0.21)	ND (0.18)	ND (0.20)	0.50 J	0.65 J	-	0.32 J	2.3	-	ND (0.30)	-	ND (0.22)	ND (0.22)
1,4-Dioxane	100	13000	ND (15)	ND (13)	ND (14)	ND (16)	ND (15)	-	ND (14)	ND (16)	-	ND (21)	-	ND (15)	ND (15)
2-Butanone (MEK)	120	100000	ND (1.8)	5.1 J	ND (1.7)	ND (1.9)	ND (1.8)	-	ND (1.7)	6.1 J	-	18.6	-	ND (1.9)	ND (1.9)
2-Hexanone	-	-	ND (1.3)	ND (1.1)	ND (1.2)	ND (1.3)	ND (1.3)	-	ND (1.2)	ND (1.4)	-	ND (1.8)	-	ND (1.3)	ND (1.3)
4-Methyl-2-pentanone(MIBK)	-	-	ND (0.43)	ND (0.37)	ND (0.41)	ND (0.46)	ND (0.43)	-	ND (0.40)	ND (0.47)	-	ND (0.61)	-	ND (0.45)	ND (0.45)
Acetone	50	100000	2.8 J	**56.3**	11.2	**85.6**	**88.9**	**72.9**	18.6	**55**	ND (35)	**97.5**	**92.6**	6.2 J	19.9
Benzene	60	4800	ND (0.12)	ND (0.11)	ND (0.12)	0.26 J	0.68	-	ND (0.12)	10	-	0.22 J	-	ND (0.13)	ND (0.13)
Bromochloromethane	-	-	ND (0.29)	ND (0.25)	ND (0.27)	ND (0.31)	ND (0.29)	-	ND (0.27)	ND (0.32)	-	ND (0.41)	-	ND (0.30)	ND (0.30)
Bromodichloromethane	-	-	ND (0.15)	ND (0.13)	ND (0.14)	ND (0.16)	ND (0.15)	-	ND (0.14)	ND (0.16)	-	ND (0.21)	-	ND (0.15)	ND (0.15)
Bromoform	-	-	ND (0.22)	ND (0.19)	ND (0.21)	ND (0.24)	ND (0.22)	-	ND (0.21)	ND (0.24)	-	ND (0.31)	-	ND (0.23)	ND (0.23)
Bromomethane	-	-	ND (0.34)	ND (0.30)	ND (0.32)	ND (0.36)	ND (0.34)	-	ND (0.32)	ND (0.37)	-	ND (0.48)	-	ND (0.36)	ND (0.35)
Carbon disulfide	-		ND (0.21)	ND (0.19)	ND (0.20)	0.27 J	0.31 J	-	ND (0.20)	0.46 J	-	0.35 J	-	ND (0.22)	0.32 J
Carbon tetrachloride	760	2400	ND (0.21)	ND (0.19)	ND (0.20)	ND (0.23)	ND (0.22)	-	ND (0.20)	ND (0.24)	-	ND (0.30)	-	ND (0.22)	ND (0.22)
Chlorobenzene	1100	100000	ND (0.14)	ND (0.13)	ND (0.14)	ND (0.16)	ND (0.15)	-	ND (0.14)	ND (0.16)	-	ND (0.20)	-	ND (0.15)	ND (0.15)
Chloroethane	-	-	ND (0.45)	ND (0.39)	ND (0.43)	ND (0.48)	ND (0.45)	-	ND (0.42)	ND (0.49)	-	ND (0.64)	-	ND (0.47)	ND (0.47)
Chloroform	370	49000	ND (0.14)	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.14)	-	ND (0.13)	ND (0.15)	-	ND (0.20)	-	ND (0.15)	ND (0.14)
Chloromethane	-	-	ND (0.24)	ND (0.21)	ND (0.23)	ND (0.26)	ND (0.25)	-	ND (0.23)	ND (0.27)	-	ND (0.35)	-	ND (0.26)	ND (0.25)
cis-1,2-Dichloroethene	250	100000	ND (0.73)	ND (0.64)	ND (0.69)	ND (0.78)	ND (0.73)	-	ND (0.68)	ND (0.80)	-	ND (1.0)	-	ND (0.76)	ND (0.76)
cis-1,3-Dichloropropene	-	-	ND (0.11)	ND (0.096)	ND (0.10)	ND (0.12)	ND (0.11)	-	ND (0.10)	ND (0.12)	-	ND (0.16)	-	ND (0.12)	ND (0.11)
Cyclohexane	-	-	ND (0.29)	ND (0.26)	ND (0.28)	ND (0.32)	ND (0.30)	-	ND (0.28)	ND (0.32)	-	ND (0.42)	-	ND (0.31)	ND (0.31)
Dibromochloromethane	-	-	ND (0.19)	ND (0.17)	ND (0.18)	ND (0.21)	ND (0.19)	-	ND (0.18)	ND (0.21)	-	ND (0.27)	-	ND (0.20)	ND (0.20)
Dichlorodifluoromethane	-	-	ND (0.34)	ND (0.29)	ND (0.32)	ND (0.36)	ND (0.34)	-	ND (0.32)	ND (0.37)	-	ND (0.48)	-	ND (0.35)	ND (0.35)
Ethylbenzene	1000	41000	ND (0.15)	ND (0.13)	0.18 J	2.7	4.8	-	0.68 J	57.6	-	0.63 J	-	ND (0.16)	ND (0.16)
Freon 113	-	-	ND (0.42)	ND (0.37)	ND (0.40)	ND (0.45)	ND (0.42)	-	ND (0.39)	ND (0.46)	-	ND (0.59)	-	ND (0.44)	ND (0.44)
Isopropylbenzene	-	-	0.26 J	ND (0.087)	ND (0.094)	1.9 J	2.5	-	1.0 J	24	-	ND (0.14)	-	ND (0.10)	ND (0.10)
m,p-Xylene	260	100000	ND (0.33)	ND (0.29)	0.58 J	6.6	12.2	-	0.81 J	102	-	4.5	-	ND (0.34)	ND (0.34)
Methyl Acetate	-	-	ND (0.80)	ND (0.70)	ND (0.76)	ND (0.86)	ND (0.80)	-	ND (0.75)	ND (0.88)	-	ND (1.1)	-	ND (0.84)	ND (0.84)
Methyl Tert Butyl Ether	930	100000	ND (0.14)	ND (0.12)	ND (0.14)	ND (0.15)	ND (0.14)	-	ND (0.13)	ND (0.16)	-	ND (0.20)	-	ND (0.15)	ND (0.15)
Methylcyclohexane	-	-	ND (0.21)	ND (0.19)	ND (0.20)	ND (0.23)	ND (0.21)	-	ND (0.20)	0.57 J	-	ND (0.30)	-	ND (0.22)	ND (0.22)
Methylene chloride	50	100000	2.0 J	1.3 J	1.2 J	ND (0.98)	ND (0.92)	-	1.5 J	ND (1.0)	-	ND (1.3)	-	ND (0.96)	ND (0.96)
o-Xylene	260	100000	ND (0.26)	ND (0.22)	0.45 J	4.3	7.9	-	1	74	-	3.3	-	ND (0.27)	ND (0.27)
Styrene	-	-	ND (0.17)	ND (0.15)	ND (0.16)	ND (0.18)	ND (0.17)	-	ND (0.16)	ND (0.18)	-	ND (0.24)	-	ND (0.17)	ND (0.17)
Tetrachloroethene	1300	19000	ND (0.28)	ND (0.25)	ND (0.27)	ND (0.30)	ND (0.28)	-	ND (0.26)	ND (0.31)	-	ND (0.40)	-	ND (0.29)	ND (0.29)
Toluene	700	100000	0.32 J	ND (0.17)	ND (0.18)	2.2	5.1	-	0.39 J	12.2	-	1.4	-	ND (0.20)	ND (0.20)
trans-1,2-Dichloroethene	190	100000	ND (0.55)	ND (0.48)	ND (0.53)	ND (0.59)	ND (0.56)	-	ND (0.52)	ND (0.61)	-	ND (0.78)	-	ND (0.58)	ND (0.58)
trans-1,3-Dichloropropene	-	-	ND (0.17)	ND (0.14)	ND (0.16)	ND (0.18)	ND (0.17)	-	ND (0.16)	ND (0.18)	-	ND (0.23)	-	ND (0.17)	ND (0.17)
Trichloroethene	470	21000	ND (0.14)	ND (0.12)	ND (0.13)	ND (0.15)	ND (0.14)	-	ND (0.13)	ND (0.15)	-	ND (0.19)	-	ND (0.14)	ND (0.14)
Trichlorofluoromethane	-	-	ND (0.23)	ND (0.20)	ND (0.22)	ND (0.25)	ND (0.23)	-	ND (0.22)	ND (0.25)	-	ND (0.33)	-	ND (0.24)	ND (0.24)
Vinyl chloride	20	900	ND (0.18) [b]	ND (0.16)	ND (0.17)	ND (0.20)	ND (0.18)	-	ND (0.17)	ND (0.20)	-	ND (0.26)	-	ND (0.19)	ND (0.19)
Xylene (total)	260	100000	ND (0.26)	ND (0.22)	1	10.9	20.1	-	1.8	176	-	7.8	-	ND (0.27)	ND (0.27)

Legend:
Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:
Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2B - BCP No. C241169
Semi - Volatile Organic Compounds in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-88 (7.50)	EP-88(8.00)SN	EP-89(7.10)	EP-89(9.5)SN	EP-90 (6.50)	EP-91(6.70)	EP-92(6.70)	EP-93(7.20)	EP-94(6.70)	EP-94S(4.90)	EP-95(7.40)	EP-95S(4.90)	EP-96(4.90)	EP-97(4.70)	EP-98(4.70)	EP-99(4.80)	EP-100 (2.90)
Lab Sample ID:			JC7723-4	JC8225-6	JC14192-1	JC14556-1	JC7723-5	JC14118-1	JC7903-3	JC14118-3	JC7903-4	JC14705-1	JC14118-4	JC14555-1	JC14703-4	JC14703-5	JC14703-2	JC14703-3	JC13260-2
Date Sampled:			11/3/2015	11/10/2015	2/12/2016	2/19/2016	11/3/2015	2/10/2016	11/4/2015	2/10/2016	11/4/2015	2/22/2016	2/10/2016	2/18/2016	2/22/2016	2/22/2016	2/22/2016	2/22/2016	1/26/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Semi-volatiles (SW846 8270D), (ug/kg)																			
1,1'-Biphenyl	-	-	ND (7.0)	23.5 J	ND (6.7)	ND (6.6)	ND (7.0)	ND (6.4)	ND (11)	55.7 J	ND (6.4)	37.1 J	21.8 J	386	ND (6.4)	28.6 J	30.2 J	514	860
1,2,4,5-Tetrachlorobenzene	-	-	ND (9.1)	ND (8.9)	ND (8.6)	ND (8.6)	ND (9.1)	ND (8.4)	ND (14)	ND (8.4)	ND (8.3)	ND (8.6)	ND (8.3)	ND (8.5)	ND (8.3)	ND (7.9)	ND (8.8)	ND (8.2)	ND (9.2)
2,3,4,6-Tetrachlorophenol	-	-	ND (36)	ND (35)	ND (34)	ND (34)	ND (36)	ND (33)	ND (54)	ND (33)	ND (33)	ND (34)	ND (33)	ND (34)	ND (32)	ND (31)	ND (34)	ND (32)	ND (36)
2,4,5-Trichlorophenol	-	-	ND (34)	ND (33)	ND (32)	ND (32)	ND (34)	ND (31)	ND (52)	ND (31)	ND (31)	ND (32)	ND (31)	ND (32)	ND (31)	ND (30)	ND (33)	ND (31)	ND (35)
2,4,6-Trichlorophenol	-	-	ND (30)	ND (30)	ND (29)	ND (29)	ND (31)	ND (28)	ND (46)	ND (28)	ND (28)	ND (29)	ND (28)	ND (29)	ND (28)	ND (27)	ND (29)	ND (27)	ND (31)
2,4-Dichlorophenol	-	-	ND (30)	ND (30)	ND (29)	ND (29)	ND (30)	ND (28)	ND (46)	ND (28)	ND (28)	ND (29)	ND (28)	ND (28)	ND (28)	ND (26)	ND (29)	ND (27)	ND (31)
2,4-Dimethylphenol	-	-	ND (69)	ND (68)	ND (66)	ND (65)	ND (69)	ND (64)	ND (110)	ND (64)	ND (63)	ND (66)	ND (64)	ND (65)	ND (63)	ND (60)	79.7 J	73.2 J	329
2,4-Dinitrophenol	-	-	ND (170)	ND (160)	ND (160)	ND (160)	ND (170)	ND (150)	ND (250)	ND (150)	ND (150)	ND (160)	ND (150)	ND (160)	ND (150)	ND (140)	ND (160)	ND (150)	ND (170)
2,4-Dinitrotoluene	-	-	ND (7.1)	ND (6.9)	ND (6.8)	ND (6.7)	ND (7.1)	ND (6.6)	ND (11)	ND (6.5)	ND (6.5)	ND (6.8)	ND (6.5)	ND (6.7)	ND (6.5)	ND (6.2)	ND (6.9)	ND (6.4)	ND (7.2)
2,6-Dinitrotoluene	-	-	ND (9.8)	ND (9.5)	ND (9.3)	ND (9.2)	ND (9.8)	ND (9.0)	ND (15)	ND (9.0)	ND (9.0)	ND (9.3)	ND (9.0)	ND (9.2)	ND (8.9)	ND (8.5)	ND (9.5)	ND (8.8)	ND (9.9)
2-Chloronaphthalene	-	-	ND (5.4)	ND (5.3)	ND (5.2)	ND (5.1)	ND (5.4)	ND (5.0)	ND (8.2)	ND (5.0)	ND (5.0)	ND (5.1)	ND (5.0)	ND (5.1)	ND (4.9)	ND (4.7)	ND (5.2)	ND (4.9)	ND (5.5)
2-Chlorophenol	-	-	ND (28)	ND (27)	ND (27)	ND (26)	ND (28)	ND (26)	ND (42)	ND (26)	ND (26)	ND (26)	ND (26)	ND (26)	ND (25)	ND (24)	ND (27)	ND (25)	ND (28)
2-Methylnaphthalene	-	-	ND (7.1)	141	ND (6.7)	ND (6.7)	ND (7.1)	28.0 J	ND (11)	228	46.0 J	101	77.5	2000	18.2 J	ND (6.2)	101	2630	5660
2-Methylphenol	330	100000	ND (55)	ND (54)	ND (52)	ND (52)	ND (55)	ND (51)	ND (83)	ND (50)	ND (50)	ND (52)	ND (50)	ND (52)	ND (50)	ND (48)	ND (53)	ND (49)	131
2-Nitroaniline	-	-	ND (8.6)	ND (8.4)	ND (8.2)	ND (8.1)	ND (8.6)	ND (7.9)	ND (13)	ND (7.9)	ND (7.9)	ND (8.2)	ND (7.9)	ND (8.1)	ND (7.8)	ND (7.5)	ND (8.3)	ND (7.7)	ND (8.7)
2-Nitrophenol	-	-	ND (35)	ND (34)	ND (33)	ND (33)	ND (35)	ND (32)	ND (53)	ND (32)	ND (32)	ND (33)	ND (32)	ND (33)	ND (32)	ND (30)	ND (34)	ND (31)	ND (35)
3&4-Methylphenol	-	100000	ND (36)	ND (35)	ND (34)	ND (34)	ND (36)	ND (33)	ND (55)	ND (33)	ND (33)	ND (34)	ND (33)	ND (34)	ND (33)	ND (32)	ND (35)	ND (33)	280
3,3'-Dichlorobenzidine	-	-	ND (25)	ND (24)	ND (24)	ND (23)	ND (25)	ND (23)	ND (38)	ND (23)	ND (23)	ND (24)	ND (23)	ND (23)	ND (23)	ND (22)	ND (24)	ND (22)	ND (25)
3-Nitroaniline	-	-	ND (11)	ND (10)	ND (10)	ND (10)	ND (11)	ND (9.9)	ND (16)	ND (9.9)	ND (9.9)	ND (10)	ND (9.9)	ND (10)	ND (9.8)	ND (9.4)	ND (10)	ND (9.7)	ND (11)
4,6-Dinitro-o-cresol	-	-	ND (72)	ND (70)	ND (68)	ND (68)	ND (72)	ND (66)	ND (110)	ND (66)	ND (66)	ND (68)	ND (66)	ND (68)	ND (66)	ND (63)	ND (70)	ND (65)	ND (73)
4-Bromophenyl phenyl ether	-	-	ND (8.6)	ND (8.4)	ND (8.2)	ND (8.1)	ND (8.6)	ND (7.9)	ND (13)	ND (7.9)	ND (7.9)	ND (8.2)	ND (7.9)	ND (8.1)	ND (7.9)	ND (7.5)	ND (8.4)	ND (7.8)	ND (8.8)
4-Chloro-3-methyl phenol	-	-	ND (34)	ND (33)	ND (33)	ND (32)	ND (34)	ND (32)	ND (52)	ND (31)	ND (31)	ND (33)	ND (31)	ND (32)	ND (31)	ND (30)	ND (33)	ND (31)	ND (35)
4-Chloroaniline	-	-	ND (10)	ND (9.8)	ND (9.5)	ND (9.5)	ND (10)	ND (9.2)	ND (15)	ND (9.2)	ND (9.2)	ND (9.5)	ND (9.2)	ND (9.4)	ND (9.1)	ND (8.8)	ND (9.7)	ND (9.0)	ND (10)
4-Chlorophenyl phenyl ether	-	-	ND (7.1)	ND (6.9)	ND (6.8)	ND (6.7)	ND (7.1)	ND (6.6)	ND (11)	ND (6.5)	ND (6.5)	ND (6.8)	ND (6.5)	ND (6.7)	ND (6.5)	ND (6.2)	ND (6.9)	ND (6.4)	ND (7.2)
4-Nitroaniline	-	-	ND (13)	ND (12)	ND (12)	ND (12)	ND (13)	ND (12)	ND (19)	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (11)	ND (11)	ND (12)	ND (11)	ND (13)
4-Nitrophenol	-	-	ND (64)	ND (63)	ND (61)	ND (61)	ND (64)	ND (59)	ND (98)	ND (59)	ND (59)	ND (61)	ND (59)	ND (61)	ND (59) [b]	ND (56) [b]	ND (62) [b]	ND (58) [b]	ND (65)
Acenaphthene	20000	100000	ND (36)	ND (35)	ND (34)	55.9	ND (36)	ND (33)	ND (54)	130	53.5	51.3	74.8	582	ND (33)	ND (31)	57.6	930	1700
Acenaphthylene	100000	100000	ND (4.0)	16.0 J	ND (3.8)	21.3 J	ND (4.0)	15.8 J	ND (6.0)	20.9 J	ND (3.6)	ND (3.8)	ND (3.6)	ND (3.7)	ND (3.6)	ND (3.5)	ND (3.8)	25.9 J	ND (4.0)
Acetophenone	-	-	ND (6.4)	19.9 J	ND (6.1)	ND (6.1)	ND (6.4)	ND (5.9)	ND (9.8)	ND (5.9)	ND (5.9)	ND (6.1)	ND (5.9)	ND (6.1)	ND (5.9)	ND (5.6)	ND (6.2)	ND (5.8)	ND (6.5)
Anthracene	100000	100000	ND (3.3)	ND (3.2)	ND (3.1)	83.4	ND (3.3)	131	ND (5.0)	109	68.1	19.8 J	57.4	112	ND (3.0)	ND (2.8)	14.7 J	201	256
Atrazine	-	-	ND (16)	ND (15)	ND (15)	ND (15)	ND (16)	ND (14)	ND (24)	ND (14)	ND (14)	ND (15)	ND (14)	ND (15)	ND (14)	ND (14)	ND (15)	ND (14)	ND (16)
Benzaldehyde	-	-	ND (9.5)	68.5 J	ND (9.0)	ND (8.9)	ND (9.5)	ND (8.7)	ND (14)	ND (8.7)	ND (8.7)	ND (9.0)	ND (8.7)	ND (8.9)	ND (8.6)	ND (8.3)	ND (9.2)	ND (8.5)	ND (9.6)
Benzo(a)anthracene	1000	1000	ND (7.3)	66.4	35.0 J	213	ND (7.3)	283	ND (11)	258	172	21.5 J	93.4	77.6	ND (6.7)	18.0 J	ND (7.1)	112	98.6
Benzo(a)pyrene	1000	1000	ND (8.1)	71.6	27.2 J	202	ND (8.1)	293	ND (12)	250	184	ND (7.7)	86.9	65.5	ND (7.3)	ND (7.0)	ND (7.8)	67.2	69.6
Benzo(b)fluoranthene	1000	1000	ND (7.8)	83.6	31.4 J	261	ND (7.8)	234	ND (12)	290	244	ND (7.4)	107	70.9	ND (7.1)	ND (6.8)	ND (7.5)	89.1	75.4
Benzo(g,h,i)perylene	100000	100000	ND (11)	53.2	17.6 J	101	ND (11)	295	ND (17)	158	118	ND (11)	48.3	42.1	ND (10)	ND (9.9)	ND (11)	36.6	43.3
Benzo(k)fluoranthene	800	3900	ND (8.4)	35.6 J	ND (8.0)	86.1	ND (8.5)	295	ND (13)	116	77.4	ND (8.0)	37.2	28.3 J	ND (7.7)	ND (7.4)	ND (8.2)	29.9 J	33.8 J
bis(2-Chloroethoxy)methane	-	-	ND (8.6)	ND (8.4)	ND (8.2)	ND (8.1)	ND (8.6)	ND (7.9)	ND (13)	ND (7.9)	ND (7.9)	ND (8.2)	ND (7.9)	ND (8.1)	ND (7.8)	ND (7.5)	ND (8.3)	ND (7.7)	ND (8.7)
bis(2-Chloroethyl)ether	-	-	ND (16)	ND (15)	ND (15)	ND (15)	ND (16)	ND (15)	ND (24)	ND (15)	ND (14)	ND (15)	ND (14)	ND (15)	ND (14)	ND (14)	ND (15)	ND (14)	ND (16)
bis(2-Chloroisopropyl)ether	-	-	ND (8.7)	ND (8.5)	ND (8.3)	ND (8.2)	ND (8.7)	ND (8.0)	ND (13)	ND (8.0)	ND (7.9)	ND (8.2)	ND (8.0)	ND (8.2)	ND (7.9)	ND (7.6)	ND (8.4)	ND (7.8)	ND (8.8)
bis(2-Ethylhexyl)phthalate	-	-	ND (13)	ND (13)	ND (13)	48.8 J	ND (13)	ND (12)	ND (20)	50.8 J	ND (12)	ND (13)	41.8 J	42.0 J	ND (12)	105	ND (13)	98.3	ND (13)
Butyl benzyl phthalate	-	-	ND (20)	ND (20)	ND (19)	ND (19)	ND (20)	ND (19)	ND (31)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (18)	ND (20)	ND (18)	ND (21)
Caprolactam	-	-	ND (24)	ND (24)	ND (23)	ND (23)	ND (24)	ND (22)	ND (37)	ND (22)	ND (22)	ND (23)	ND (22)	ND (23)	ND (22)	ND (21)	ND (24)	ND (22)	ND (25)
Carbazole	-	-	ND (4.2)	ND (4.1)	ND (4.0)	30.9 J	ND (4.2)	ND (3.9)	ND (6.4)	36.1 J	25.5 J	ND (4.0)	ND (3.9)	46.3 J	ND (3.8)	ND (3.7)	ND (4.1)	71.5	ND (4.3)
Chrysene	1000	3900	ND (6.1)	82	33.2 J	219	ND (6.1)	314	ND (9.3)	267	187	14.8 J	99.2	79.7	ND (5.6)	15.3 J	ND (5.9)	95.4	90.5
Dibenzo(a,h)anthracene	330	330	ND (14)	ND (13)	ND (13)	30.9 J	ND (14)	314	ND (21)	39.1	27.9 J	ND (13)	ND (12)	ND (13)	ND (12)	ND (12)	ND (13)	ND (12)	ND (14)
Dibenzofuran	7000	59000	ND (5.3)	25.2 J	ND (5.0)	23.0 J	ND (5.3)	ND (4.8)	ND (8.0)	105	47.5 J	56.8 J	61.1 J	727	21.9 J	19.1 J	49.8 J	819	1350
Diethyl phthalate	-	-	ND (4.8)	ND (4.7)	ND (4.6)	ND (4.5)	ND (4.8)	ND (4.4)	ND (7.3)	ND (4.4)	ND (4.4)	ND (4.6)	ND (4.4)	ND (4.5)	ND (4.4)	ND (4.2)	ND (4.7)	ND (4.3)	ND (4.9)
Dimethyl phthalate	-	-	ND (5.4)	ND (5.3)	ND (5.2)	ND (5.1)	ND (5.4)	ND (5.0)	ND (8.2)	ND (5.0)	ND (5.0)	ND (5.1)	ND (5.0)	ND (5.1)	ND (4.9)	ND (4.7)	ND (5.2)	ND (4.9)	ND (5.5)
Di-n-butyl phthalate	-	-	ND (4.5)	ND (4.4)	ND (4.3)	ND (4.2)	ND (4.5)	ND (4.1)	ND (6.8)	ND (4.1)	ND (4.1)	ND (4.2)	ND (4.1)	ND (4.2)	ND (4.1)	ND (3.9)	ND (4.3)	ND (4.0)	ND (4.5)
Di-n-octyl phthalate	-	-	ND (5.1)	ND (5.0)	ND (4.9)	ND (4.8)	ND (5.1)	ND (4.7)	ND (7.8)	ND (4.7)	ND (4.7)	ND (4.9)	ND (4.7)	ND (4.8)	ND (4.7)	ND (4.5)	ND (4.9)	ND (4.6)	ND (5.2)
Fluoranthene	100000	100000	ND (4.6)	153	85.3	486	ND (4.6)	217	ND (7.0)	606	417	74.3	262	274	ND (4.2)	55.9	33.5 J	483	331
Fluorene	30000	100000	ND (4.5)	20.5 J	ND (4.3)	27.1 J	ND (4.5)	46.8	ND (6.8)	90.2	46.9	39.4	68.9	407	16.5 J	39.7	36.9 J	595	768
Hexachlorobenzene	330	1200	ND (7.5)	ND (7.3)	ND (7.1)	ND (7.0)	ND (7.5)	ND (6.9)	ND (11)	ND (6.9)	ND (6.8)	ND (7.1)	ND (6.8)	ND (7.0)	ND (6.8)	ND (6.5)	ND (7.2)	ND (6.7)	ND (7.6)
Hexachlorobutadiene	-	-	ND (10)	ND (9.8)	ND (9.5)	ND (9.5)	ND (10)	ND (9.2)	ND (15)	ND (9.2)	ND (9.2)	ND (9.5)	ND (9.2)	ND (9.4)	ND (9.1)	ND (8.8)	ND (9.7)	ND (9.0)	ND (10)
Hexachlorocyclopentadiene	-	-	ND (60)	ND (59)	ND (57)	ND (57)	ND (60)	ND (55)	ND (91)	ND (55)	ND (55)	ND (57)	ND (55)	ND (57)	ND (55)	ND (53)	ND (58)	ND (54)	ND (61)
Hexachloroethane	-	-	ND (12)	ND (12)	ND (12)	ND (12)	ND (12)	ND (11)	ND (19)	ND (11)	ND (11)	ND (12)	ND (11)	ND (12)	ND (11)	ND (11)	ND (12)	ND (11)	ND (12)
Indeno(1,2,3-cd)pyrene	500	500	ND (20)	54.4	ND (19)	120	ND (20)	246	ND (30)	173	130	ND (19)	52.4	43.8	ND (18)	ND (17)	ND (19)	43.8	37.5 J
Isophorone	-	-	ND (7.1)	ND (6.9)	ND (6.7)	ND (6.7)	ND (7.1)	ND (6.5)	ND (11)	ND (6.5)	ND (6.5)	ND (6.7)	ND (6.5)	ND (6.7)	ND (6.5)	ND (6.2)	ND (6.8)	ND (6.4)	ND (7.2)
Naphthalene	12000	100000	ND (6.1)	191	ND (5.8)	ND (5.7)	ND (6.1)	18.3 J	ND (9.2)	151	45.5	ND (5.8)	50.9	625	ND (5.5)	ND (5.3)	28.3 J	1250	4200
Nitrobenzene	-	15000	ND (12)	ND (12)	ND (11)	ND (11)	ND (12)	ND (11)	ND (18)	ND (11)	ND (11)	ND (11)	ND (11)	ND (11)	ND (11)	ND (10)	ND (12)	ND (11)	ND (12)
N-Nitroso-di-n-propylamine	-	-	ND (11)	ND (11)	ND (11)	ND (11)	ND (11)	ND (10)	ND (17)	ND (10)	ND (10)	ND (11)	ND (10)	ND (11)	ND (10)	ND (9.8)	ND (11)	ND (10)	ND (11)
N-Nitrosodiphenylamine	-	-	ND (20)	ND (19)	ND (19)	ND (19)	ND (20)	ND (18)	ND (30)	ND (18)	ND (18)	ND (19)	ND (18)	ND (19)	ND (18)	ND (17)	ND (19)	ND (18)	ND (20)
Pentachlorophenol	800	6700	ND (92)	ND (90)	ND (88)	ND (87)	ND (92)	ND (85)	ND (140)	ND (85)	ND (85)	ND (88)	ND (85)	ND (87)	ND (84)	ND (81)	ND (89)	ND (83)	ND (94)
Phenanthrene	100000	100000	ND (4.2)	121	68.1	441	ND (4.2)	132	ND (6.4)	478	266	44.2	225	482	25.4 J	28.9 J	59.4	968	858
Phenol	330	100000	ND (28)	ND (28)	ND (27)	ND (27)	ND (28)	ND (26)	ND (43)	ND (26)	ND (26)	ND (27)	ND (26)	ND (27)	ND (26)	ND (25)	ND (27)	ND (26)	ND (29)
Pyrene	100000	100000	ND (4.7)	155	70.2	451	ND (4.7)	218	ND (7.2)	537	410	58.7	214	194	ND (4.3)	61	23.5 J	396	337

Legend:

Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2B - BCP No. C241169
Semi - Volatile Organic Compounds in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-100 (2.90)DUP	EP-100(1.52)	EP-101(4.70)	EP-102(3.00)	EP-102 (1.90)	EP-103(3.00)	EP-103(1.40)	SITE C TR4-1	SITE C TR4-2
Lab Sample ID:			JC13260-3	JC13824-2	JC14703-1	JC13051-4	JC13389-1	JC13051-1	JC13824-1	JC15422-1	JC15422-2
Date Sampled:			1/26/2016	2/4/2016	2/22/2016	1/20/2016	1/28/2016	1/20/2016	2/4/2016	3/4/2016	3/4/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Semi-volatiles (SW846 8270D), (ug/kg)											
1,1'-Biphenyl	-	-	2970	-	240	1340	-	50.9 J	-	108	466
1,2,4,5-Tetrachlorobenzene	-	-	ND (9.2)	-	ND (8.7)	ND (9.2)	-	ND (9.1)	-	ND (8.8)	ND (8.5)
2,3,4,6-Tetrachlorophenol	-	-	ND (36)	-	ND (34)	ND (36)	-	ND (36)	-	ND (35)	ND (33)
2,4,5-Trichlorophenol	-	-	ND (35)	-	ND (33)	ND (35)	-	ND (34)	-	ND (33)	ND (32)
2,4,6-Trichlorophenol	-	-	ND (31)	-	ND (29)	ND (31)	-	ND (30)	-	ND (30)	ND (28)
2,4-Dichlorophenol	-	-	ND (31)	-	ND (29)	ND (31)	-	ND (30)	-	ND (29)	ND (28)
2,4-Dimethylphenol	-	-	475	-	235	507	-	ND (69)	-	ND (67)	ND (65)
2,4-Dinitrophenol	-	-	ND (170)	-	ND (160)	ND (170)	-	ND (170)	-	ND (160)	ND (150)
2,4-Dinitrotoluene	-	-	ND (7.2)	-	ND (6.8)	ND (7.2)	-	ND (7.1)	-	ND (6.9)	ND (6.6)
2,6-Dinitrotoluene	-	-	ND (9.9)	-	ND (9.4)	ND (9.9)	-	ND (9.7)	-	ND (9.5)	ND (9.1)
2-Chloronaphthalene	-	-	ND (5.5)	-	ND (5.2)	ND (5.5)	-	ND (5.4)	-	ND (5.3)	ND (5.0)
2-Chlorophenol	-	-	ND (28)	-	ND (27)	ND (28)	-	ND (28)	-	ND (27)	ND (26)
2-Methylnaphthalene	-	-	18300	-	679	10300	-	130	-	485	1900
2-Methylphenol	330	100000	322	-	ND (53)	83.4	-	ND (55)	-	ND (53)	ND (51)
2-Nitroaniline	-	-	ND (8.7)	-	ND (8.3)	ND (8.7)	-	ND (8.6)	-	ND (8.4)	ND (8.0)
2-Nitrophenol	-	-	ND (36)	-	ND (34)	ND (35)	-	ND (35)	-	ND (34)	ND (33)
3&4-Methylphenol	-	100000	751	ND (35)	ND (35)	173	-	ND (36)	-	ND (35)	ND (34)
3,3'-Dichlorobenzidine	-	-	ND (25)	-	ND (24)	ND (25)	-	ND (25)	-	ND (24)	ND (23)
3-Nitroaniline	-	-	ND (11)	-	ND (10)	ND (11)	-	ND (11)	-	ND (10)	ND (10)
4,6-Dinitro-o-cresol	-	-	ND (73)	-	ND (69)	ND (73)	-	ND (72)	-	ND (70)	ND (67)
4-Bromophenyl phenyl ether	-	-	ND (8.8)	-	ND (8.3)	ND (8.8)	-	ND (8.6)	-	ND (8.4)	ND (8.0)
4-Chloro-3-methyl phenol	-	-	ND (35)	-	ND (33)	ND (35)	-	ND (34)	-	ND (33)	ND (32)
4-Chloroaniline	-	-	ND (10)	-	ND (9.6)	ND (10)	-	ND (10)	-	ND (9.8)	ND (9.3)
4-Chlorophenyl phenyl ether	-	-	ND (7.2)	-	ND (6.8)	ND (7.2)	-	ND (7.1)	-	ND (6.9)	ND (6.6)
4-Nitroaniline	-	-	ND (13)	-	ND (12)	ND (13)	-	ND (13)	-	ND (12)	ND (12)
4-Nitrophenol	-	-	ND (66)	-	ND (62) [b]	ND (65)	-	ND (64)	-	ND (63)	ND (60)
Acenaphthene	20000	100000	4350	-	461	2440	-	66.4	-	229	689
Acenaphthylene	100000	100000	ND (4.0)	-	20.3 J	79	-	ND (4.0)	-	27.7 J	17.3 J
Acetophenone	-	-	ND (6.6)	-	ND (6.2)	ND (6.5)	-	ND (6.4)	-	ND (6.3)	ND (6.0)
Anthracene	100000	100000	1530	-	128	968	-	43.2	-	131	103
Atrazine	-	-	ND (16)	-	ND (15)	ND (16)	-	ND (15)	-	ND (15)	ND (14)
Benzaldehyde	-	-	ND (9.6)	-	ND (9.1)	ND (9.6)	-	42.7 J	-	ND (9.2)	ND (8.8)
Benzo(a)anthracene	1000	1000	1050	ND (7.1)	126	170	-	83.1	-	413	105
Benzo(a)pyrene	1000	1000	800	-	69.2	116	-	102	-	408	99.7
Benzo(b)fluoranthene	1000	1000	819	-	89.3	148	-	125	-	485	115
Benzo(g,h,i)perylene	100000	100000	421	-	33.7 J	64.4	-	65.7	-	256	64.8
Benzo(k)fluoranthene	800	3900	336	-	33.1 J	57	-	49.5	-	168	38.9
bis(2-Chloroethoxy)methane	-	-	ND (8.7)	-	ND (8.3)	ND (8.7)	-	ND (8.6)	-	ND (8.4)	ND (8.0)
bis(2-Chloroethyl)ether	-	-	ND (16)	-	ND (15)	ND (16)	-	ND (16)	-	ND (15)	ND (15)
bis(2-Chloroisopropyl)ether	-	-	ND (8.8)	-	ND (8.3)	ND (8.8)	-	ND (8.6)	-	ND (8.4)	ND (8.1)
bis(2-Ethylhexyl)phthalate	-	-	ND (13)	-	290	ND (13)	-	ND (13)	-	79	67.9 J
Butyl benzyl phthalate	-	-	ND (21)	-	ND (20)	ND (21)	-	ND (20)	-	67.0 J	53.2 J
Caprolactam	-	-	ND (25)	-	ND (23)	ND (25)	-	ND (24)	-	ND (24)	ND (23)
Carbazole	-	-	374	-	73.9	174	-	ND (4.2)	-	56.2 J	41.7 J
Chrysene	1000	3900	965	-	122	164	-	89.1	-	433	104
Dibenzo(a,h)anthracene	330	330	118	-	ND (13)	17.4 J	-	ND (13)	-	67.8	18.7 J
Dibenzofuran	7000	59000	3850	-	363	1980	-	62.0 J	-	223	767
Diethyl phthalate	-	-	ND (4.9)	-	ND (4.6)	ND (4.9)	-	ND (4.8)	-	ND (4.7)	ND (4.5)
Dimethyl phthalate	-	-	ND (5.5)	-	ND (5.2)	ND (5.5)	-	ND (5.4)	-	ND (5.3)	ND (5.0)
Di-n-butyl phthalate	-	-	ND (4.5)	-	ND (4.3)	ND (4.5)	-	ND (4.5)	-	ND (4.3)	ND (4.2)
Di-n-octyl phthalate	-	-	ND (5.2)	-	ND (4.9)	ND (5.2)	-	ND (5.1)	-	ND (5.0)	ND (4.8)
Fluoranthene	100000	100000	3190	-	455	929	-	185	-	988	302
Fluorene	30000	100000	2820	-	350	2080	-	56.7	-	146	400
Hexachlorobenzene	330	1200	ND (7.6)	-	ND (7.2)	ND (7.6)	-	ND (7.4)	-	ND (7.3)	ND (6.9)
Hexachlorobutadiene	-	-	ND (10)	-	ND (9.6)	ND (10)	-	ND (10)	-	ND (9.8)	ND (9.3)
Hexachlorocyclopentadiene	-	-	ND (61)	-	ND (58)	ND (61)	-	ND (60)	-	ND (59)	ND (56)
Hexachloroethane	-	-	ND (12)	-	ND (12)	ND (12)	-	ND (12)	-	ND (12)	ND (11)
Indeno(1,2,3-cd)pyrene	500	500	393	-	34.0 J	70.1	-	69.3	-	270	68.1
Isophorone	-	-	ND (7.2)	-	ND (6.8)	ND (7.2)	-	ND (7.1)	-	ND (6.9)	ND (6.6)
Naphthalene	12000	100000	**16800**	17.7 J	326	**15300**	5600	194	-	228	675
Nitrobenzene	-	15000	ND (12)	-	ND (12)	ND (12)	-	ND (12)	-	ND (12)	ND (11)
N-Nitroso-di-n-propylamine	-	-	ND (11)	-	ND (11)	ND (11)	-	ND (11)	-	ND (11)	ND (10)
N-Nitrosodiphenylamine	-	-	ND (20)	-	ND (19)	ND (20)	-	ND (20)	-	ND (19)	ND (19)
Pentachlorophenol	800	6700	ND (94)	-	ND (89)	ND (94)	-	ND (92)	-	ND (90)	ND (86)
Phenanthrene	100000	100000	4650	-	516	2950	-	148	-	649	441
Phenol	330	100000	ND (29)	-	ND (27)	ND (29)	-	ND (28)	-	ND (28)	ND (26)
Pyrene	100000	100000	2670	-	396	676	-	157	-	935	252

Legend:
Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:
Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2C - BCP No. C241169
Pesticides and Polychlorinated Biphenyls in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-88 (7.50)	EP-88(8.00)SN	EP-89(7.10)	EP-89(9.5)SN	EP-90 (6.50)	EP-91(6.70)	EP-92(6.70)	EP-93(7.20)	EP-94(6.70)	EP-94S(4.90)	EP-95(7.40)
Lab Sample ID:			JC7723-4	JC8225-6	JC14192-1	JC14556-1	JC7723-5	JC14118-1	JC7903-3	JC14118-3	JC7903-4	JC14705-1	JC14118-4
Date Sampled:			11/3/2015	11/10/2015	2/12/2016	2/19/2016	11/3/2015	2/10/2016	11/4/2015	2/10/2016	11/4/2015	2/22/2016	2/10/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC Semi-volatiles (SW846 8081B), (ug/kg)													
4,4'-DDD	3.3	13000	ND (0.28)	ND (0.25)	ND (0.27)	ND (0.27)	ND (0.26)	ND (0.27)	ND (0.43)	ND (0.26)	ND (0.27)	ND (0.26)	ND (0.27)
4,4'-DDE	3.3	8900	ND (0.26)	ND (0.23)	ND (0.24)	ND (0.24)	ND (0.23)	ND (0.24)	ND (0.38)	ND (0.24)	1.1	ND (0.23)	1.6
4,4'-DDT	3.3	7900	ND (0.29)	ND (0.26)	ND (0.28)	ND (0.28)	ND (0.27)	ND (0.27)	ND (0.44)	0.94	ND (0.28)	ND (0.27)	ND (0.28)
Aldrin	5	97	ND (0.69)	ND (0.61)	ND (0.65)	ND (0.64)	ND (0.62)	ND (0.64)	ND (1.0)	ND (0.64)	ND (0.64)	ND (0.63)	ND (0.65)
alpha-BHC	20	480	ND (0.51)	ND (0.45)	ND (0.48)	ND (0.48)	ND (0.46)	ND (0.48)	ND (0.77)	ND (0.48)	ND (0.48)	ND (0.47)	ND (0.48)
alpha-Chlordane	94	4200	ND (0.41)	ND (0.36)	ND (0.39)	1.6	ND (0.37)	ND (0.38)	ND (0.61)	ND (0.38)	ND (0.38)	3.7	7.7
beta-BHC	36	360	ND (0.47)	ND (0.42)	ND (0.45)	ND (0.44)	ND (0.43)	ND (0.44)	ND (0.71)	ND (0.44)	ND (0.45)	47.1	ND (0.45)
delta-BHC	40	100000	ND (0.30)	ND (0.27)	ND (0.29)	ND (0.28)	ND (0.27)	ND (0.28)	ND (0.45)	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.29)
Dieldrin	5	200	ND (0.60)	ND (0.53)	ND (0.57)	ND (0.56)	ND (0.54)	ND (0.56)	ND (0.90)	ND (0.56)	1.3 [b]	ND (0.55)	0.74
Endosulfan sulfate	2400	24000	ND (0.44)	ND (0.39)	ND (0.41)	ND (0.41)	ND (0.40)	ND (0.41)	ND (0.65)	ND (0.41)	ND (0.41)	ND (0.40)	ND (0.41)
Endosulfan-I	2400	24000	ND (0.25)	ND (0.22)	ND (0.24)	ND (0.24)	ND (0.23)	ND (0.24)	ND (0.38)	ND (0.24)	ND (0.24)	ND (0.23)	ND (0.24)
Endosulfan-II	2400	24000	ND (0.73)	ND (0.64)	ND (0.69)	ND (0.68)	ND (0.66)	ND (0.68)	ND (1.1)	ND (0.68)	ND (0.68)	ND (0.67)	ND (0.69)
Endrin	14	11000	ND (0.27)	ND (0.24)	ND (0.26)	ND (0.25)	ND (0.25)	6.2	ND (0.41)	8.4	ND (0.25)	ND (0.25)	29.1
Endrin aldehyde	-	-	ND (0.57)	ND (0.50)	ND (0.54)	ND (0.54)	ND (0.52)	ND (0.53)	ND (0.86)	ND (0.53)	ND (0.54)	ND (0.52)	ND (0.54)
Endrin ketone	-	-	ND (0.40)	ND (0.36)	ND (0.38)	ND (0.38)	ND (0.37)	ND (0.38)	ND (0.60)	ND (0.38)	ND (0.38)	ND (0.37)	ND (0.38)
gamma-BHC (Lindane)	100	1300	ND (0.35)	ND (0.31)	ND (0.33)	ND (0.33)	ND (0.32)	1.4	ND (0.52)	2.4	3.3	ND (0.32)	3.8
gamma-Chlordane	-	-	ND (0.59)	ND (0.52)	ND (0.55)	1	ND (0.53)	ND (0.55)	ND (0.88)	ND (0.55)	ND (0.55)	2	3.9
Heptachlor	42	2100	ND (0.63)	7.1	ND (0.60)	ND (0.59)	ND (0.57)	9.2	ND (0.95)	6.7	ND (0.59)	0.74	14.2
Heptachlor epoxide	-	-	ND (0.32)	ND (0.28)	ND (0.30)	ND (0.30)	ND (0.29)	ND (0.30)	ND (0.48)	ND (0.30)	ND (0.30)	ND (0.29)	ND (0.30)
Methoxychlor	-	-	ND (0.43)	ND (0.38)	ND (0.40)	ND (0.40)	ND (0.39)	ND (0.40)	ND (0.64)	ND (0.40)	ND (0.40)	ND (0.39)	ND (0.40)
Toxaphene	-	-	ND (13)	ND (12)	ND (13)	ND (12)	ND (12)	ND (12)	ND (20)	ND (12)	ND (12)	ND (12)	ND (13)
GC Semi-volatiles (SW846 8082A), (ug/kg)													
Aroclor 1016	100	1000	ND (12)	ND (11)	ND (13)	ND (13)	ND (11)	ND (12)	ND (18)	ND (12)	ND (11)	ND (12)	ND (13)
Aroclor 1221	100	1000	ND (23)	ND (20)	ND (30)	ND (30)	ND (20)	ND (30)	ND (34)	ND (30)	ND (21)	ND (30)	ND (31)
Aroclor 1232	100	1000	ND (13)	ND (11)	ND (16)	ND (16)	ND (11)	ND (15)	ND (19)	ND (15)	ND (12)	ND (15)	ND (16)
Aroclor 1242	100	1000	ND (17)	ND (15)	ND (14)	ND (14)	ND (16)	ND (14)	ND (26)	ND (14)	ND (16)	ND (13)	ND (14)
Aroclor 1248	100	1000	ND (12)	ND (10)	ND (11)	ND (11)	ND (11)	ND (11)	ND (18)	ND (11)	ND (11)	ND (11)	ND (11)
Aroclor 1254	100	1000	ND (17)	ND (15)	ND (21)	ND (21)	ND (15)	ND (21)	ND (26)	ND (21)	ND (16)	ND (21)	ND (22)
Aroclor 1260	100	1000	ND (16)	ND (14)	ND (10)	ND (10)	ND (15)	ND (10)	ND (24)	ND (10)	ND (15)	ND (10)	ND (10)
Aroclor 1262	100	1000	ND (11)	ND (9.6)	ND (13)	ND (13)	ND (9.8)	ND (13)	ND (16)	ND (13)	ND (10)	ND (9.2)	ND (13)
Aroclor 1268	100	1000	ND (12)	ND (10.0)	ND (9.5)	ND (9.4)	ND (11)	ND (9.4)	ND (18)	ND (9.4)	ND (11)	ND (13)	ND (9.5)

Legend:

Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2C - BCP No. C241169
Pesticides and Polychlorinated Biphenyls in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-95S(4.90)	EP-96(4.90)	EP-97(4.70)	EP-98(4.70)	EP-99(4.80)	EP-100 (2.90)	EP-100 (2.90)DUP	EP-100(1.52)	EP-101(4.70)	EP-102(3.00)	EP-102 (1.90)
Lab Sample ID:			JC14555-1	JC14703-4	JC14703-5	JC14703-2	JC14703-3	JC13260-2	JC13260-3	JC13824-2	JC14703-1	JC13051-4	JC13389-1
Date Sampled:			2/18/2016	2/22/2016	2/22/2016	2/22/2016	2/22/2016	1/26/2016	1/26/2016	2/4/2016	2/22/2016	1/20/2016	1/28/2016
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC Semi-volatiles (SW846 8081B), (ug/kg)													
4,4'-DDD	3.3	13000	ND (0.25)	ND (0.25)	ND (0.24)	ND (0.27)	ND (0.25)	1.6	ND (0.29)	-	ND (0.25)	1.5	-
4,4'-DDE	3.3	8900	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.24)	ND (0.23)	ND (0.26)	ND (0.26)	-	ND (0.22)	ND (0.26)	-
4,4'-DDT	3.3	7900	1.3	ND (0.25)	ND (0.25)	ND (0.28)	2.4	1.2	1.9	-	ND (0.25)	1.2	-
Aldrin	5	97	ND (0.60)	ND (0.59)	ND (0.58)	ND (0.66)	ND (0.61)	ND (0.69)	ND (0.69)	-	ND (0.59)	ND (0.69)	-
alpha-BHC	20	480	ND (0.45)	ND (0.44)	1	ND (0.49)	ND (0.46)	ND (0.51)	ND (0.52)	-	ND (0.44)	ND (0.52)	-
alpha-Chlordane	94	4200	4.7	ND (0.35)	ND (0.35)	ND (0.39)	ND (0.36)	ND (0.41)	ND (0.41)	-	ND (0.35)	ND (0.41)	-
beta-BHC	36	360	ND (0.41)	ND (0.41)	ND (0.40)	ND (0.45)	ND (0.42)	ND (0.47)	ND (0.48)	-	ND (0.41)	ND (0.48)	-
delta-BHC	40	100000	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.29)	ND (0.27)	ND (0.30)	ND (0.30)	-	ND (0.26)	ND (0.31)	-
Dieldrin	5	200	2.7	ND (0.52)	ND (0.51)	ND (0.58)	3.5	ND (0.60)	ND (0.61)	-	ND (0.52)	ND (0.61)	-
Endosulfan sulfate	2400	24000	ND (0.38)	ND (0.38)	ND (0.37)	ND (0.42)	ND (0.39)	ND (0.44)	ND (0.44)	-	ND (0.38)	ND (0.44)	-
Endosulfan-I	2400	24000	ND (0.22)	ND (0.22)	ND (0.21)	ND (0.24)	ND (0.23)	ND (0.25)	ND (0.25)	-	6.8	ND (0.26)	-
Endosulfan-II	2400	24000	ND (0.63)	ND (0.63)	ND (0.62)	ND (0.70)	ND (0.65)	ND (0.73)	ND (0.73)	-	ND (0.63)	ND (0.74)	-
Endrin	14	11000	ND (0.24)	ND (0.23)	2.6	1.3	3	ND (0.27)	3.9	-	7.9	ND (0.27)	-
Endrin aldehyde	-	-	ND (0.50)	ND (0.49)	ND (0.48)	ND (0.55)	ND (0.51)	ND (0.57)	ND (0.57)	-	ND (0.49)	ND (0.58)	-
Endrin ketone	-	-	ND (0.35)	ND (0.35)	ND (0.34)	ND (0.39)	ND (0.36)	ND (0.40)	ND (0.41)	-	ND (0.35)	ND (0.41)	-
gamma-BHC (Lindane)	100	1300	2.1	ND (0.30)	ND (0.30)	ND (0.33)	ND (0.31)	1.1	3.1	-	15.4	ND (0.35)	-
gamma-Chlordane	-	-	2.3	ND (0.51)	ND (0.50)	ND (0.56)	ND (0.52)	ND (0.59)	ND (0.59)	-	ND (0.51)	ND (0.59)	-
Heptachlor	42	2100	3.5	ND (0.55)	16.4	ND (0.60)	12.8	1.5	5	-	24.4	ND (0.64)	-
Heptachlor epoxide	-	-	ND (0.28)	ND (0.27)	ND (0.27)	ND (0.30)	ND (0.28)	ND (0.32)	ND (0.32)	-	ND (0.27)	ND (0.32)	-
Methoxychlor	-	-	ND (0.37)	ND (0.37)	ND (0.36)	ND (0.41)	ND (0.38)	ND (0.43)	ND (0.43)	-	ND (0.37)	ND (0.43)	-
Toxaphene	-	-	ND (12)	ND (11)	ND (11)	ND (13)	ND (12)	ND (13)	ND (13)	-	ND (11)	ND (13)	-
GC Semi-volatiles (SW846 8082A), (ug/kg)													
Aroclor 1016	100	1000	ND (12)	ND (12)	ND (11)	ND (13)	ND (12)	ND (12)	ND (11)	-	ND (12)	ND (12)	-
Aroclor 1221	100	1000	ND (28)	ND (28)	ND (27)	ND (31)	ND (29)	ND (22)	ND (21)	-	ND (28)	ND (23)	-
Aroclor 1232	100	1000	ND (14)	ND (14)	ND (14)	ND (16)	ND (15)	ND (12)	ND (12)	-	ND (14)	ND (13)	-
Aroclor 1242	100	1000	ND (13)	ND (13)	ND (12)	ND (14)	ND (13)	ND (17)	ND (16)	-	ND (13)	ND (18)	-
Aroclor 1248	100	1000	ND (10)	ND (10)	ND (10)	ND (11)	ND (11)	ND (11)	ND (11)	-	ND (10)	ND (12)	-
Aroclor 1254	100	1000	ND (20)	ND (20)	ND (19)	ND (22)	ND (20)	ND (16)	ND (16)	-	ND (20)	ND (17)	-
Aroclor 1260	100	1000	ND (9.5)	ND (9.4)	ND (9.3)	ND (10)	ND (9.7)	ND (16)	ND (15)	-	ND (9.4)	ND (16)	-
Aroclor 1262	100	1000	ND (12)	ND (8.7)	ND (8.5)	ND (9.6)	ND (9.0)	ND (10)	ND (10)	-	ND (8.7)	ND (11)	-
Aroclor 1268	100	1000	ND (8.8)	ND (12)	ND (12)	ND (13)	ND (12)	ND (11)	ND (11)	-	ND (12)	ND (12)	-

Legend:

Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2C - BCP No. C241169
Pesticides and Polychlorinated Biphenyls in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-103(3.00)	EP-103(1.40)	SITE C TR4-1	SITE C TR4-2
Lab Sample ID:			JC13051-1	JC13824-1	JC15422-1	JC15422-2
Date Sampled:			1/20/2016	2/4/2016	3/4/2016	3/4/2016
Matrix:			Soil	Soil	Soil	Soil
GC Semi-volatiles (SW846 8081B), (ug/kg)						
4,4'-DDD	3.3	13000	ND (0.28)	-	ND (0.29)	ND (0.27)
4,4'-DDE	3.3	8900	ND (0.25)	-	ND (0.26)	1.2
4,4'-DDT	3.3	7900	ND (0.29)	-	3.5	6.7
Aldrin	5	97	ND (0.67)	-	1.1	1.2
alpha-BHC	20	480	ND (0.50)	-	ND (0.51)	ND (0.48)
alpha-Chlordane	94	4200	ND (0.40)	-	15	30.8
beta-BHC	36	360	ND (0.46)	-	ND (0.48)	ND (0.44)
delta-BHC	40	100000	ND (0.29)	-	ND (0.30)	ND (0.28)
Dieldrin	5	200	ND (0.59)	-	9.2	32.2
Endosulfan sulfate	2400	24000	ND (0.43)	-	1.2	ND (0.41)
Endosulfan-I	2400	24000	ND (0.25)	-	ND (0.25)	ND (0.24)
Endosulfan-II	2400	24000	ND (0.71)	-	ND (0.73)	ND (0.68)
Endrin	14	11000	ND (0.26)	-	ND (0.27)	1.5
Endrin aldehyde	-	-	ND (0.56)	-	ND (0.57)	ND (0.53)
Endrin ketone	-	-	ND (0.39)	-	ND (0.40)	ND (0.38)
gamma-BHC (Lindane)	100	1300	0.97	-	ND (0.35)	ND (0.33)
gamma-Chlordane	-	-	ND (0.57)	-	16.3	42.6
Heptachlor	42	2100	3.6	-	14.2	60.2
Heptachlor epoxide	-	-	ND (0.31)	-	1.7	1.5
Methoxychlor	-	-	ND (0.42)	-	ND (0.43)	ND (0.40)
Toxaphene	-	-	ND (13)	-	ND (13)	ND (12)
GC Semi-volatiles (SW846 8082A), (ug/kg)						
Aroclor 1016	100	1000	ND (12)	-	ND (13)	ND (13)
Aroclor 1221	100	1000	ND (22)	-	ND (32)	ND (30)
Aroclor 1232	100	1000	ND (12)	-	ND (17)	ND (16)
Aroclor 1242	100	1000	ND (17)	-	ND (15)	ND (14)
Aroclor 1248	100	1000	ND (11)	-	ND (12)	ND (11)
Aroclor 1254	100	1000	ND (17)	-	ND (23)	ND (21)
Aroclor 1260	100	1000	ND (16)	-	ND (11)	ND (10)
Aroclor 1262	100	1000	ND (11)	-	ND (14)	ND (13)
Aroclor 1268	100	1000	ND (12)	-	ND (10)	ND (9.4)

Legend:
Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:
Nomenclature: EP-'grid #' (elevations in NAVD88)
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EP-wall = sidewall sample

Table 2D - BCP No. C241169
Metals in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-88 (7.50)	EP-88(8.00)SN	EP-89(7.10)	EP-89(9.5)SN	EP-90 (6.50)	EP-91(6.70)	EP-92(6.70)	EP-93(7.20)	EP-94(6.70)	EP-94S(4.90)
Lab Sample ID:			**JC7723-4**	**JC8225-6**	**JC14192-1**	**JC14556-1**	**JC7723-5**	**JC14118-1**	**JC7903-3**	**JC14118-3**	**JC7903-4**	**JC14705-1**
Date Sampled:			**11/3/2015**	**11/10/2015**	**2/12/2016**	**2/19/2016**	**11/3/2015**	**2/10/2016**	**11/4/2015**	**2/10/2016**	**11/4/2015**	**2/22/2016**
Matrix:			**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Metals Analysis, (mg/kg)												
Aluminum	-	-	7920	6300	8160	7800	8470	6280	12200	7150	8670	7810
Antimony	-	-	ND (2.4)	ND (2.2)	ND (2.1)	ND (2.1)	ND (2.2)	ND (2.2)	ND (3.5)	ND (2.2)	ND (2.2)	ND(2.1)
Arsenic	13	16	2.5	2.3	ND (2.1)	2.7	ND (2.2)	ND (2.2)	ND (3.5)	2.4	3.2	2.8
Barium	350	400	40.7	26	37.7	29.5	27.3	24.6	44.6	37.6	46.1	26.9
Beryllium	7.2	72	0.33	0.28	0.33	0.3	0.31	0.33	0.54	0.36	0.39	0.3
Cadmium	2.5	4.3	ND (0.60)	ND (0.56)	ND (0.53)	ND (0.52)	ND (0.56)	ND (0.54)	ND (0.86)	ND (0.55)	ND (0.56)	ND(0.53)
Calcium	-	-	1180	2210	1300	3810	954	1140	2270	5190	11600	1080
Chromium	-	180	16	12.3	16.1	12.8	16.9	15	21.2	15.6	16	13.3
Cobalt	-	-	6.9	ND (5.6)	6.2	5.3	6.6	ND (5.4)	ND (8.6)	5.6	ND (5.6)	5.4
Copper	50	270	12.7	16.1	13.6	12.3	12.9	10.4	14.4	24.9	23.7	13.7
Iron	-	-	14500	10700	13100	10800	12600	10700	17900	12300	12200	14000
Lead	63	400	4.2	39.4	3.7	9.7	4.1	5.4	5	43.2	61.3	5.2
Magnesium	-	-	2640	2460	2890	2430	3490	2320	4500	2840	3090	2300
Manganese	1600	2000	163	147	416	346	288	141	481	281	230	155
Mercury	0.18	0.81	ND (0.037)	0.041	ND (0.034)	ND (0.034)	ND (0.037)	ND (0.032)	ND (0.033)	0.089	0.17	**0.21**
Nickel	30	310	12.8	10.9	14.1	11.1	13.5	11.3	21.7	13	13.4	11.3
Potassium	-	-	ND (1200)	ND (1100)	ND (1100)	ND (1000)	1230	ND (1100)	ND (1700)	1260	ND (1100)	ND(1100)
Selenium	3.9	180	ND (2.4)	ND (2.2)	ND (2.1)	ND (2.1)	ND (2.2)	ND (2.2)	ND (3.5)	ND (2.2)	ND (2.2)	ND(2.1)
Silver	2	180	ND (0.60)	0.81	ND (0.53)	0.71	ND (0.56)	ND (0.54)	ND (0.86)	ND (0.55)	ND (0.56)	0.55
Sodium	-	-	ND (1200)	ND (1100)	ND (1100)	ND (1000)	ND (1100)	ND (1100)	ND (1700)	ND (1100)	ND (1100)	ND(1100)
Thallium	-	-	ND (1.2)	ND (1.1)	ND (1.1)	ND (1.0)	ND (1.1)	ND (1.1)	ND (1.7)	ND (1.1)	ND (1.1)	ND(1.1)
Vanadium	-	-	25.1	16.7	23.9	19.7	21.6	19.3	30.8	20.7	22.7	22.9
Zinc	109	10000	27.6	42.8	29.2	28.9	40.5	27	58.9	53.3	63.1	34.9
General Chemistry												
Cyanide, mg/kg	27	27	ND (0.26)	0.3	ND (0.26)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.42)	ND (0.24)	ND (0.26)	ND(0.25)
Solids, Percent, %	-	-	84.4	89.9	90.1	92.5	85.1	91.1	55.7	90.1	91.8	89.9

Legend:

Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

Table 2D - BCP No. C241169
Metals in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-95(7.40)	EP-95S(4.90)	EP-96(4.90)	EP-97(4.70)	EP-98(4.70)	EP-99(4.80)	EP-100 (2.90)	EP-100 (2.90)DUP	EP-100(1.52)
Lab Sample ID:			**JC14118-4**	**JC14555-1**	**JC14703-4**	**JC14703-5**	**JC14703-2**	**JC14703-3**	**JC13260-2**	**JC13260-3**	**JC13824-2**
Date Sampled:			**2/10/2016**	**2/18/2016**	**2/22/2016**	**2/22/2016**	**2/22/2016**	**2/22/2016**	**1/26/2016**	**1/26/2016**	**2/4/2016**
Matrix:			**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Metals Analysis, (mg/kg)											
Aluminum	-	-	7600	6790	5150	5530	6050	6400	8330	9000	-
Antimony	-	-	ND (2.2)	ND (2.2)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.3)	ND (2.2)	-
Arsenic	13	16	2.2	ND (2.2)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	2.9	2.9	-
Barium	350	400	37.7	33.8	ND(21)	21.7	ND(21)	30.4	58.9	57.3	-
Beryllium	7.2	72	0.36	0.26	0.24	0.29	0.27	0.27	0.33	0.38	-
Cadmium	2.5	4.3	ND (0.54)	ND (0.54)	ND (0.52)	ND (0.52)	ND (0.53)	ND (0.52)	ND (0.57)	ND (0.56)	-
Calcium	-	-	3880	3650	1000	736	898	17100	2600	3910	-
Chromium	-	180	15.8	14.5	10.1	9.7	11.5	12.7	18	17.5	-
Cobalt	-	-	6.2	ND (5.4)	ND(5.2)	ND(5.2)	ND(5.3)	ND(5.2)	ND (5.7)	ND (5.6)	-
Copper	50	270	21.1	13	8.5	9.5	9.8	15.3	24.4	25.6	-
Iron	-	-	12600	10700	8380	8030	10700	9500	12400	12000	-
Lead	63	400	22.7	8.3	4	3	3.4	11.8	62.7	**120**	-
Magnesium	-	-	3030	2590	2090	1940	2220	3110	2430	2710	-
Manganese	1600	2000	211	165	102	481	113	180	171	181	-
Mercury	0.18	0.81	0.077	ND (0.034)	ND(0.033)	ND(0.032)	ND(0.034)	0.041	0.086	0.16	-
Nickel	30	310	13.6	10.5	13.5	8.4	11.5	9.6	12.1	21.9	-
Potassium	-	-	1340	ND (1100)	ND(1000)	ND(1000)	ND(1100)	ND(1000)	ND (1100)	ND (1100)	-
Selenium	3.9	180	ND (2.2)	ND (2.2)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.3)	ND (2.2)	-
Silver	2	180	ND (0.54)	ND (0.54)	ND(0.52)	ND(0.52)	ND(0.53)	ND(0.52)	ND (0.57)	ND (0.56)	-
Sodium	-	-	ND (1100)	ND (1100)	ND(1000)	ND(1000)	ND(1100)	ND(1000)	ND (1100)	ND (1100)	-
Thallium	-	-	ND (1.1)	ND (1.1)	ND(1.0)	ND(1.0)	ND(1.1)	ND(1.0)	ND (1.1)	ND (1.1)	-
Vanadium	-	-	21.9	17.8	14.3	14.5	16.8	16.2	20.6	20.6	-
Zinc	109	10000	50.3	30.9	31.2	20.6	24.8	44	65.5	69.6	-
General Chemistry											
Cyanide, mg/kg	27	27	ND (0.25)	ND (0.26)	ND(0.26)	ND(0.24)	ND(0.26)	ND(0.24)	ND (0.26)	ND (0.26)	-
Solids, Percent, %	-	-	90.5	90	92.3	94	90.1	92.5	86.1	86.2	89.4

Legend:

Exceedance of UUSCO

Exceedance of RRSCO

Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)

S*= Indicates sidewall sample (followed by cardinal direction)

ND = Not detected at indicated method detection limit

J = Estimated value

- = No standard

EP- bottom = bottom endpoint

EP-wall = sidewall sample

Table 2D - BCP No. C241169
Metals in Endpoint Soil Sample Results
Queens Plaza Residential Development Site C, Long Island City, NY

Client Sample ID:	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)	EP-101(4.70)	EP-102(3.00)	EP-102 (1.90)	EP-103(3.00)	EP-103(1.40)	SITE C TR4-1	SITE C TR4-2
Lab Sample ID:			**JC14703-1**	**JC13051-4**	**JC13389-1**	**JC13051-1**	**JC13824-1**	**JC15422-1**	**JC15422-2**
Date Sampled:			**2/22/2016**	**1/20/2016**	**1/28/2016**	**1/20/2016**	**2/4/2016**	**3/4/2016**	**3/4/2016**
Matrix:			**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Metals Analysis, (mg/kg)									
Aluminum	-	-	7300	12100	-	10500	-	7110	5980
Antimony	-	-	ND (2.2)	ND (2.3)	-	ND (2.4)	-	ND (2.3)	ND (2.2)
Arsenic	13	16	ND (2.2)	2.3	-	ND (2.4)	-	2.7	3.1
Barium	350	400	22.7	92	-	42.9	-	41.7	37.9
Beryllium	7.2	72	0.28	0.42	-	0.51	-	0.39	0.35
Cadmium	2.5	4.3	ND (0.54)	ND (0.59)	-	ND (0.60)	-	ND (0.57)	ND (0.54)
Calcium	-	-	2710	5740	-	1790	-	23200	44400
Chromium	-	180	14.3	25.8	-	16.7	-	16.7	17.4
Cobalt	-	-	ND(5.4)	8.7	-	ND (6.0)	-	ND (5.7)	ND (5.4)
Copper	50	270	16.1	25	-	16.6	-	**501**	16.2
Iron	-	-	9860	16300	-	8930	-	11100	6960
Lead	63	400	9.8	35.9	-	47.6	-	**193**	17.7
Magnesium	-	-	2370	4910	-	2210	-	5060	3180
Manganese	1600	2000	95.7	258	-	131	-	209	140
Mercury	0.18	0.81	ND(0.035)	0.093	-	0.12	-	0.13	0.036
Nickel	30	310	11	20	-	10.7	-	11.5	9.9
Potassium	-	-	ND(1100)	2540	-	ND (1200)	-	ND (1100)	ND (1100)
Selenium	3.9	180	ND (2.2)	ND (2.3)	-	ND (2.4)	-	ND (2.3)	ND (2.2)
Silver	2	180	ND(0.54)	0.61	-	ND (0.60)	-	ND (0.57)	ND (0.54)
Sodium	-	-	ND(1100)	ND (1200)	-	ND (1200)	-	ND (1100)	ND (1100)
Thallium	-	-	ND(1.1)	ND (1.2)	-	ND (1.2)	-	ND (1.1)	ND (1.1)
Vanadium	-	-	17.6	37.8	-	18.2	-	19.2	13.9
Zinc	109	10000	29.8	66	-	40.4	-	99.6	52.7
General Chemistry									
Cyanide, mg/kg	27	27	ND(0.26)	ND (0.28)	-	ND (0.28)	-	ND (0.26)	ND (0.27)
Solids, Percent, %	-	-	89.2	82.9	84.8	82.3	57.2	85.4	88.6

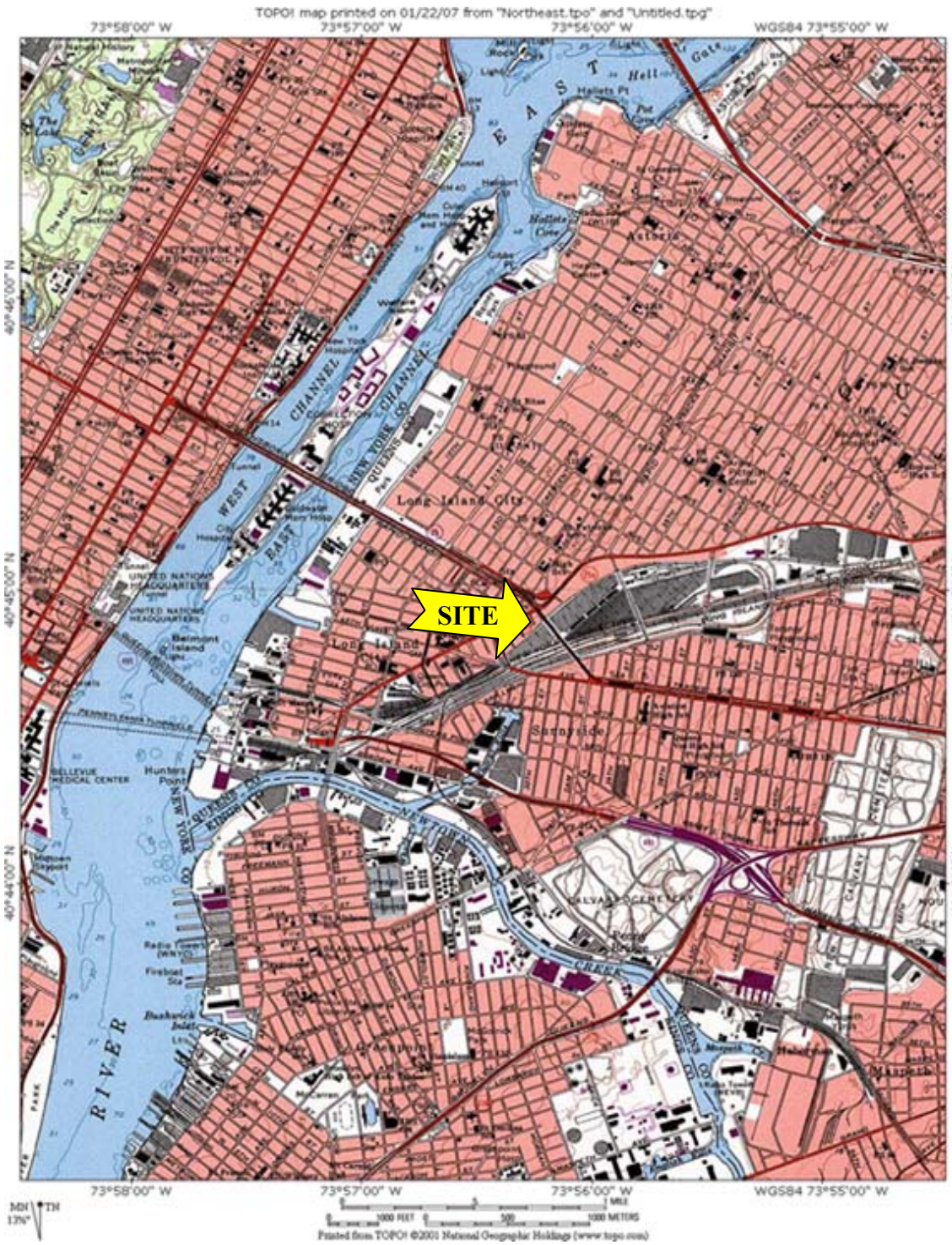
Legend:

Exceedance of UUSCO
Exceedance of RRSCO
Exceedance of UUSCO and RRSCO

Notes:

Nomenclature: EP-'grid #' (elevations in NAVD88)
S*= Indicates sidewall sample (followed by cardinal direction)
ND = Not detected at indicated method detection limit
J = Estimated value
- = No standard
EP- bottom = bottom endpoint
EP-wall = sidewall sample

FIGURES



40074-G1 Weehawken, NJ NY Quadrant 7.5 Minute Topographic Map, published by the USGS, and obtained from TOPO! ©2001

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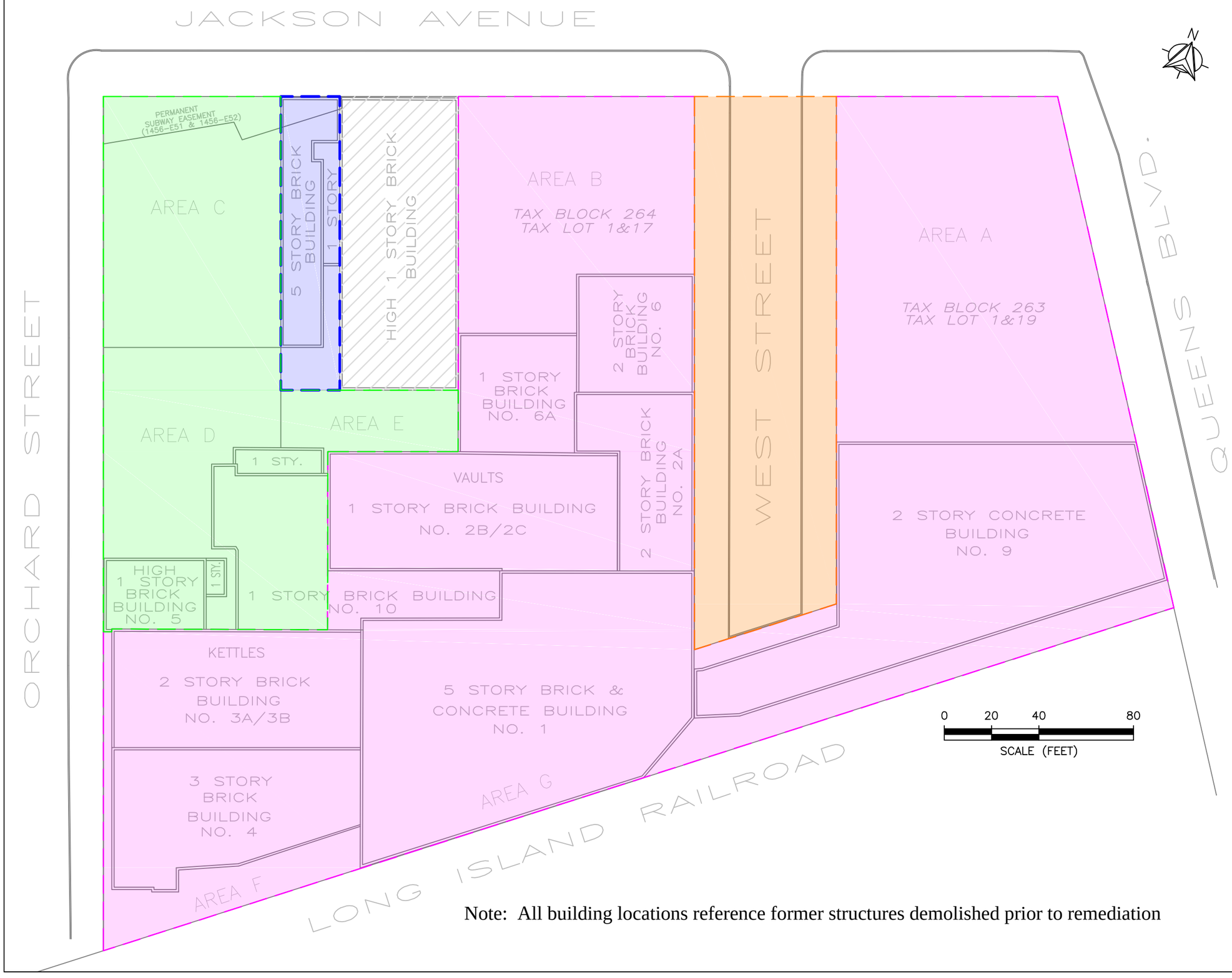
FIGURE 1: SITE LOCATION MAP

SITE: Queens Plaza Residential Development
Brownfield Cleanup Site
Long Island City, NY

CLIENT: LIC Development Owner, L.P.



Note: All building locations reference former structures demolished prior to remediation

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Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Queens Plaza Residential Development - BCP Site C
C241169

FIGURE 2

SITE LAYOUT

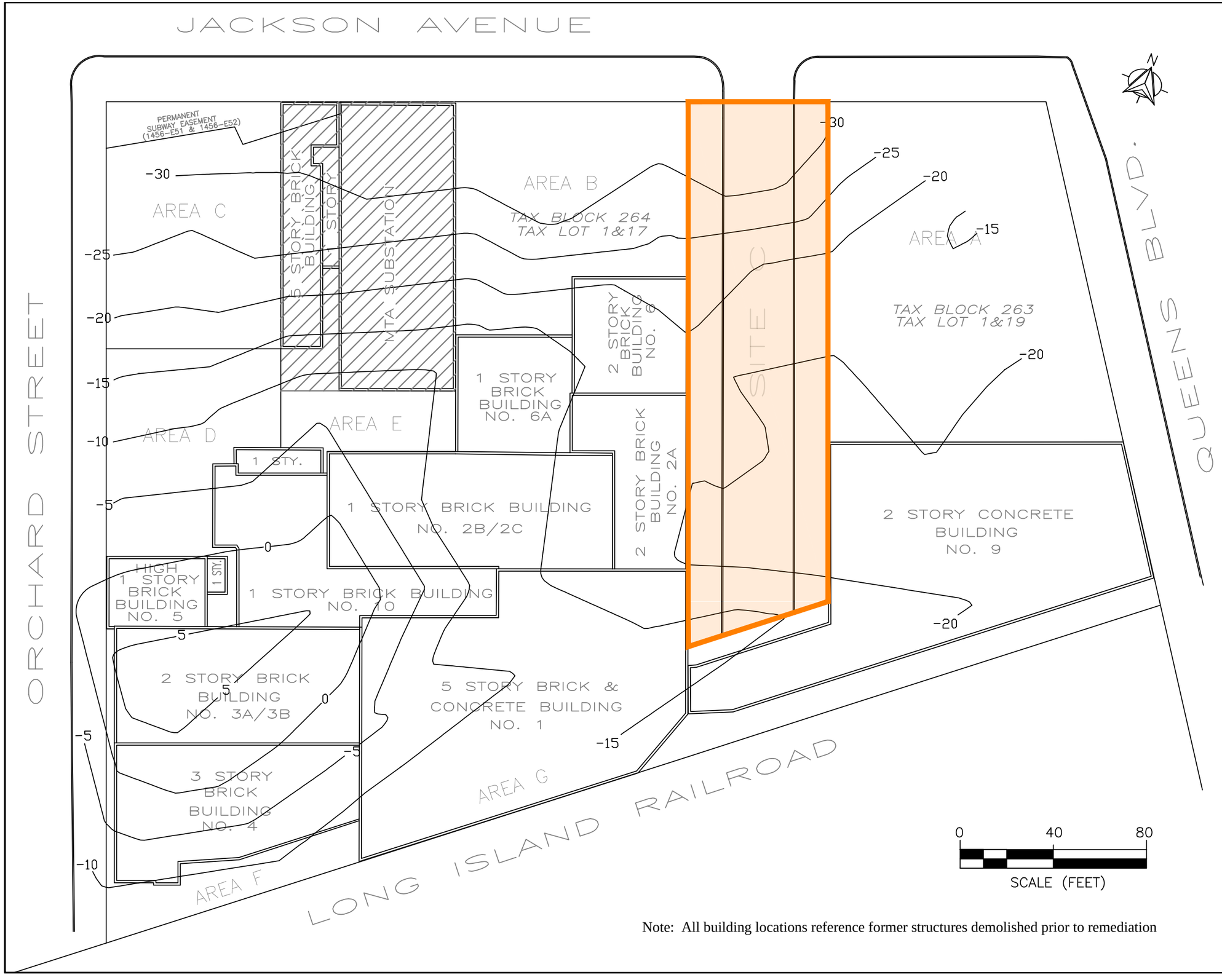
April 2016

Project Number
10112-005

LEGEND

- BCP SITE A (C241105)
- BCP SITE B (C241151)
- BCP SITE C (C241169)
- OER LOT 14 (Non-BCP site)
- OUTSIDE BCP SITES

FILE: P:\99999 - Tishman\Figures\Site C - SMP\Figure 2 - Site Layout.dwg DATE: 4/29/2016



Note: All building locations reference former structures demolished prior to remediation

FILE: P:\99999 - Tishman\Figures\Site C - SMP\Figure 3 - Bedrock Contour Map.dwg DATE: 4/29/2016

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Queens Plaza Residential Development - BCP Site C C241169

FIGURE 3

BEDROCK ELEVATION CONTOUR MAP

April 2016

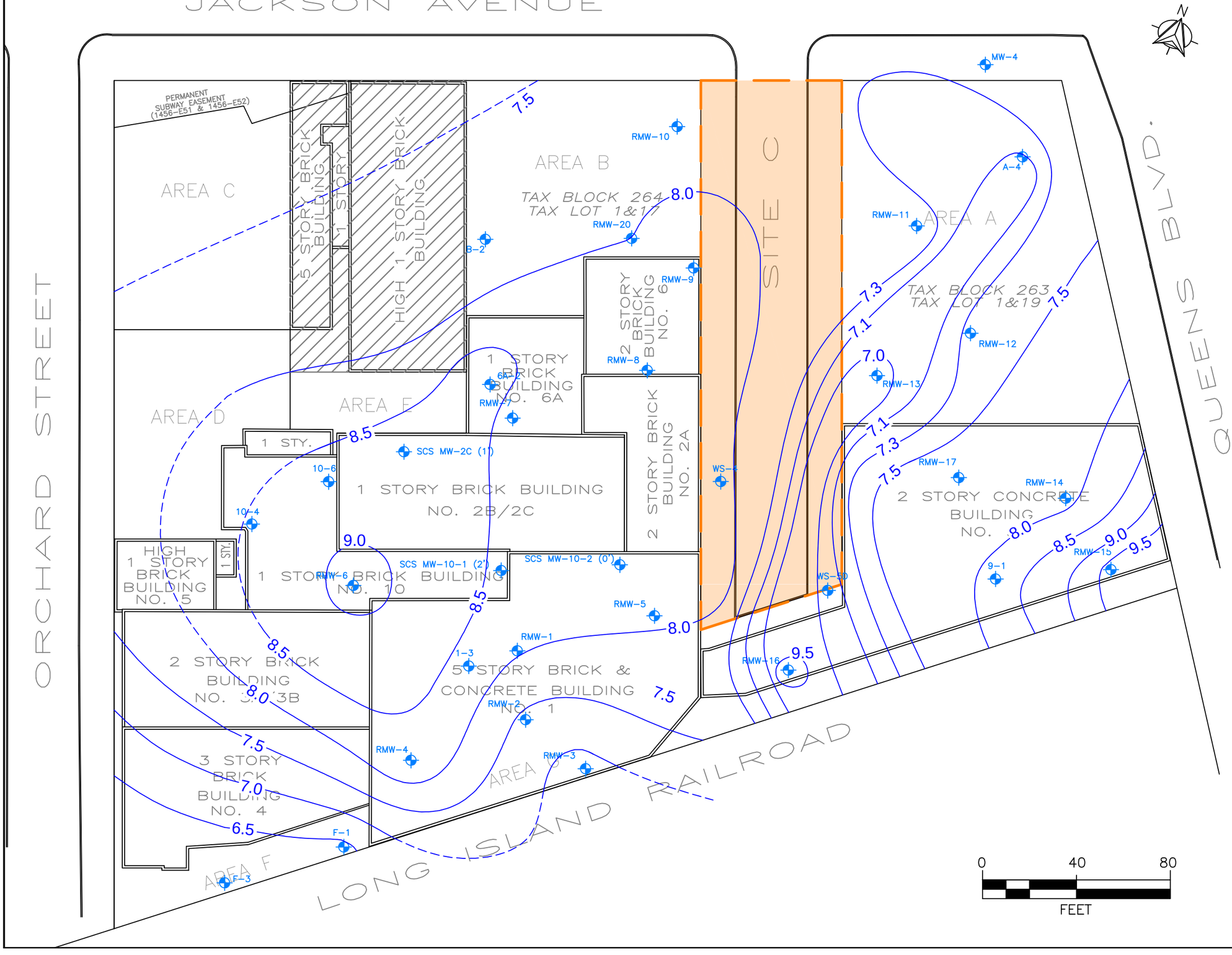
Project Number
10112-005

LEGEND

- BCP SITE C
- 0 — CONTOUR OF ELEVATION OF TOP OF ROCK

ELEVATION IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

SOURCE: SUPPORT OF EXCAVATION GENERAL PLAN (9-24-14) BY MUESER RUTLEDGE (UPDATED 10/24/14)



FILE: P:\99999 - Tishman\Figures\Site C - SMP\Figure 4 - Groundwater Contour Map.dwg DATE: 4/28/2016

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New York, NY 10001

Queens Plaza Residential
Development - Site C
BCP241169

FIGURE 4

GROUNDWATER ELEVATION CONTOUR MAP

Date
April 2016

Project Number
10112-005

LEGEND

- BCP SITE C
- OUTSIDE OF SITE
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (NAVD88)

ELEVATION NORTH AMERICAN VERTICAL DATUM (NAVD88)
GROUNDWATER ELEVATIONS MEASURED ON 12/22/14

FILE: P:\99999 - Tishman\Figures\Site C - SMP\Figure 5 - Endpoint Sampling Locations.dwg DATE: 5/15/2015

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New York, NY 10001

Queens Plaza Residential Development - BCP Site C
C241169

FIGURE 5

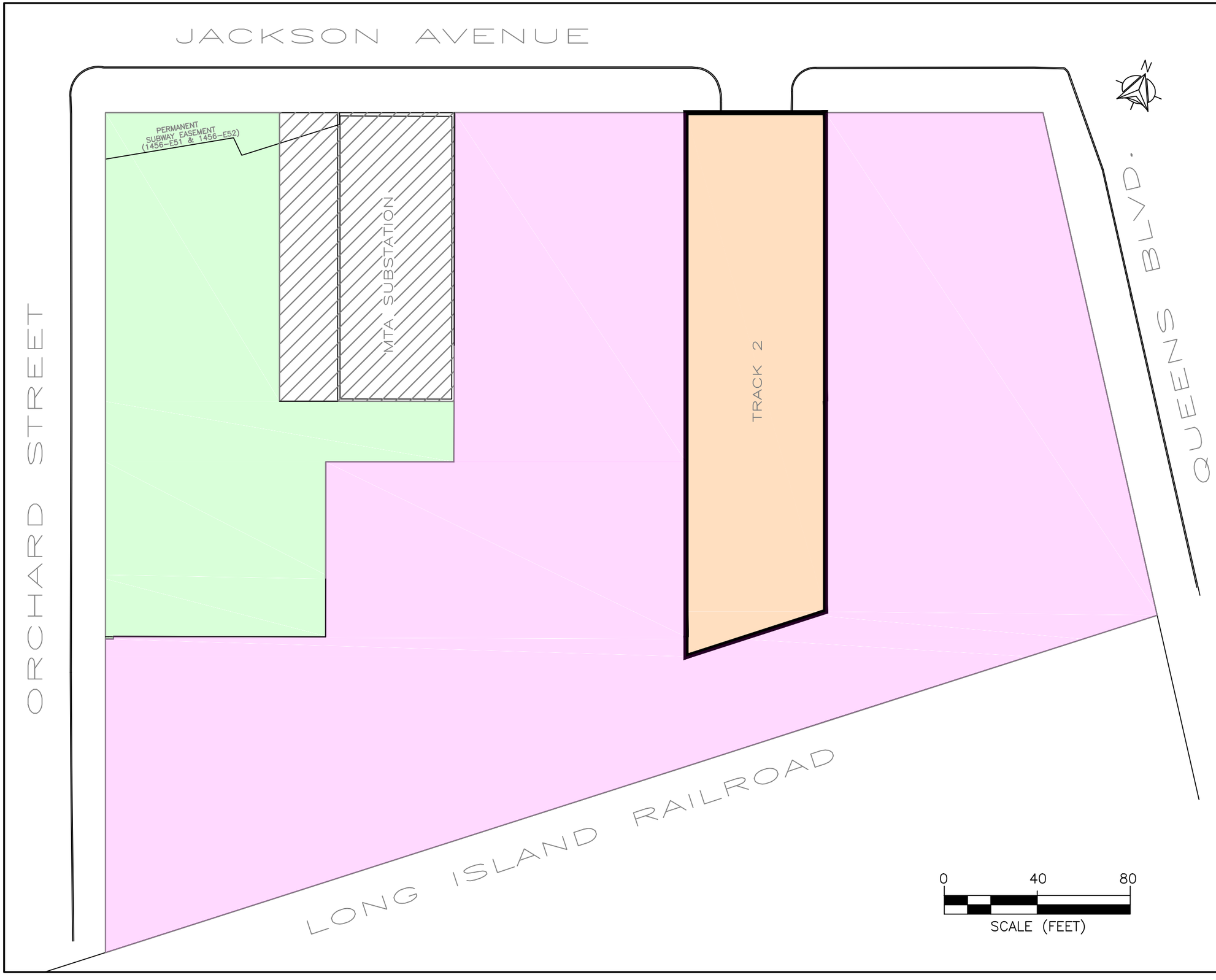
ENDPOINT SAMPLE LOCATIONS

April 2016

Project Number
10112-005

LEGEND

79	GRID CELL NUMBER
6.0'	FINAL ENVIRONMENTAL EXCAVATION ELEVATION / ELEVATION OF DEMARCATION LAYER
EP-1 (10.5') ×	END–POINT SAMPLE LOCATION AND ELEVATION (NAVD88) PASSED OR APPROVED



FILE: P:\99999 - Tishman\Figures\Site C - FER\Figure 6 - Asbuilt + Institutional Control Boundaries.dwg DATE: 5/25/2016

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New York, NY 10001

Queens Plaza Residential Development - BCP Site C
C241169

FIGURE 6

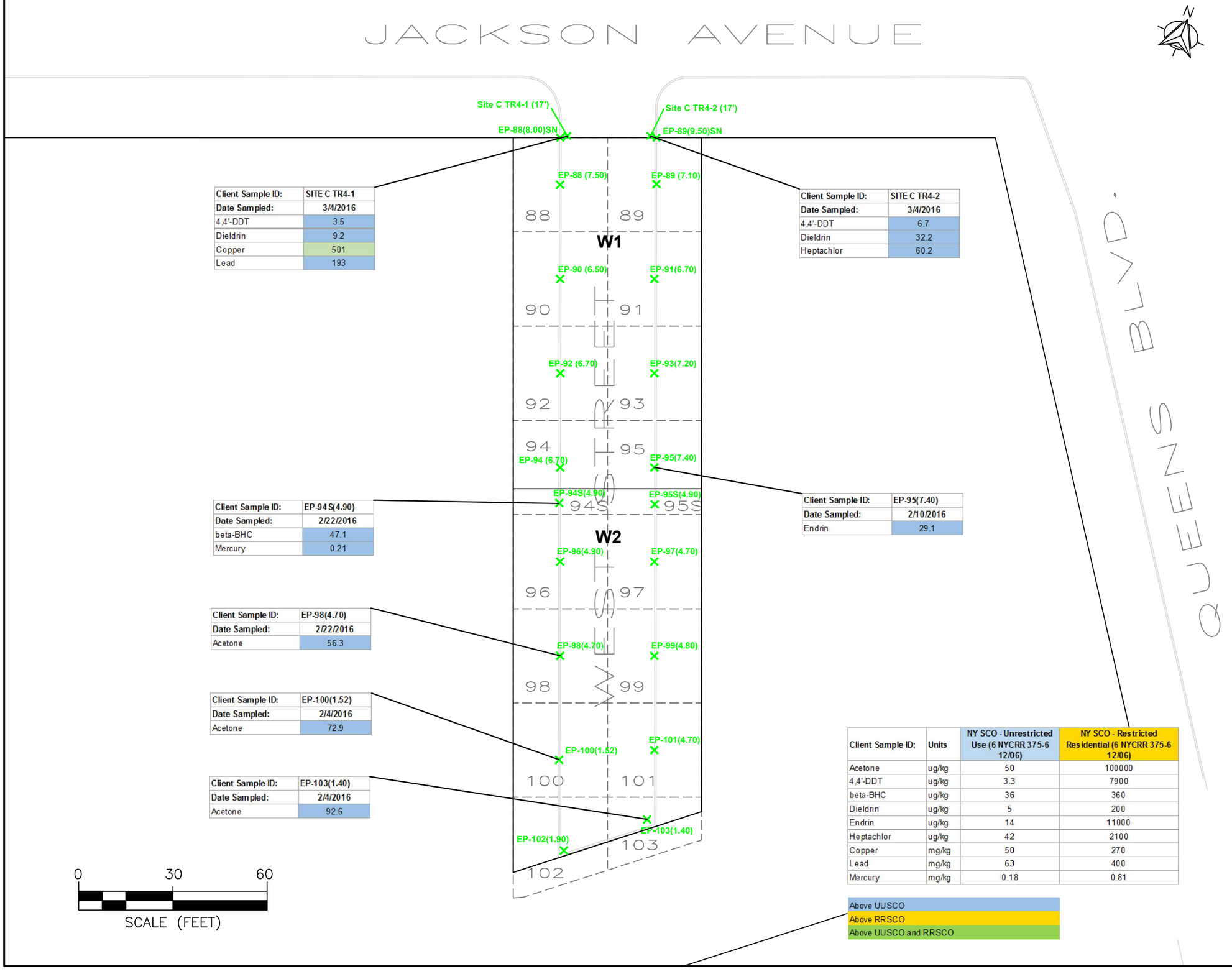
INSTITUTIONAL CONTROL BOUNDARY

April 2016

Project Number
10112-005

LEGEND

- BCP SITE C
- OUTSIDE OF SITE
- INSTITUTIONAL CONTROL BOUNDARY



Client Sample ID:	SITE C TR4-1
Date Sampled:	3/4/2016
4,4'-DDT	3.5
Dieldrin	9.2
Copper	501
Lead	193

Client Sample ID:	SITE C TR4-2
Date Sampled:	3/4/2016
4,4'-DDT	6.7
Dieldrin	32.2
Heptachlor	60.2

Client Sample ID:	EP-94S(4.90)
Date Sampled:	2/22/2016
beta-BHC	47.1
Mercury	0.21

Client Sample ID:	EP-95(7.40)
Date Sampled:	2/10/2016
Endrin	29.1

Client Sample ID:	EP-98(4.70)
Date Sampled:	2/22/2016
Acetone	56.3

Client Sample ID:	EP-100(1.52)
Date Sampled:	2/4/2016
Acetone	72.9

Client Sample ID:	EP-103(1.40)
Date Sampled:	2/4/2016
Acetone	92.6

Client Sample ID:	Units	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)	NY SCO - Restricted Residential (6 NYCRR 375-6 12/06)
Acetone	ug/kg	50	100000
4,4'-DDT	ug/kg	3.3	7900
beta-BHC	ug/kg	36	360
Dieldrin	ug/kg	5	200
Endrin	ug/kg	14	11000
Heptachlor	ug/kg	42	2100
Copper	mg/kg	50	270
Lead	mg/kg	63	400
Mercury	mg/kg	0.18	0.81

Above UUSCO
Above RRSCO
Above UUSCO and RRSCO

Fleming Lee Shue
Environmental Management & Consulting
158 West 29th Street, 9th Fl.
New York, NY 10001

Queens Plaza Residential Development - BCP Site C C241169

FIGURE 7

SOIL ABOVE OF UUSCOs and RRSCOs

April 2016

Project Number
10112-005

LEGEND

79 — GRID CELL NUMBER

EP-1 (10.5') — END-POINT SAMPLE LOCATION AND ELEVATION (NAVD88) PASSED OR APPROVED

A1-B — WASTE CLASS GRID NUMBER

FILE: P:\99999 - Tishman\Figures\Site C - FER\Figure 7 - UUSCO Exceedances.dwg DATE: 5/15/2015

APPENDIX A

Environmental Easement and Survey Map

Notice to Municipality

Date: July 6, 2016

Name of Official: Office of the City Register
Name of Municipality: City of New York, Queens County
Address: 144-06 94th Avenue, 1st floor, Jamaica, NY 11435

Re: Environmental Easement

Dear Sir or Madam:

Attached please find a copy of an environmental easement granted to the New York State Department of Environmental Conservation ("DEC")
on June 17, 2016 and recorded on June 28, 2016, as CRFN 2016000217577,
by LIC Development Owner, L.P.
for property at 28-30 Jackson Avenue (a/k/a 28-34 Jackson Avenue), Queens, New York.
Tax Map No.: Block 264, Lot 17
DEC Site No: C241169 (Queens Plaza Residential Development- BCP Site C)

This Environmental Easement restricts future use of the above-referenced property to restricted residential use. Any on-site activity must be done in accordance with the Environmental Easement and the Site Management Plan which is incorporated into the Environmental Easement. DEC approval is also required prior to any groundwater use.

Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

> 1. Whenever the department is granted an environmental easement, it shall provide each affected local government with a copy of such easement and shall also provide a copy of any documents modifying or terminating such environmental easement.
>
> 2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an environmental easement and that may relate to or impact such easement, the affected local government shall notify the department and refer such application to the department. The department shall evaluate whether the application is consistent with the environmental easement and shall notify the affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local government shall not approve the application until it receives approval from the department.

An electronic version of every environmental easement that has been accepted by the Department is available to the public at: http://www.dec.ny.gov/chemical/36045.html. Please forward this notice to your building and/or planning departments, as applicable, to ensure your compliance with these provisions of New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Very truly yours,

LIC Development Owner, L.P.

By: _____

Name:

Title: **Steven R. Wechsler**
Senior Managing Director

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

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RECORDING AND ENDORSEMENT COVER PAGE PAGE 1 OF 12

Document ID: 2016062200711001 Document Date: 06-17-2016 Preparation Date: 06-22-2016
Document Type: EASEMENT
Document Page Count: 11

PRESENTER:
FIRST AMERICAN TITLE INSURANCE (FIRSTAM PICKUP)
666 THIRD AVENUE-5TH FLOOR
TITLE# 799516 ML ACCOM
NEW YORK, NY 10017
212-850-0670

RETURN TO:
NYS DEPT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY 14TH FLOOR
ATTN: BRADFORD D BURNS, ESQ
ALBANY, NY 12233

PROPERTY DATA

Borough	Block	Lot	Unit	Address
QUEENS	264	17	Entire Lot	28-30 JACKSON AVENUE

Property Type: NON-RESIDENTIAL VACANT LAND Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
LIC DEVELOPMENT OWNER, L.P.
C/O TISIIMAN SPEYER, 45 ROCKEFELLER PLAZA
NEW YORK, NY 10111

GRANTEE/BUYER:
THE PEOPLE OF THE STATE OF NEW YORK
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :		
Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	92.00
Affidavit Fee:	$	0.00

Filing Fee: $ 250.00
NYC Real Property Transfer Tax: $ 0.00
NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 06-28-2016 15:37
City Register File No.(CRFN): **2016000217577**

City Register Official Signature

3020-799516

ENVIRONMENTAL EASEMENT

made between

LIC Development Owner, L.P.

and

The People of the State of New York

as of the 17th day of June, 2016

and affecting

Block 264

Lot 17

Queens County, New York

AFTER RECORDING, RETURN TO:

NYS Dept of Environmental Conservation

Office of General Counsel

625 Broadway, 14th Floor

Albany, NY 12233-1500

Attn: Bradford D. Burns, Esq.

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 17th day of June, 2016, between LIC Development Owner, L.P., having an office at c/o Tishman Speyer, 45 Rockefeller Center, New York, New York 10111, County of New York, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 28-30 Jackson Avenue in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 264 Lot 17 (the "Property") as more particularly described in Schedule A hereto, pursuant to (i) that certain Bargain and Sale Deed from Outlet City, Inc. to Grantor dated June 13, 2014 and recorded in the City Register of the City of New York (the "Register") in City Register File Number ("CRFN") 2014000218359, (ii) that certain Deed from TST LIC Development, L.L.C. to Grantor dated June 13, 2014 and recorded in the Register as CRFN 2014000218158, and (iii) that certain Quitclaim Indenture from The City of New York to Grantor dated November 18, 2014 and recorded in the Register as CRFN 2014000406406. The

portion of the Property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.30890 +/- acres, and is hereinafter more fully described in the Land Title Survey dated June 6, 2015 prepared by Saeid Jalilvand, LLS of Montrose Surveying Co., LLP, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule B; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241169-03-15, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii),
Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and
Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for

industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the

property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:	Site Number: C241169 Office of General Counsel NYSDEC 625 Broadway Albany New York 12233-5500
With a copy to:	Site Control Section Division of Environmental Remediation NYSDEC 625 Broadway Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

LIC Development Owner, L.P.:

By: _____

Print Name: Russell Makowsky

Title: Vice President & Treasurer Date: 6/14/16

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF NEW YORK)

On the 14 day of June, in the year 20 16, before me, the undersigned, personally appeared Russell Makowsky, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same, and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

KERRI A. GARRETT
Notary Public, State of New York
No. 01GA6022001
Qualified in Queens County
Certificate Filed in New York County
Commission Expires March 22, 2019

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 16th day of June, in the year 2016 before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

PATRICK EUGENE FOSTER
NOTARY PUBLIC, STATE OF NEW YORK
QUALIFIED IN KINGS COUNTY
NO. 02FO6278032
COMMISSION EXPIRES 03/18/2017

SCHEDULE "A" PROPERTY DESCRIPTION

Tax Block 264 Tax Lot 17

ALL that certain plot piece or parcel of land situate lying and being in the Borough and County of Queens, City and State of New York bounded and described as follows:

BEGINNING at a point on the easterly side of Orchard Street (60 feet wide) distant 215.83 feet southerly from the corner formed by the intersection of the easterly side of Orchard Street with the southerly side of Jackson Avenue (100 feet wide);

RUNNING THENCE easterly, at right angles to the easterly side of Orchard Street, 31.67 feet to a point;

RUNNING THENCE northerly, at right angles to the last mentioned course, 24.58 feet to a point;

RUNNING THENCE easterly, at right angles to the last mentioned course, 64.25 feet to a point;

RUNNING THENCE northerly, at right angles to the last mentioned course, 28.75 feet to a point;

RUNNING THENCE easterly, at right angles to the last mentioned course, 53.97 feet to a point;

RUNNING THENCE northerly, at right angles to the southerly side of Jackson Avenue, 162.50 feet to the southerly side of Jackson Avenue;

RUNNING THENCE easterly, along the southerly side of Jackson Avenue, 185.92 feet to a point;

RUNNING THENCE southerly, at right angles to the southerly side of Jackson Avenue, 41.58 feet to a point;

RUNNING THENCE westerly, at right angles to the last mentioned course, 23.50 feet to a point;

RUNNING THENCE southerly, at right angles to the last mentioned course, 32.08 feet to a point;

RUNNING THENCE westerly, at right angles to the last mentioned course, 2.50 feet to a point;

RUNNING THENCE southerly, at right angles to the last mentioned course, 188.16 feet to the northwesterly side of the Long Island Rail Road;

RUNNING THENCE southwesterly, along the northwesterly side of the Long Island Rail Road, along a line forming an angle of 107 degrees 55 minutes 03 seconds on the northwest with the last mentioned course, 63.06 feet to an angle point;

RUNNING THENCE southwesterly, continuing along the northwesterly side of the Long Island Rail Road, along a line forming an angle of 179 degrees 50 minutes 46 seconds on the northwest with the northwesterly side of the Long Island Rail Road, 262.32 feet to the easterly side of Orchard Street;
RUNNING THENCE northerly, along the easterly side of Orchard Street, 145.42 feet to the point or place of BEGINNING.

SCHEDULE "B" CONTROLLED PROPERTY DESCRIPTION

BEGINNING at a point on the southerly line of Jackson Avenue said point being distant 93.55 feet from the intersection of the southeasterly corner of Queens Boulevard and Jackson Avenue, as shown on the City Map;

1. THENCE southerly, along a line a distance of 214.59 feet forming an interior angle of 90 degrees, with the previous course, to a point;

2. THENCE. westerly, along a line a distance of 63 .04 feet forming an interior angle of 107 degrees, 52 minutes, 23 seconds, with the previous course, to a point;

3. THENCE northerly, along a line a distance of 233.94 feet forming an interior angle of 72 degrees, 07 minutes, 37 seconds, with the previous course, to a point;

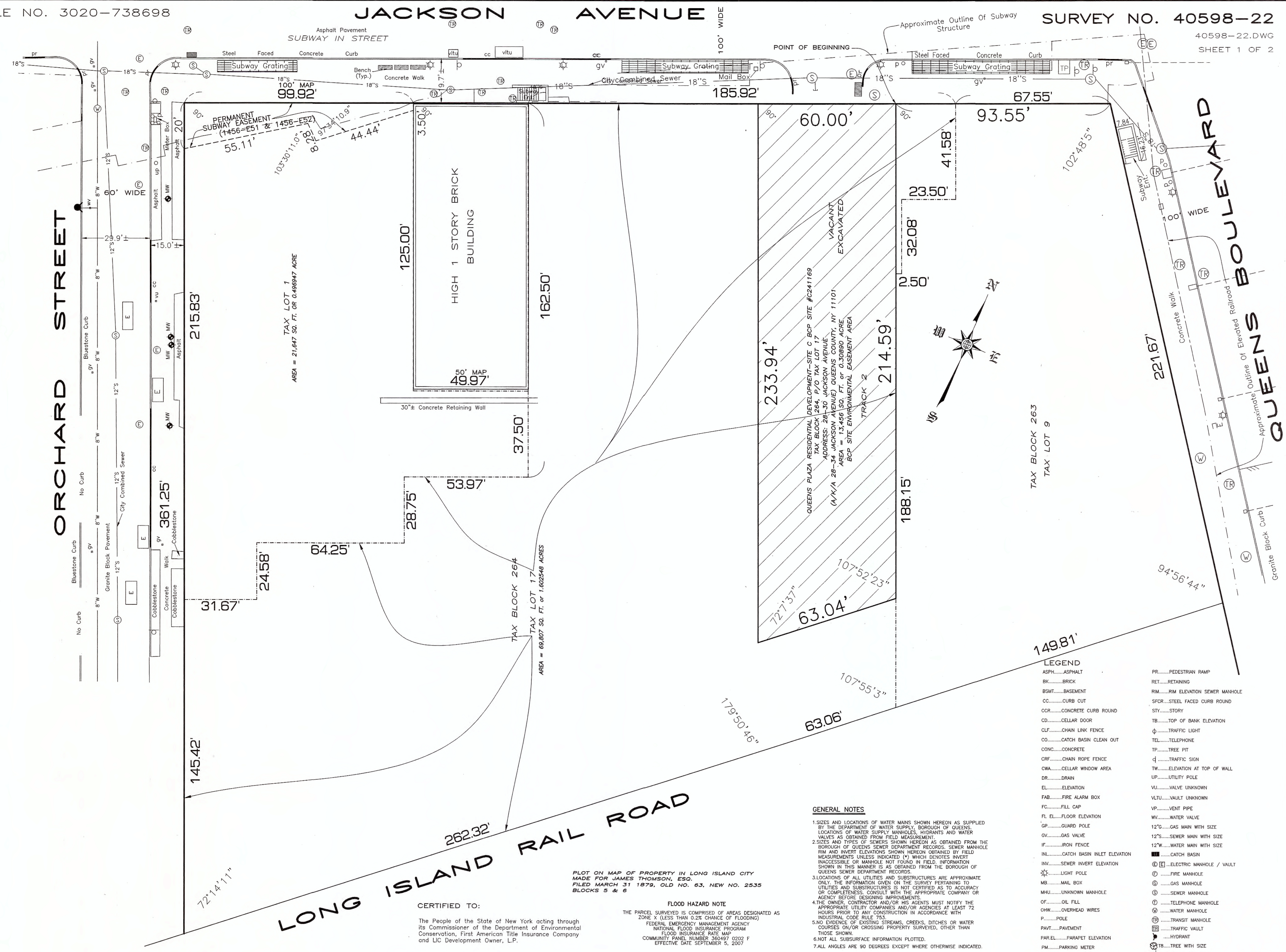
4. THENCE easterly, along a line, a distance of 60.00 feet forming an interior angle of 90 degrees, with the previous course, to the point or place of BEGINNING.

First American Title Insurance Company
666 Third Avenue 5th fl
New York, N.Y. 10017
Phone: (212) 922-9700
Fax: (212) 922-0881

VICINITY MAP
NOT TO SCALE

TITLE NO. 3020-738698

SURVEY NO. 40598-22
40598-22.DWG
SHEET 1 OF 2



This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law.

THE ENGINEERING AND INSTITUTIONAL CONTROLS for the Easement are set forth in more detail in the Site Management Plan ("SMP"). A copy of the SMP must be obtained by any party with an interest in the property. The SMP may be obtained from the New York State Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov.

▨ ENVIRONMENTAL EASEMENT BOUNDARY

ENVIRONMENTAL EASEMENT AREA ACCESS

THE DEC OR THEIR AGENT MAY ACCESS THE ENVIRONMENTAL EASEMENT AREA AS SHOWN HEREON THROUGH ANY EXISTING STREET ACCESS OR BUILDING INGRESS/EGRESS ACCESS POINT.

ENGINEEERING / INSTITUTIONAL CONTROLS

- **Groundwater Restriction** - The use of groundwater underlying the property is prohibited without treatment rendering it safe for intended use.
- **Vegetable Gardens and Farming** - on the property are prohibited (this does not include raised bed gardens or green roofs)
- **Land Use** - The use and development of the site is limited to restricted residential, industrial and commercial uses only.

ENGINEERING CONTROLS AS PER ARNOLD F. FLEMING, P.E.

ENVIRONMENTAL EASEMENT DESCRIPTION

BEGINNING at a point on the southerly line of Jackson Avenue said point being distant 93.55 feet westerly from the intersection of the southeasterly corner of Queens Boulevard and Jackson Avenue, as shown on the City Map;

1. THENCE southerly, along a line a distance of 214.59 feet forming an interior angle of 90 degrees, with the previous course, to a point;

2. THENCE. westerly, along a line a distance of 63 .04 feet forming an interior angle of 107 degrees, 52 minutes, 23 seconds, with the previous course, to a point;

3. THENCE northerly, along a line a distance of 233.94 feet forming an interior angle of 72 degrees, 07 minutes, 37 seconds, with the previous course, to a point;

4. THENCE easterly, along a line, a distance of 60.00 feet forming an interior angle of 90 degrees, with the previous course, to the point or place of BEGINNING.

THE ABOVE DESCRIBED EASEMENT HAS AN AREA OF 13,456 SQ. FT. OR 0.30890 ACRE.

BCP Site Metes and Bounds and Environmental Easement Metes and Bounds are the same.

SCHEDULE B ITEMS

5. Subway Consent recorded in Liber 3310 Cp 273.

6. Permanent Subway Easement recited in Final Order Condemnation filed 9/14/1950 under Index No. 5543/50 and as evidenced as REUC 1456-E51 on the New York City Tax Map (affects Block 264 Lot 1).

PLOT ON MAP OF PROPERTY IN LONG ISLAND CITY MADE FOR JAMES THOMSON, ESQ. FILED MARCH 31 1879, OLD NO. 63, NEW NO. 2535 BLOCKS 5 & 6

CERTIFIED TO:

The People of the State of New York acting through its Commissioner of the Department of Environmental Conservation, First American Title Insurance Company and LIC Development Owner, L.P.

FLOOD HAZARD NOTE

THE PARCEL SURVEYED IS COMPRISED OF AREAS DESIGNATED AS ZONE X (LESS THAN 0.2% CHANCE OF FLOODING)
FEDERAL EMERGENCY MANAGEMENT AGENCY
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
COMMUNITY PANEL NUMBER 360497 0202 F
EFFECTIVE DATE SEPTEMBER 5, 2007

GENERAL NOTES

1. SIZES AND LOCATIONS OF WATER MAINS SHOWN HEREON AS SUPPLIED BY THE DEPARTMENT OF WATER SUPPLY, BOROUGH OF QUEENS. LOCATIONS OF WATER SUPPLY MANHOLES, HYDRANTS AND WATER VALVES AS OBTAINED FROM FIELD MEASUREMENT.
2. SIZES AND TYPES OF SEWERS SHOWN HEREON AS OBTAINED FROM THE BOROUGH OF QUEENS SEWER DEPARTMENT RECORDS. SEWER MANHOLE RIM AND INVERT ELEVATIONS SHOWN HEREON OBTAINED BY FIELD MEASUREMENTS UNLESS INDICATED (*) WHICH DENOTES INVERT INACCESSIBLE OR MANHOLE NOT FOUND IN FIELD. INFORMATION SHOWN IN THIS MANNER IS AS OBTAINED FROM THE BOROUGH OF QUEENS SEWER DEPARTMENT RECORDS.
3. LOCATIONS OF ALL UTILITIES AND SUBSTRUCTURES ARE APPROXIMATE ONLY. THE INFORMATION GIVEN ON THE SURVEY PERTAINING TO UTILITIES AND SUBSTRUCTURES IS NOT CERTIFIED AS TO ACCURACY OR COMPLETENESS. CONSULT WITH THE APPROPRIATE COMPANY OR AGENCY BEFORE DESIGNING IMPROVEMENTS.
4. THE OWNER, CONTRACTOR AND/OR HIS AGENTS MUST NOTIFY THE APPROPRIATE UTILITY COMPANIES AND/OR AGENCIES AT LEAST 72 HOURS PRIOR TO ANY CONSTRUCTION IN ACCORDANCE WITH INDUSTRIAL CODE RULE 753.
5. NO EVIDENCE OF EXISTING STREAMS, CREEKS, DITCHES OR WATER COURSES ON/OR CROSSING PROPERTY SURVEYED, OTHER THAN THOSE SHOWN.
6. NOT ALL SUBSURFACE INFORMATION PLOTTED.
7. ALL ANGLES ARE 90 DEGREES EXCEPT WHERE OTHERWISE INDICATED.

LEGEND

ASPH.......ASPHALT
BK..........BRICK
BSMT.......BASEMENT
CC..........CURB CUT
CCR........CONCRETE CURB ROUND
CD..........CELLAR DOOR
CLF.........CHAIN LINK FENCE
CO..........CATCH BASIN CLEAN OUT
CONC......CONCRETE
CRF.........CHAIN ROPE FENCE
CWA........CELLAR WINDOW AREA
DR..........DRAIN
EL...........ELEVATION
FAB.........FIRE ALARM BOX
FC..........FILL CAP
FL EL.....FLOOR ELEVATION
GP..........GUARD POLE
GV..........GAS VALVE
IF............IRON FENCE
INL.........CATCH BASIN INLET ELEVATION
INV.........SEWER INVERT ELEVATION
.........LIGHT POLE
MB..........MAIL BOX
MHU........UNKNOWN MANHOLE
OF...........OIL FILL
OHW........OVERHEAD WIRES
P.........POLE
PAVT......PAVEMENT
PAR.EL........PARAPET ELEVATION
PM........PARKING METER
PMULT.....POLE, MULTIPLE USAGE
PR........PEDESTRIAN RAMP
RET......RETAINING
RIM.......RIM ELEVATION SEWER MANHOLE
SFCR....STEEL FACED CURB ROUND
STY.......STORY
TB........TOP OF BANK ELEVATION
ϕ........TRAFFIC LIGHT
TEL.......TELEPHONE
TP........TREE PIT
........TRAFFIC SIGN
TW........ELEVATION AT TOP OF WALL
UP........UTILITY POLE
VU.........VALVE UNKNOWN
VLTU......VAULT UNKNOWN
VP.........VENT PIPE
WV.........WATER VALVE
12"G......GAS MAIN WITH SIZE
12"S......SEWER MAIN WITH SIZE
12"W......WATER MAIN WITH SIZE
■ ....CATCH BASIN
Ⓔ E ...ELECTRIC MANHOLE / VAULT
Ⓕ ....FIRE MANHOLE
Ⓖ ....GAS MANHOLE
Ⓢ ....SEWER MANHOLE
Ⓣ ....TELEPHONE MANHOLE
Ⓦ ....WATER MANHOLE
TR ....TRANSIT MANHOLE
TR ....TRAFFIC VAULT
.....HYDRANT
T8.....TREE WITH SIZE
... MONITORING WELL

DRAWN: SJ

20 0 20 40 60
GRAPHIC SCALE - FEET

2.4 0 2.4 4.8 7.2
GRAPHIC SCALE - METERS

REV	DATE	DESCRIPTION	ck
	06-06-15	ENVIRONMENTAL EASEMENT SURVEY	

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW

ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S INKED SEAL OR HIS EMBOSSED SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES

CERTIFICATIONS INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED AND ON HIS BEHALF TO THE TITLE COMPANY. GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS

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B.G. MEINIKHEIM C.S.*C.U. POWELL C.E.,C.S.*L.C.L. SMITH C.S.*NATHAN CAMPBELL C.E.,C.S.*A.U. WHITSON C.E.,C.S.*
WILLIAM L. SAVACOOL C.E.,L.S.,C.S.*A.U. WHITSON INC. C.E.,C.S.*G. WEBER L.S.,C.S.*C. STIDOLPH R.A.,L.S.*WHITSON & POWELL INC. P.E.,L.S.,C.S.*KELLER & POWELL P.E.,L.S.,C.S.*LOUIS MONTROSE C.E.,L.S.,C.S.*FRED J. POWELL P.E.,L.S.,C.S.*

MONTROSE
SURVEYING CO., LLP.
CITY & LAND SURVEYORS
116 20 METROPOLITAN AVE * RICHMOND HILL NY 11418-1090 * (718) 849-0600

[illegible]

STATE OF NEW YORK
SAEID JALILVAND
050236
LICENSED LAND SURVEYOR

CITY OF NEW YORK
COUNTY QUEENS
TAX BLOCK 264
TAX LOT P/O 17

SCALE: 1" = 20'

APPENDIX B

Site Contacts

Appendix B – List of Site Contacts
Queens Plaza Residential Development
Site C – BCP Site #C241169

AGENCY OR CONTACT	PHONE NUMBER
Medical, Fire, and Police	911
One Call Center	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center	(800) 222-1222
National Response Center Pollution Toxic Chemical Oil Spills	(800) 424-8802
New York State Department of Environmental Conservation (NYSDEC) Spills Hotline	(800) 457-7362
Applicant and Property Owner: LIC Development Owner L.P. (c/o Tishman-Speyer Properties)	(212) 715-0361
Primary Remedial Consultant: Fleming-Lee Shue, Inc., Arnold Fleming	(212) 675-3225
Secondary Remedial Consultant: Roux Associates, Inc., Joshua Levine	(631) 232-2600
NYSDEC Case Manager: Michael Haggerty	(518) 402-9688
* Note: Contact numbers subject to change and should be updated as necessary.	

APPENDIX C

Excavation Work Plan

APPENDIX C – EXCAVATION WORK PLAN (EWP)

The following sections includes a description of plans and procedures to be followed for the implementation of the Excavation Work Plan (EWP) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site.

C-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the NYSDEC. Except in the event of emergency inspection and maintenance, whereby the notification will be provided as soon as practical. Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B of this SMP.

Table 1: Notifications*

Michael Haggerty	(518)-402-9767 [michael.haggerty@dec.ny.gov]

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;

- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

C-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

A demarcation layer composed of high visibility orange snow fencing was laid down on Site C at the environmental dig depth to separate any residual soils from the imported clean fill. The demarcation layer is located at elevation 5 feet NAVD88 in W2 (southern half of the property) and elevation 10 feet NAVD88 in W1 (northern half of the property). Figure 1 of this EWP shows the location and elevation of the demarcation layer.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section C-7 of this Appendix.

C-3 SOIL STAGING METHODS

Soil stockpiles generated from remaining contamination (residual soil) will be continuously encircled with a berm and/or silt fence, placed upon plastic sheeting, covered with plastic sheeting at the end of each day, and separated from soil excavated from the clean fill cover. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Soil excavated from the clean fill cover will not require these procedures.

Stockpiles generated from remaining contamination will be kept covered by anchored plastic sheeting, when inactive, until removal. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

C-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan. The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

The qualified environmental professional will be responsible for ensuring that all outbound trucks will be cleaned before leaving the Site until the activities performed under this section are complete. Vehicles and equipment shall be cleaned to remove soil generated during intrusive activities before such vehicles and equipment leave the site. Brooms or shovels will be utilized for the gross removal of the soil from vehicles and equipment. If brooms or shovels do not sufficiently remove soil adhered to vehicles and equipment, vehicles and equipment will be washed with water and detergent. If washing vehicles and equipment with water and detergent is necessary, then a truck wash will be constructed. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking. The qualified environmental professional will be responsible for ensuring that all

egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

C-5 MATERIALS TRANSPORT OFF-SITE

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

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes include transportation of soil to disposal facilities including Bayshore Soil Management, LLC located in Keasby, New Jersey, P-Park Facility, located in Prospect Park, NJ, and Clean Earth Inc., located in Carteret, New Jersey. Truck transport routes are attached. Future truck transportation routes and disposal facilities may differ based on waste classification data and facility operations and will be identified in the pre-excavation notification.

All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport; (g) community input [where necessary].

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

C-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

C-7 MATERIALS REUSE ON-SITE

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Excavated residual soil that is intended for reuse shall be characterized for reuse. Stockpiles of residual soil shall be characterized for reuse using DER 5.4(e)10 and placed on and covered by plastic sheeting. If the excavated residual soil is odorous, soil shall also be placed on and covered with plastic sheeting, and shall be protected with silt fencing and appropriately graded to control run-off.

Excavated residual soil that is not intended for reuse on-site will be characterized and disposed of off-site in accordance with all applicable regulations and this SMP.

On-site residual soil used for this purpose must receive NYSDEC approval. Clean fill cover material that is disturbed and kept separate from underlying residual soil is suitable for reuse as clean fill cover material.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

C-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

C-9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). All imported soils will be considered acceptable for use if it meets the requirements for Track 2 restricted residential use as set forth in NYCRR Part 375-6.7(d) and in the RAWP. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

C-10 STORMWATER POLLUTION PREVENTION

The contractor shall prepare and maintain a Stormwater Pollution Prevention Plan (SWPPP) for the site in accordance with the evolving work areas, topography and drainage patterns if necessary. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering. Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

C-11 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL

pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

C-12 COMMUNITY AIR MONITORING PLAN

A figure showing the location of air sampling stations based on generally prevailing wind conditions is shown in Figure 1. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

C-13 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site. Specific odor control methods to be used on a routine basis will include scented spray, automatic misters, and spray foam. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles;

(b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

C-14 DUST CONTROL PLAN

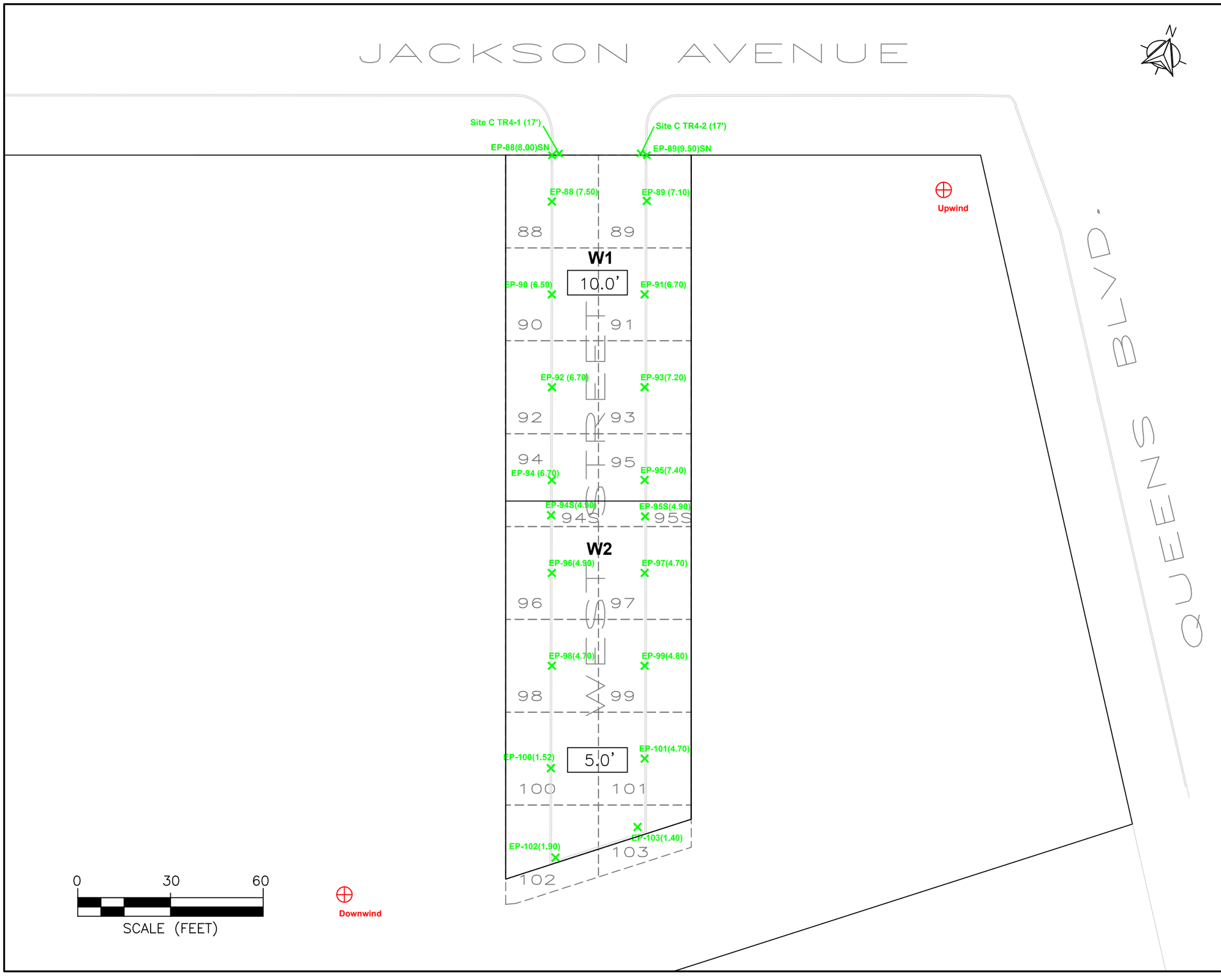
A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

C-15 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work. A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

Figures



FILE: P:\99999 – Tishman\Figures\Site C – SMP\Figure 5 – Endpoint Sampling Locations.dwg DATE: 5/15/2015

Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Queens Plaza Residential Development - BCP Site C
C241169

FIGURE 1

ENDPOINT SAMPLE LOCATIONS

April 2016

Project Number
10112-005

LEGEND

- 79 — GRID CELL NUMBER
- 6.0' — FINAL ENVIRONMENTAL EXCAVATION ELEVATION / ELEVATION OF DEMARCATION LAYER
- EP-1 (10.5') — END–POINT SAMPLE LOCATION AND ELEVATION (NAVD88) PASSED OR APPROVED
- AIR MONITORING LOCATIONS

Attachment A

Truck Transport Routes

Transmittal

Posillico | We know how.

Posillico Business Unit: [X] Civil [ ] Materials [ ] Environmental [ ] Drilling [ ] Consulting [ ] Development

To:	Gregory Rinaldi	Transmittal No.:	14
Company:	Hudson Meridian	Date:	3/12/2015
Phone/Fax:	212-608-6600 212-608-7611	Project:	Queens Plaza Residential Development
Address:	40 Rector St 18th Floor New York, NY 10006	Subject:	Material Disposal Truck Routes
		Sent Via:	Email/ProCore

[X] Attached [ ] Catalog Cuts [ ] Certifications [ ] Schedule [ ] Change Order

[ ] Letter [X] Shop [ ] Specifications [ ] Subcontract [X] Submittal #: 12.00

Copies	Date	No	Description
1	3/12/15	1	Bayshore Recycling Truck Route
1	3/12/15	2	Prospect Park Truck Route
1	3/12/15	3	Clean Earth Carteret Truck Route

The above is transmitted as checked below:

[X] For approval [ ] Approved as submitted [ ] Resubmit [ ] Copies for approval
[X] For your use [ ] Approved as noted [ ] Submit [ ] Copies for distribution
[ ] As requested [ ] Returned for corrections [ ] Return [ ] Corrected prints
[ ] For review & comment [ ] For Bids Due:

Remarks:

CC: Lou Bana
Rob Delmonte
Mike Quasarano
Alex Gomez
Paul Casazza

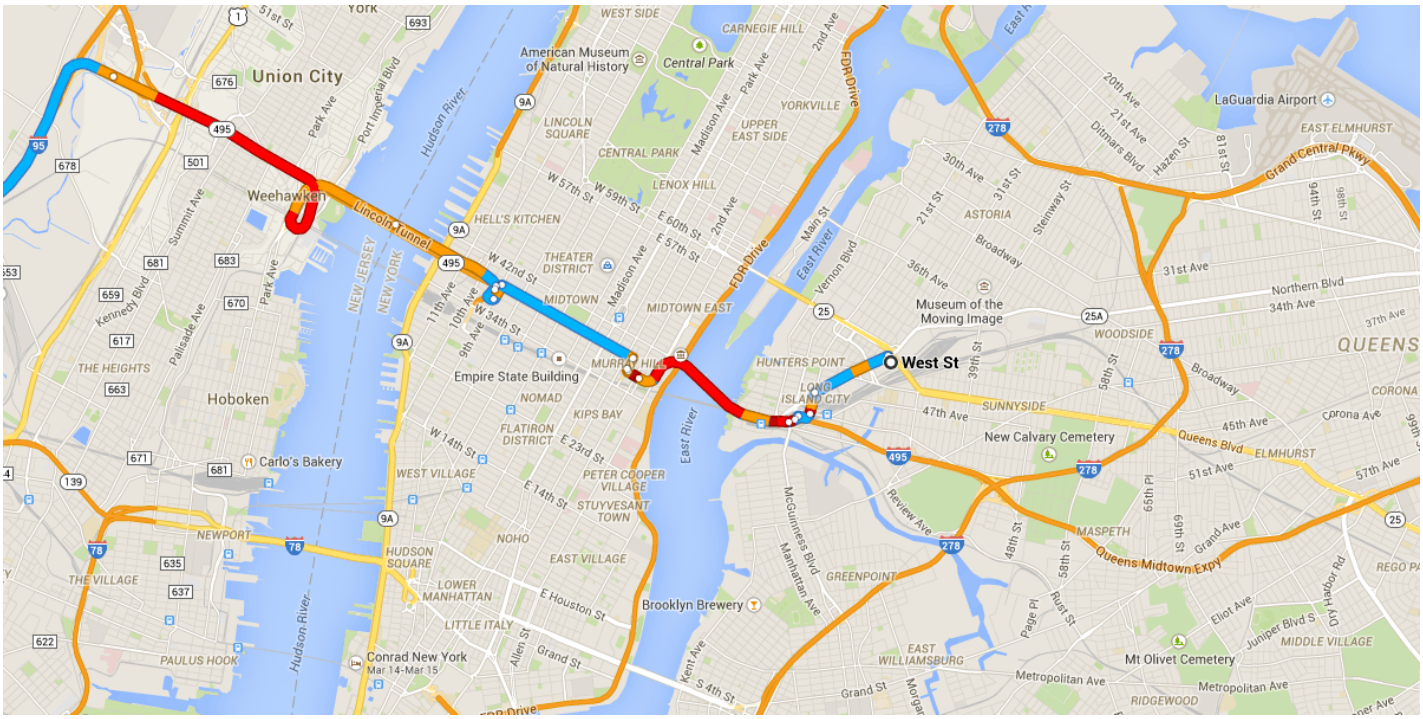
Signed By: Alex Gomez

Name: Alex Gomez
Title: Project Engineer
Email: agomez@posillicoinc.com

Google

Drive 33.6 miles, 50 min

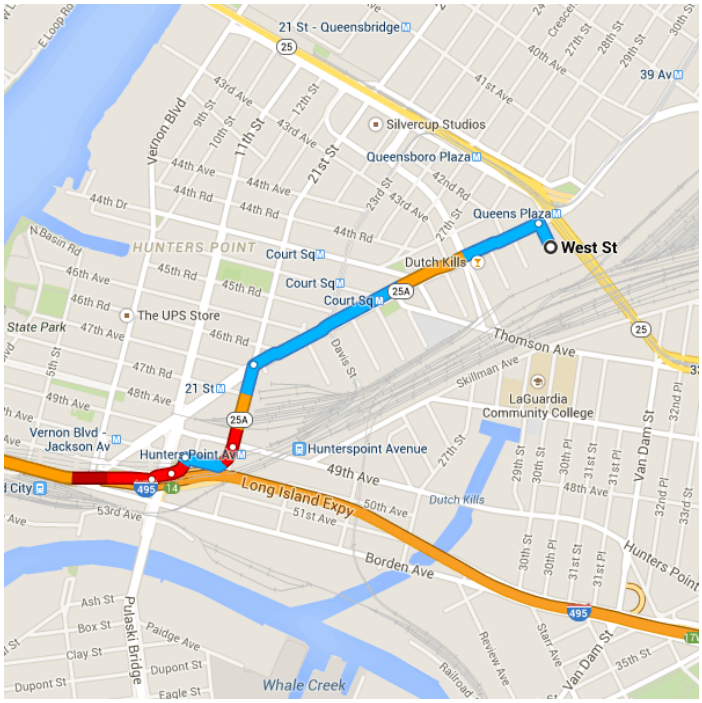
Directions from **West St** to **Bayshore Recycling Corporation**



West St
Long Island City, NY 11101

Get on **I-495 W** from **Jackson Ave**

1.0 mi / 5 min



1. Head **northwest** on **West St** toward **Jackson Ave**
   ⚠ Restricted usage road

   276 ft
2. Turn **left** onto **Jackson Ave**

   0.6 mi
3. Turn **left** onto **21st St**

   0.2 mi
4. Turn **right** onto **50th Ave**

   0.1 mi
5. Turn **left** onto the **I-495 W** ramp
   ⚠ Toll road

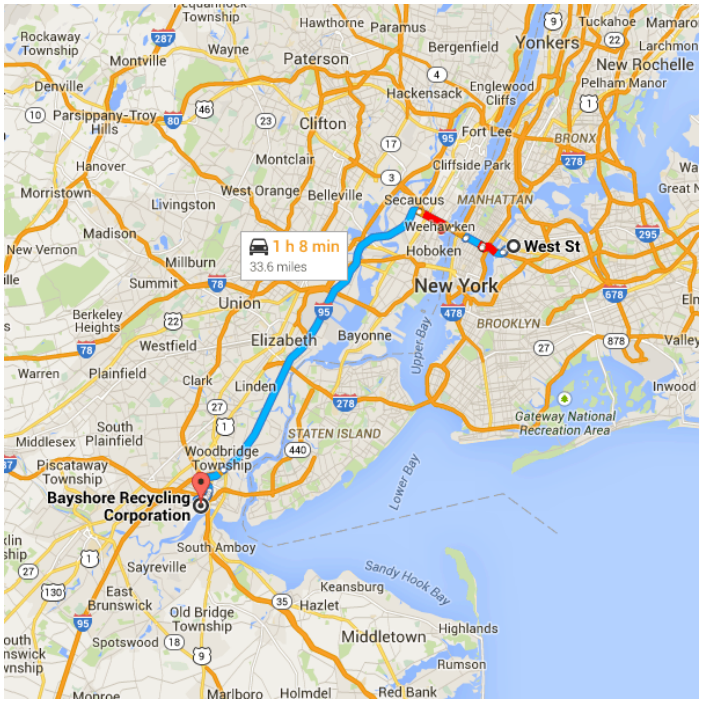
   236 ft
6. Keep **left** and merge onto **I-495 W**
   ⚠ Toll road

   220 ft

Drive from **NJ-495 W** and **I-95 S/New**

Jersey Turnpike S to Fords, Woodbridge Township. Take exit **11** from **I-95 S/New Jersey Turnpike S**

31.0 mi / 43 min



7. Merge onto **I-495 W**
   Toll road
   1.4 mi
8. Take the exit toward **Tunnel Exit St**
   Toll road
   0.1 mi
9. Keep **right** to continue toward **Tunnel Exit St**
   Toll road
   115 ft
10. Continue onto **Tunnel Exit St**
    499 ft
11. Turn **left** onto **E 39th St**
    1.1 mi
12. Turn **left** onto **9th Ave**
    0.1 mi
13. Slight **right** onto the **Lincoln Tunnel** ramp to **New Jersey**
    0.1 mi
14. Merge onto **NY-495 W**
    112 ft
15. Keep **right** at the fork to stay on **NY-495 W**
    Entering New Jersey
    0.9 mi
16. Continue onto **NJ-495 W**
    3.2 mi
17. Take the exit on the **left** onto **I-95 S/New Jersey Turnpike S**
    Partial toll road
    21.2 mi
18. Take exit **11** for **Garden State Pkwy** toward **US-9/Woodbridge**
    Toll road
    1.2 mi

19. Keep **left** at the fork, follow signs for **U.S. 9/New Jersey 440/Woodbridge/The Amboys/Garden State Parkway S/U.S. 1**
Toll road
0.2 mi

20. Keep **right**, follow signs for **US-1/US-9/Woodbridge/The Amboys**
Partial toll road
0.3 mi

21. Keep **left** at the fork to continue toward **U.S. 9 S**
0.1 mi

22. Keep **left** at the fork, follow signs for **US-9 S/NJ-440 S/I-287/The Amboys**
0.5 mi

23. Keep **left** at the fork, follow signs for **US-9 S/NJ-440 W** and merge onto **U.S. 9 S**
0.2 mi

Take **Industrial Ave/Riverside Dr** to **Crows Mill Rd**

1.5 mi / 3 min

24. Merge onto **U.S. 9 S**
0.2 mi

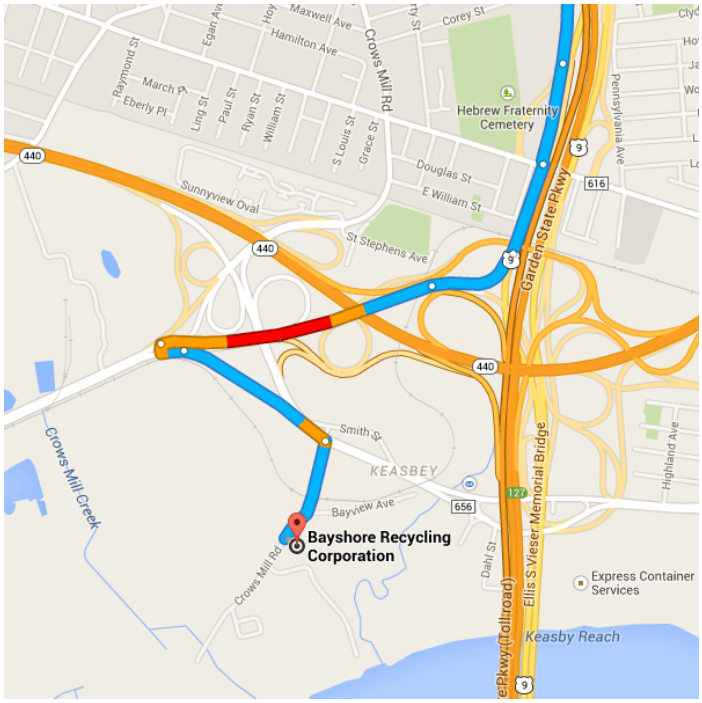
25. Take the **NJ-440 S/Industrial Ave** exit toward **I-287**
0.2 mi

26. Slight **left** onto **Industrial Ave/Riverside Dr**
0.5 mi

27. Make a **U-turn**
335 ft

28. Merge onto **Riverside Dr/Smith St** via the ramp to **US-9 N/NJ-440 N**
0.3 mi

29. Turn **right** onto **Crows Mill Rd**
Destination will be on the left
0.2 mi



Bayshore Recycling Corporation

75 Crows Mill Road, Keasbey, NJ 08832

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

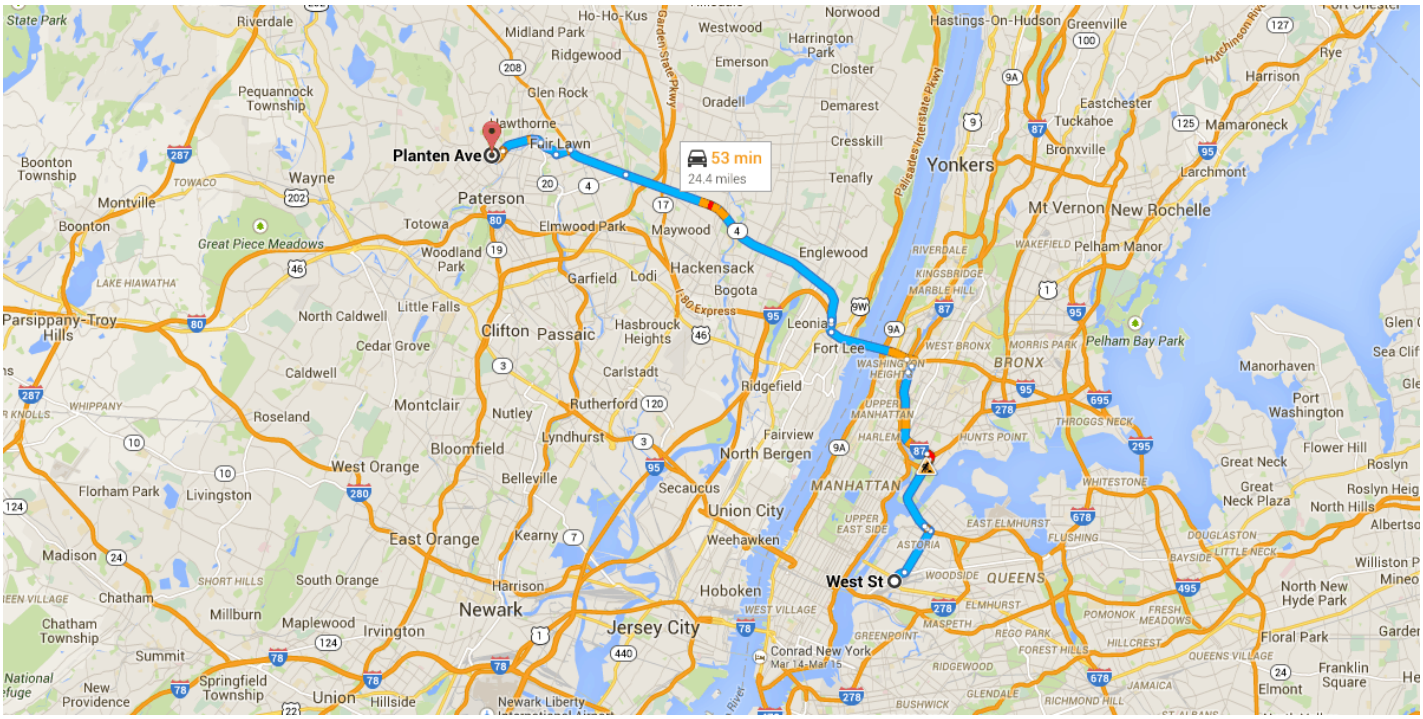
regarding your route.

Map data ©2015 Google

Google

Drive 24.4 miles, 44 min

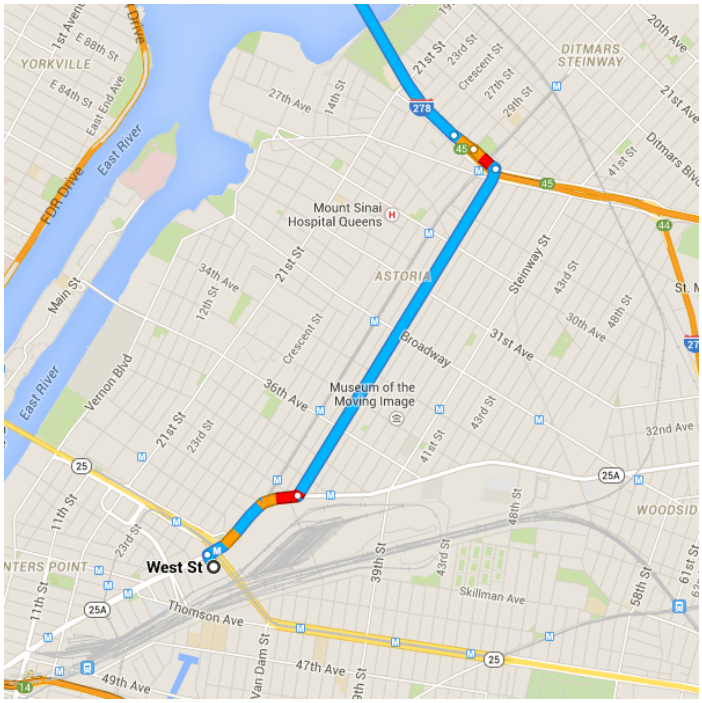
Directions from **West St** to **Planten Ave**



West St
Long Island City, NY 11101

Get on **I-278 E/Robert F. Kennedy Bridge** from **Northern Blvd** and **33rd St**

2.2 mi / 9 min



1. Head **northwest** on **West St** toward **Jackson Ave**
   ⚠ Restricted usage road

   276 ft

2. Turn **right** onto **Northern Blvd**

   0.4 mi

3. Turn **left** onto **33rd St**

   1.5 mi

4. Turn **left** onto **Hoyt Ave N**

   0.1 mi

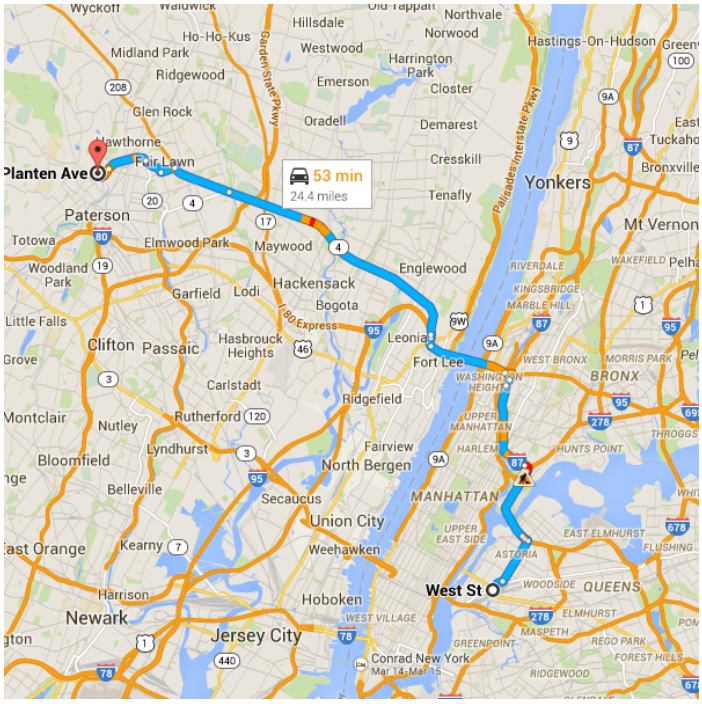
5. Take the **Interstate 278 E/Robert F Kennedy Bridge** ramp on the **left** to **Manhattan/Bronx/Randalls Island**
   ⚠ Toll road

   492 ft

Continue on **I-278 E/Robert F. Kennedy Bridge**. Take **I-87 N**, **I-95 S**, **NJ-4 W** and **NJ-208 N** to **Fair Lawn Ave** in Fair Lawn. Take the **Fair Lawn Ave W** exit from **NJ-208 N**

19.3 mi / 28 min

6. Merge onto **I-278 E/Robert F. Kennedy Bridge**
   Partial toll road
   2.4 mi
7. Take exit **47** on the **left** for **Interstate 87 N/Major Deegan Expressway** toward **Albany**
   0.2 mi
8. Merge onto **I-87 N**
   2.9 mi
9. Take exit **7N-7S** for **U.S. 1 N/Interstate 95 N/Cross Bronx Expressway/Interstate 95 S** toward **New Haven/G Washington Bridge/Trenton**
   0.2 mi
10. Keep **left** at the fork to continue on **Exit 7S**, follow signs for **Interstate 95 S/U.S. 1 S/George Washington Bridge/Trenton** and merge onto **I-95 S/U.S. 1 S**
    0.5 mi
11. Keep **left** at the fork to continue on **I-95 S/Trans-Manhattan Expy**, follow signs for **U.S.1**
    Continue to follow I-95 S
    Entering New Jersey
    2.5 mi
12. Take the **NJ-4/I-95 S** exit toward **Hackensack/I-80/New Jersey Turnpike**
    0.2 mi
13. Keep **right** to continue on **Exit 72A**, follow signs for **New Jersey 4 W/Paramus**
    0.1 mi
14. Continue onto **NJ-4 W**
    8.2 mi
15. Continue onto **NJ-208 N** (signs for **New Jersey 208 N/Oakland**)
    1.9 mi



16. Take the **Fair Lawn Ave W** exit

0.2 mi

Take **River Rd** and **Wagaraw Rd** to **Planten Ave** in Prospect Park

2.9 mi / 8 min

17. Merge onto **Fair Lawn Ave**

0.5 mi

18. Turn **right** onto **River Rd**

0.6 mi

19. Continue onto **Wagaraw Rd**

1.3 mi

20. Slight **left** onto **Goffle Rd**

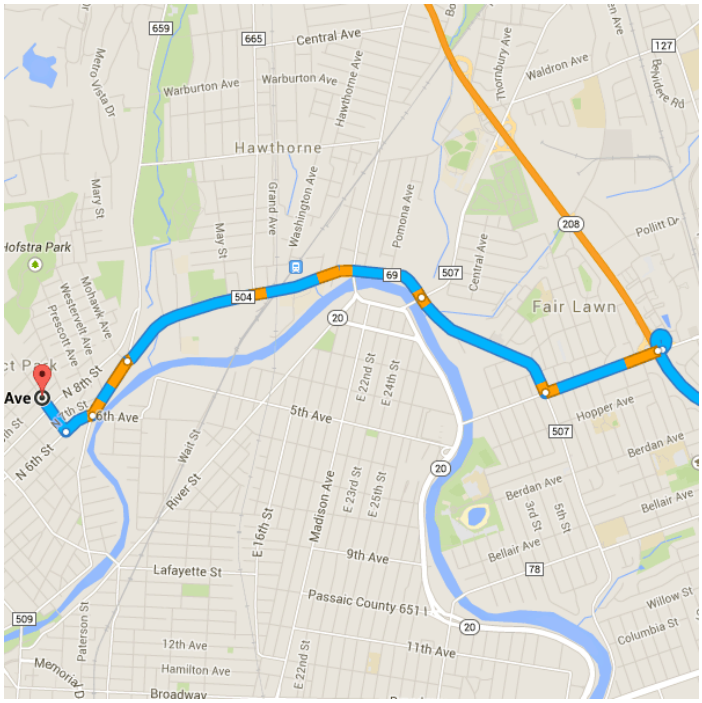
0.3 mi

21. Turn **right** onto **N 6th St**

0.1 mi

22. Turn **right** onto **Planten Ave**

0.2 mi



Planten Ave

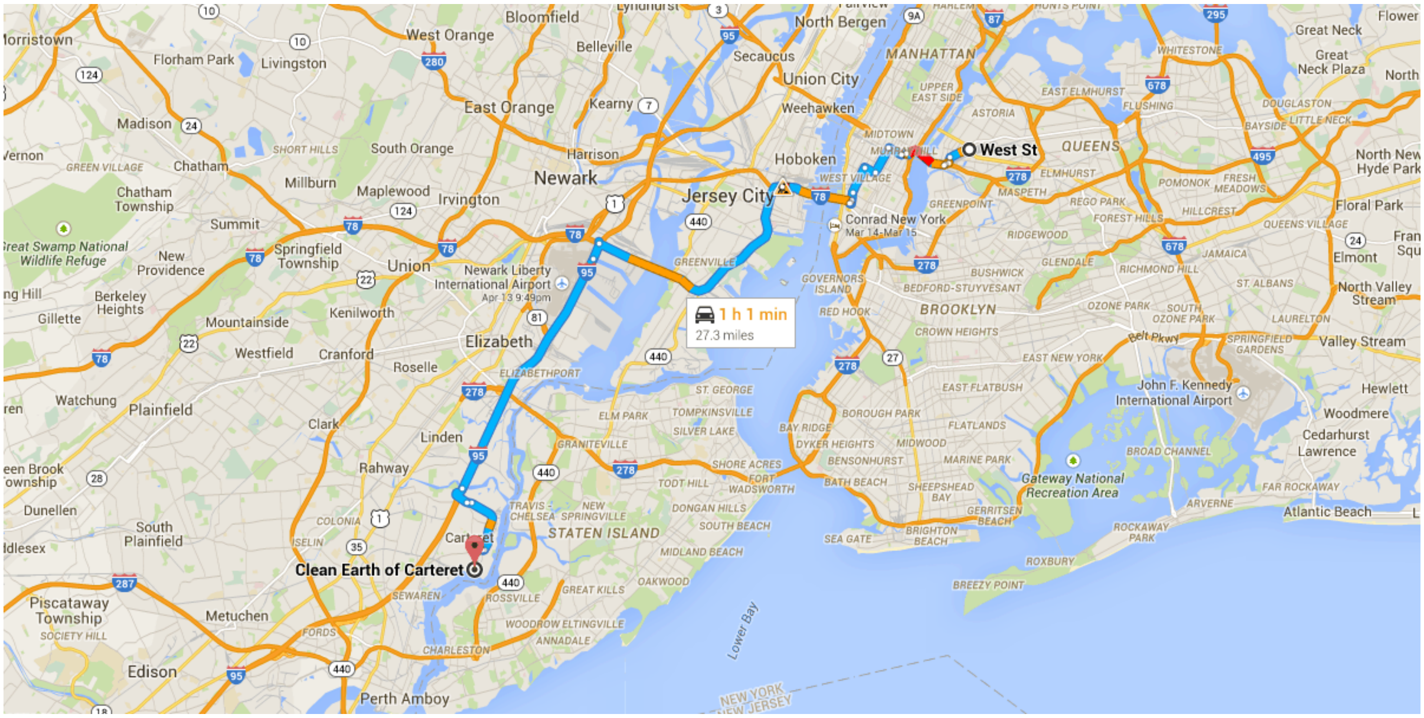
Prospect Park, NJ 07508

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

Google

Drive 27.3 miles, 47 min

Directions from West St to Clean Earth of Carteret

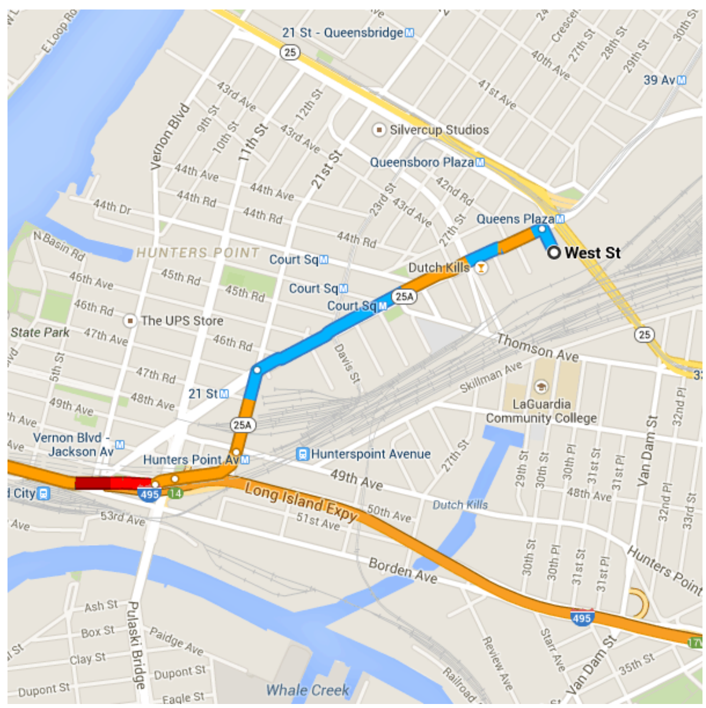


West St

Long Island City, NY 11101

Get on **I-495 W** from **Jackson Ave**

1.0 mi / 4 min



1. Head **northwest** on **West St** toward **Jackson Ave**
   Restricted usage road

   276 ft
2. Turn **left** onto **Jackson Ave**

   0.6 mi
3. Turn **left** onto **21st St**

   0.2 mi
4. Turn **right** onto the ramp to **Midtown Tun/Manhattan**
   Partial toll road

   0.1 mi
5. Keep **left** and merge onto **I-495 W**
   Toll road

   220 ft

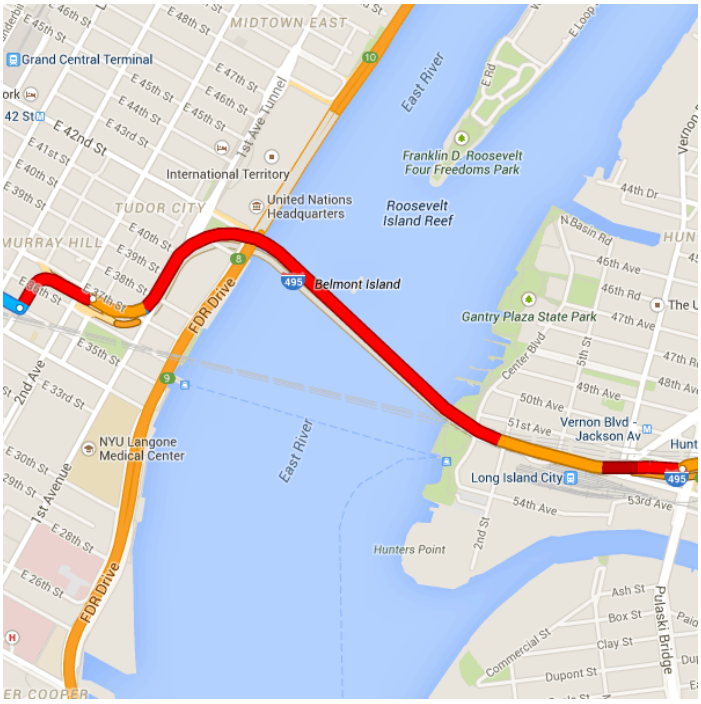
Continue on **I-495 W** to Manhattan. Exit

from I-495 W

1.6 mi / 3 min

6. Merge onto **I-495 W**
   Toll road
   1.4 mi

7. Take the exit on the **left** toward **E 35th St**
   Toll road
   0.2 mi



Take 5th Ave and 7th Ave to I-78 W in Jersey City

5.1 mi / 16 min

8. Turn **right** onto **E 35th St**
   0.4 mi

9. Turn **left** onto **5th Ave**
   0.9 mi

10. Turn **right** onto **W 17th St**
    0.4 mi

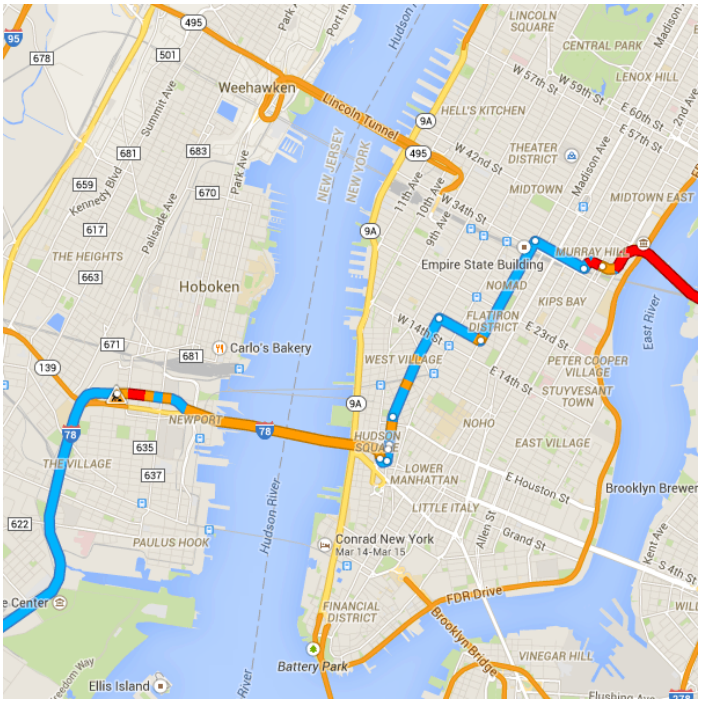
11. Turn **left** at the 2nd cross street onto **7th Ave**
    0.8 mi

12. Continue onto **Varick St**
    0.2 mi

13. Keep **right** to stay on **Varick St**
    240 ft

14. Keep **right** to stay on **Varick St**
    466 ft

15. Turn **right** toward **I-78 W/Clifford Milburn Holland Tunnel/Holland Tunnel**
    377 ft

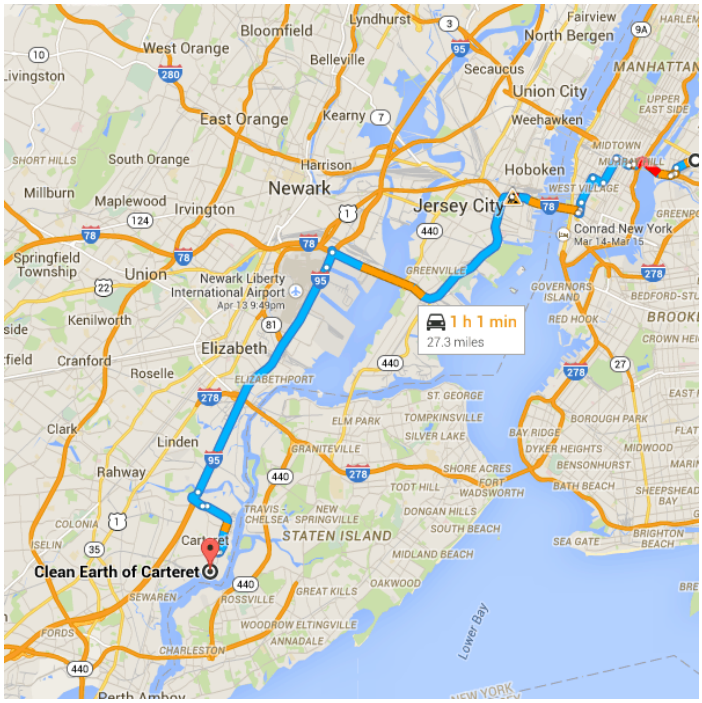


16. Slight **right** onto **I-78 W/Clifford Milburn Holland Tunnel/Holland Tunnel**
    - Continue to follow I-78 W
    - Entering New Jersey

2.2 mi

Continue on **I-78 W**. Take **I-95 S** to **Peter J Sica Industrial Hwy** in Carteret. Take exit **12** from **I-95 S**

17.6 mi / 19 min



17. Keep **right** at the fork to stay on **I-78 W**, follow signs for **Turnpike/Interstate 78/Interstate 95**
    - Toll road

7.9 mi

18. Take the **I-95 S** exit toward **Turnpike S**
    - Toll road

0.2 mi

19. Keep **left** to continue toward **I-95 S**
    - Toll road

0.5 mi

20. Keep **left** at the fork and merge onto **I-95 S**
    - Toll road

8.2 mi

21. Take exit **12** toward **Carteret Rahway**
    - Toll road

0.7 mi

22. Keep **left** at the fork, follow signs for **West Carteret/Rahway/Industrial Hwy**
    - Toll road

0.2 mi

Follow **Peter J Sica Industrial Hwy** to **Middlesex Ave**

2.0 mi / 4 min

23. Continue onto **Peter J Sica Industrial Hwy**
    - Partial toll road

1.8 mi

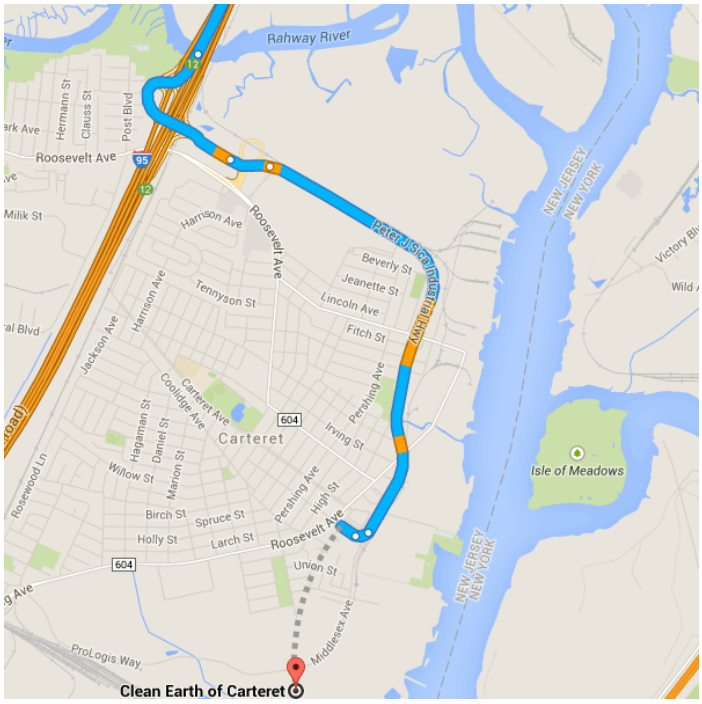
24. Slight **right** toward **Middlesex Ave**

299 ft

25. Slight **right** onto **Middlesex Ave**

Destination will be on the right

344 ft



Clean Earth of Carteret

24 Middlesex Avenue, Carteret, NJ 07008

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

APPENDIX D

Community Air Monitoring Program

Appendix D

Queens Plaza Residential Development – Site C
Brownfield Cleanup Program (BCP) No. C241169
Long Island City, NY

COMMUNITY AIR MONITORING PLAN

LIC Development Owner, LP
c/o Tishman Speyer
45 Rockefeller Plaza
New York, New York 10111

Project Number: 10112-006

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

March 2016

Arnold F. Fleming, P.E.

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Community Air Monitoring Plan (CAMP)

1.0 Purpose

The purpose of the CAMP is to protect downwind receptors (e.g., residences, businesses, schools, nearby workers, and the public) from potential airborne contaminants released as a direct result of the site management activities, including groundwater monitoring, possible remedial activities, and any future development. The CAMP helps to confirm that work related to the SMP does not spread airborne contamination off-site by providing real-time monitoring protocols for VOCs and particulates (i.e., dust) at the downwind Brownfield Site perimeter while monitoring, remedial activities, and future development are in progress. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

The CAMP does not establish action levels for worker respiratory protection, which are given in the Health and Safety Plan included in Appendix D and developed in accordance with 40 CFR 1910 and 1920.

2.0 Contaminant Source

The main contaminants of concern in Brownfield Site soils are creosote-based and petroleum-based VOCs, benzene, toluene, ethylbenzene, and xylenes, (collectively BTEX); the semi-volatile compound naphthalene; and the poly aromatic hydrocarbons (PAHs). Metals and polychlorinated biphenyls (PCBs) represent a secondary and minor concern.

3.0 Remedial Activities

The March 2007 Remedial Work Plan (RWP), to which this CAMP is an attachment, details the remediation activities that will be performed at the Brownfield Site.

Creosote and metals-contaminated soils on the Brownfield Site will be removed by excavation and under construction tents at some locations. All existing buildings and subsurface structures on Brownfield Site will be demolished prior to excavation in those areas. Existing paved areas will be stripped of the pavement (concrete and asphalt) prior to excavation. The excavation and handling of soils will generate dust and airborne particulates.

Groundwater will be exposed once soil is excavated to the water table. The water table will be lowered by groundwater extraction. The extracted groundwater will be treated through a water/oil separator prior to discharge to New York City sewers.

4.0 Receptor Population

Potentially exposed receptors during remediation are passerby, and, to a lesser degree, individuals living, working, and shopping in the vicinity of the project

5.0 Monitoring Plan

While excavating, stockpiling, or otherwise handling on-site soils, the proposed CAMP, entailing upwind and downwind perimeter monitoring, will be implemented as described in the following sections. Due care will be taken to monitor and control fugitive odors and dust emissions from the Brownfield Site, minimizing the risk of exposure to the surrounding receptor population during remediation.

5.1 Continuous Monitoring

Continuous monitoring for VOCs and dust particulates will be conducted for all ground-intrusive activities and any handling of soils on the Brownfield Site.

5.2 Periodic Monitoring

Periodic VOC monitoring only will occur during non-intrusive activities such as collection of groundwater samples from monitoring wells and soil samples for disposal characterization.

5.3.1 VOC Monitoring, Response Levels, and Actions

VOCs will be continually monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) using a PID. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The PID will be calibrated at least daily, or more often if needed. The PID will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work may resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work may resume, provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet) is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, work must cease. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

5.3.2 Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind background level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work will cease and a re-evaluation of activities initiated. Work may resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration. All readings must be recorded and be available for State (DEC and DOH) personnel to review.

APPENDIX E

Health and Safety Plan

Queens Plaza Residential Development
Brownfield Cleanup Program No. C241169
Long Island City, NY

HEALTH & SAFETY PLAN

TST LIC Development LLC
c/o Tishman Speyer
45 Rockefeller Plaza
New York, New York 10111

Submitted to:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

ARNOLD F. FLEMING P.E.

&

Fleming Lee Shue

Environmental Management & Consulting
158 West 29th Street, 9th Floor
New York, New York 10001
http://www.flemingleeshue.com

March 2016

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ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

Fleming-Lee Shue, Inc. (FLS) and Arnold F. Fleming P.E. (AFF) prepared this site-specific Health and Safety Plan (HASP) for use by FLS employees and representatives of AFF and FLS during activities performed under the Site Management Plan (SMP) at the Queens Plaza Residential Development Site (hereafter referred to as the "Site") located in Long Island City, New York. The Site was remediated under the Brownfield Cleanup Program (BCP) as Site No. C241169 administered by the New York State Department of Environmental Conservation (NYSDEC).

The purpose of this HASP is to identify the real and potential hazards associated with environmental field activities and to stipulate appropriate health and safety procedures. The procedures and guidelines contained in this document are intended to minimize exposure to chemical, physical, and biological hazards that may be present in the soil, groundwater, or air, and to reduce the potential for accidents and injuries.

The SMP includes health and safety requirements for the operation, maintenance and monitoring of the composite cover, as well as for conducting groundwater monitoring. This HASP has been developed as a sample for the SMP. The HASP may need to be altered depending on the work to be conducted. While this HASP does not discuss other routine health and safety issues common to general construction/excavation, Attachment V – Construction Health and Safety Rules, provides discussion of these topics.

All subcontractors working with FLS/AFF will be provided with a copy of this HASP for review. Based on their means and methods of executing the work activities, the subcontractors will either accept the safety procedures outlined in this HASP and by FLS/AFF Health and Safety Officer's (HSO) supervision or the subcontractor can provide a HASP addendum, for FLS/AFF review and acceptance, stating any additional procedures that they wish to be incorporated. Other parties (contractors, subcontractors, and their employees) performing their own scope of work not covered by this HASP can review this

HASP but must prepare their own HASP that meets Occupational Safety and Health Administration (OSHA) requirements.

This HASP will be kept onsite during field activities and shall be accessible at all times. This HASP will be reviewed as necessary and amended or revised as conditions change and additional activities arise. All FLS/AFF site personnel and subcontractors will receive site specific HASP training and will be required to sign the Acknowledgement Form (Attachment I). All visitors, who visit the site for the purposes of observing our work activities will also receive a health and safety briefing, sign the Acknowledgement Form, and be escorted at all times.

The general provisions of this HASP were developed in accordance with the provisions of OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard, 29 CFR 1910.120 or 29 CFR 1926.65.

The Occupational Safety and Health Act (1970) requires the following:

- Employers shall furnish each employee with a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm.
- Employers must comply with occupational health and safety standards and rules, regulations and orders pursuant to the Occupational Safety and Health Act, that are applicable to company business and operations.
- All employees must comply with occupational health and safety standards and regulations under the Act, which are applicable to their actions and situations.
- Employees are encouraged to contact their immediate superior for information that will help them understand their responsibilities under the Act.

1.2 Site Description

The Site is located in Long Island City, Queens County, New York and has been designated Tax Block 263, Lot 11. The adjacent BCP Site B occupies Tax Block 264, Lots 1R and 17 and Block 263, Lots 1 and 9. The site is an approximately 0.31-acre area, and is bounded by Jackson Avenue to the north and the Queens Plaza Residential Brownfield Site B (C241105) to the south, east, and west (see Figure 2). The owner of the Site parcel at the time of issuance of the SMP is:

TST LIC Development, LLC

The Site is currently under construction and will eventually consist of a multi-story high rise building with retail on the first floor and residential on the remaining floors. The Site is zoned for Mixed-use Residential and Commercial. The Site lies in an area containing a mixture of residential buildings, office buildings, municipal parking and commercial enterprises consisting of warehouses, light manufacturing, retail, and shipping terminals. The Long Island Railroad (LIRR) Sunnyside Yard A is located to the south of the Site C and is a major transportation hub consisting of numerous tracks and train service equipment.

1.3 Site Background

Prior to development, the Site occupied an elevated area between two streams, an unnamed stream to the west and Dutch Kill to the east of the Site (Beers, 1868), both discharging into Newtown Creek. Both streams were flanked by a marsh south of the Site that now contains the LIRR Sunnyside Yard. The West Chemical Company (West Chemical) occupied the Site from the early 1900s until 1977. During this time, West Chemical manufactured a variety of commercial and household disinfectants, soaps, floor waxes, insecticides, and paper product dispensing machines. Prior to 1950, West Chemical manufactured a disinfectant that required storage of large quantities of creosote. Creosote use was discontinued by 1951 because of leaks and a fire that prompted the Fire Department of New York to empty the entire contents of a creosote-filled above ground storage tank directly to the ground surface in order to prevent its combustion during the fire.

Reportedly, West Chemical stored a variety of other materials including muriatic acid, alcohol, rosin, fats, and oils. These materials were used in the manufacture of hand creams, cleaning products (floor waxes and cleaners), and vending machine products.

West Chemical divested the property and transferred ownership to Outlet City, Inc. in 1978. LIC Development Owner, LLC (the “BCP Volunteer”) acquired the Site on June 13, 2014.

The buildings which housed West Chemical’s former operations were demolished in 2014. Redevelopment and remediation of the Site began in February 2015, remediating the Site through excavation and removal of source material. The Site soils were excavated to

development depth with remaining soil found to be consistent with the Site's Track 2 Cleanup Objectives. The achieved cleanup objectives are consistent with the goals of the Brownfield Cleanup Agreement and for the intended use of the Site.

2.0 SCOPE OF WORK

This HASP addresses the general activities associated with the planned environmental management of the Site. These activities include, but are not limited to, the following:

- Mobilization/demobilization
  - Mobilization and demobilization of equipment and supplies
  - Establishment of Site access procedures, site security and work zones
- Monitoring Activities
  - Investigation derived waste handling and storage activities
- Inspection Activities
  - Inspection of the composite cover
- Operation and Maintenance Activities
  - Operation, routine and non-routine maintenance of engineering controls

The planned environmental activities are detailed in the succeeding sections.

2.2 Site Management Inspections

Site-wide inspections will be performed monthly by building maintenance staff and annually by a Professional Engineer. Site-wide inspections will also be performed after all severe weather conditions and emergencies that may affect ECs or monitoring devices.

2.3 Operation and Maintenance of Engineering Controls

All remedial components installed at the Site will remain operational and be maintained as necessary. Monitoring of the composite cover will be performed on a routine basis. Unscheduled inspections and/or sampling may take place when a suspected failure of the composite cover has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

2.4 Investigation Derived Waste Management

All investigation derived waste (IDW) generated during the site management activities will be stored in covered 55-gallon, Department of Transportation (DOT) approved, steel drums which will be sealed at the end of each work day Each drum will be labeled with the date, well/boring number, waste type (soil, purge water), and a point of contact. The drums will be stored in a secure area of the Site until the drums can be properly removed. An appropriate

waste designation will be assigned based on the remedial investigation results and the IDW will be properly disposed of according to local, state, and federal regulations.

3.0 POTENTIAL CHEMICAL, PHYSICAL AND BIOLOGICAL HAZARDS AND CONTROLS

This section discusses the potential chemical, physical, and biological hazards and controls associated with the Site management tasks above. A summary of potential Site management tasks, safety hazards, and safety requirements is presented in Table 1.

3.1 Site–Specific Potential Chemical Hazards/Controls

Based on data collected during previous investigations, the potential chemical hazards are VOCs,SVOCs, and Metals. The following are chemicals of concern:

- VOCs
    - Acetone
    - Benzene
    - 1,2-Dichlorobenzene
    - 1,4-Dichlorobenzene
    - 1,2-Dichloroethane
    - Ethylbenzene
    - Isopropylbenzene
    - Toluene
    - Xylene
- SVOCs
    - Acenaphthene
    - Benzo(a)anthracene
    - Benzo(a)pyrene
    - Benzo(b)fluoranthene
    - 1,1’-Biphenyl
    - Chrysene
    - 2,4-Dimethylphenol
    - Indeno(1,2,3-cd)pyrene
    - 2-Methylphenol
    - Naphthalene
    - Phenol
- Metals
    - Chromium
    - Copper
    - Iron
    - Lead

- Magnesium
- Manganese
- Mercury
- Nickel
- Selenium
- Sodium
- Zinc

Attachment II lists the recognized and suspected health hazards, exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure for the chemicals known or suspected. Any chemical hazards will be minimized by limiting exposure of personnel to soil and groundwater, engineering controls, and PPE. Material Safety Data Sheets (MSDS) are provided as Attachment III.

3.2 Physical Hazards/Controls

Physical hazards potentially present at the Site include, but are not limited to, the following:

Hazard	Control
Slip, trip and fall (uneven terrain and slippery surfaces)	Avoid uneven terrain, walk slowly, wear sturdy/supportive shoes
Environmental (heat/cold) stress	A discussion of heat stress and cold stress and related illnesses and controls is provided in Attachment IV.
Dust/Particulate Inhalation Hazard	Dust suppression and monitoring will be employed as necessary. The air monitoring requirements are discussed in Section 6.0, and requirements are listed in Table 1. Actions levels are listed in Table 2.
Vehicular Traffic	Avoid working in high traffic areas. If necessary, use cones, reflective vests, and consider use of a flagman/additional protection.
Fire	Ensure class ABC fire extinguisher is nearby to work area when using equipment that can provide an ignition source (heavy machinery, generators, power tools)
Noise hazards	Use ear plugs and/or ear muffs during demolition and excavation activities.
Use of heavy equipment	Stay clear of heavy equipment during operation. Maintain eye contact with operator when approaching equipment.

Anticipated Site operations do not include the need for specific operations such as lockout/tag-out, scaffolds or confined spaces; therefore these items are not addressed in this HASP. If Site activities require these operations, the HASP will be amended and personnel properly trained, experienced and competent personnel shall be utilized.

3.3 Biological Hazards

General biological hazards present at the Brownfield Site include, but not limited to, the following:

- Bites or stings from insects (particularly ticks) resulting in skin inflammation, disease, or allergic reaction
- Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma
- Rodents and droppings inside buildings

4.0 HEALTH AND SAFETY PROTOCOLS

4.1 Training

Knowledge of the safety rules, supplemented by compliance, is essential to safety. New employees will be provided orientation training by qualified personnel having at a minimum the 40-hour OSHA HAZWOPPER training and will be furnished information and literature covering the company health and safety policies, rules, and procedures. This orientation training must be provided prior to the employee's visit to the Site. Employees must read the HASP and project-specific Work Plan, which contains the applicable regulations/standards for their job.

3.2 Project Team Organization and Responsibilities

All personnel who participate in invasive field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities, as needed. The Health and Safety meeting will include all personnel and members of the Site management project team that would be at risk to exposure. Field personnel at risk to direct exposure will sign the acknowledgment form (Attachment I) maintained by the HSO. The key Site management project team organization and roles are described below.

Health and Safety Officer

- Administers all aspects of the occupational health and safety program to FLS and AFF personnel and our subcontractors
- Develops programs and technical guidance to identify and remove physical, chemical, and biological hazards from facilities, operations, and sites
- Assists management and supervisors in the health and safety training of employees
- Conducts inspections to identify unhealthy or unsafe conditions or work practices
- Takes immediate corrective action
- Investigates all accidents and takes action to eliminate accident causes
- Monitors to determine the degree of hazard
- Determines the protection levels and equipment required to ensure the safety of personnel
- Evaluates on-site conditions (i.e., weather and chemical hazard information) and recommending to the project manager and/or the field coordinator, modifications to the work plan and personnel protection levels

- Monitors performance of all personnel to ensure compliance with the required safety procedures
- Ensures that all personnel have been trained in proper site-safety procedures including the use of Personal Protective Equipment (PPE), and have read and signed the Acknowledgment Form (Attachment I)
- Conducts daily health and safety briefings as necessary
- Halts work if necessary
- Ensures strict adherence to the Site HASP
- Reviews personnel medical monitoring participation to ensure compliance
- Records safety infractions and corrective actions in field log
- Notifies subcontractors of unsafe conditions
- Ensure overall project objectives are being met
- Ensures that safety equipment is available
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations

Project Manager

- Ensure overall project objectives are being met
- Supports HSO

All FLS and AFF Employees

The minimum personal qualifications for each individual participating in field activities are as follows:

- Has had all OSHA-specific medical examinations including, but not limited to, audiometric testing under the hearing conservation program and medical approval for the use of respirators
- Participation in the FLS Occupational Health Monitoring Program
- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4])
- Be familiar with and comply with proper health and safety practices
- Use the required safety devices and proper personal protective safety equipment
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries

- Be alert on site and communicate unsafe conditions and safety infractions immediately

4.3 Subcontractor Compliance

All FLS and AFF contracts and subcontracts require that state laws concerning health and safety will be observed by the subcontractor. The provisions of these health and safety responsibilities apply to subcontractors and their employees working for FLS. Failure to fulfill this requirement is a failure to meet the conditions of the contract.

4.4 Levels of Personal Protective Equipment

All PPE must be worn as required for each job in all operations where there is an exposure to hazardous conditions. Upon review of contaminant levels, physical and biological hazards, exposure routes and the nature of the management tasks, it has been determined that PPE requirements will vary depending on the tasks/activities. For visual inspections the minimal PPE should include work clothes or coveralls, safety boots with steel toe and additional PPE as required. If any of these activities are performed in vehicle trafficked areas or an active construction area, additional PPE will be must be worn as appropriate including reflective vests and hard hat.

If there is a future excavation into residual contaminated soil left at the Site, Level D protection will be used during these field activities with a contingency to upgrade to Level C protection if total organic compound concentrations in the breathing zone consistently reach or exceed 5 parts per million (ppm) as measured with a photoionization detector (PID). If PID readings in the breathing zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. Air monitoring is further discussed in Section 6.

4.5 General Hazard Controls

4.5.1 General Workplace Safety Rules

- Report unsafe conditions, accidents, injuries, or incidents to the HSO and Project Manager—immediately

- Use eye and/or face protection where there is danger from flying objects or particles, (such as when grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes
- Dress properly - Loose clothing and jewelry shall not be worn
- Keep all equipment in safe working condition - Never use defective tools or equipment
- Report any defective tools or equipment to immediate supervisor
- Properly care for and be responsible for all PPE
- Do not leave materials in aisles, walkways, stairways, work areas, roadways, or other points of egress
- Practice good housekeeping at all times
- Training on equipment is required prior to unsupervised operation
- During work, pause every few minutes and assess surrounding conditions—be alert!
- For personal safety, be cognizant of your surroundings and ensure that equipment is properly secured

General construction health and safety guidelines are provided in Attachment V. These will only apply if any management activities must be performed in an active construction area.

4.5.2 Housekeeping

- Proper housekeeping is the foundation for a safe work environment. It definitely helps prevent accidents and fires, as well as creating a professional appearance in the work area
- Material will be piled or stored in a stable manner so that it will not be subject to falling
- Combustible scrap, debris, and garbage shall be removed from the work area at frequent and regular intervals
- Stairways, walkways, exit doors, in front of electrical panels, or access to firefighting equipment will be kept clear of materials, supplies, trash, and debris

4.5.3 Fire Prevention

- All firefighting equipment shall be conspicuously located, accessible, and inspected periodically, and maintained in operating condition

- All employees must know the location of firefighting equipment in the work area and have knowledge of its use and application

4.5.4 Personal Hygiene

Eating, drinking and the use of tobacco products in the immediate work area are prohibited. Field personnel taking prescription or non-prescription medication that could impair function or cause drowsiness should alert the HSO before work begins. Beards or facial hair that could interfere with the use of a respirator are not permitted if a respirator is being used. Dermal contact with groundwater or soil should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the site.

4.6 Spill Containment Program

The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits, consisting of absorbents and protective equipment should be available to clean up minor spills. A minor chemical spill is one that the FLS and AFF staff is capable of handling safely without the assistance of emergency personnel. All other chemical spills are considered major. For a major spill, contact the HSO.

Procedure for Responding to a Minor Chemical Spill

- Contact HSO to obtain guidance
- Alert people in immediate area of spill
- Wear PPE, minimum level D—**First assess the spill to determine whether you have sufficient protection to continue**
- Upgrade to level C to avoid breathing vapors from spill
- Confine spill to small area using absorbent, debris, soil etc.
- Absorb spill with vermiculite, dry sand, or oil-sorbent pads
- Collect residues, place in DOT-approved containers (labeled) and dispose as chemical waste
- Clean spill area

5.0 INDIVIDUAL HEALTH AND SAFETY PROGRAMS LISTING

The OSHA standards specify various individual programs that may be applicable to work performed on construction sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately.

5.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Important elements of the written program are required to include a master listing of chemicals, maintaining material safety data sheets on each chemical, and training of employees on the program, the chemicals exposed to, and safety data sheets.

5.2 Occupational Noise Exposure/Hearing Conservation Program

If employees are exposed to noise levels above 85 decibels on the A scale (85 dBA), protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as written program, noise monitoring, hearing evaluations and follow-on testing, personal protective equipment (hearing protection), and maintenance of medical records.

5.3 Assured Equipment Grounding Conductor Program

If the employer uses assured equipment grounding verses ground fault circuit interrupters to provide employee electrical grounding protection, this program is required. Program elements include the inclusion of all cord sets, receptacles and cord/plug connected equipment and tools; a written program; quarterly testing; recording of each test by logging, color coding, or other equally effective means; and designation of a competent person to run the program.

5.4 Emergency Response Plan

If employees are engaged in emergency response to a hazardous substance/chemical release, an emergency response plan must be developed and implemented to handle anticipated emergencies. Program elements include a written response plan, identification and training of responding employees, medical surveillance and consultation, and post response operations.

6.0 AIR QUALITY MONITORING AND ACTION LEVELS

Air monitoring requirements by field activity is specified in Table 1. As shown in Table 1, air monitoring will not be required for most activities unless it involves disturbance of the residual contaminated soil left at the Site. If remaining contaminated soil is to be disturbed the following air monitoring protocol shall be followed accordingly. The monitoring instruments will be calibrated daily or as necessary due to field conditions and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book. The action levels and required responses are listed in the Table 2.

6.1 Total Organic Vapor Action Levels

Periodic readings above 5 ppm require caution. A sustained PID measurement greater than 5 ppm or objectionable nuisance odors, detected over a 15-minute period in the breathing zone, will require upgrading to Level C protection. A sustained PID measurement 25 ppm or greater, detected over a 15-minute period in the breathing zone, will require suspension of work activities. The source will be identified and corrective action taken to abate the VOC emissions so that VOC levels are less than 25 ppm.

6.2 Particulate Monitoring Action Levels

Particulate monitoring will be performed as necessary using a real-time particulate monitor that will monitor particulate matter less than ten microns (PM10) in size with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols

Size range: <0.1 to 10 microns

Sensitivity: 0.001 mg/m3

Range: 0.001 to 10 mg/m3

Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. The action level will be established at 150 µg/m3 over the integrated period not to exceed 15 minutes.

7.0 DECONTAMINATION

7.1 Site/Work Area Organization

The work area and appropriate organization will be defined prior to startup of the management tasks/activities. A typical site work area will consist of an exclusion zone where the actual field activity will take place; a decontamination zone; and a command post located outside the decontamination area and exclusion zones. Levels of personal protection in the exclusion zone will vary depending on the task being performed and air monitoring data, and will be specified by the HSO.

7.2 Personnel Decontamination

Decontamination (decon) of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decon will take place in the designated decontamination zone using the following steps, if applicable:

- Soap and potable water wash and potable water rinse of gloves
- Glove removal
- Field wash of hands and face

7.3 Equipment Decontamination

The following decontamination procedure will be implemented in the field after field equipment has come in contact with contaminated material.

- Rinse equipment in tap water
- Scrub equipment with non-phosphate detergent and tap water
- Rinse equipment with distilled water
- Allow equipment to air dry

8.0 EMERGENCY AND CONTINGENCY PLAN

Emergency communications will be maintained during all on-site field activities. The emergency route to the hospital is depicted on Figure 3 and emergency contacts and their phone numbers are presented in Table 3.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

All OSHA recordable injuries and illnesses will be reported using OSHA Form 301 (Attachment VI).

General Emergency Response Procedures:

Any employee discovering a fire, explosion, or release of hazardous materials, which could potentially harm human health, or the environment, must immediately notify 911 to activate appropriate emergency procedures.

The following steps will be taken to expeditiously secure the appropriate assistance:

- Ascertain pertinent information (location, type of emergency condition, presence of possible victims which may be hurt or trapped nearby to the condition) and immediately contact and provide this information to 911 emergency personnel.
- Identify yourself and give the exact location first, then the type of emergency, and the presence of possible victims which may be hurt or trapped nearby to the condition. Then await the arrival of emergency response police officers, staying a safe distance from the emergency condition if warranted.
- Contact the FLS HSO and Project Manager and notify them of situation while waiting for emergency personnel.
- If possible, have a responsible person nearby to help flag down responding emergency services personnel as they respond.
- Emergency response personnel will assess the reported emergency and advise what appropriate action needs to be taken (i.e., evacuate an area).

Unless specifically trained to handle an emergency of the type you may be reporting, please do not attempt to render assistance in handling the emergency unless ordered to do so by competent authority or emergency services personnel.

Emergency Medical Services

In the event of an injury or illness that requires medical treatment, the HSO will contact emergency services by dialing 911 (ambulance) for the transportation of the individual. In the event ambulance service is not available or the response time is not suitable, the following are driving directions to the hospital:

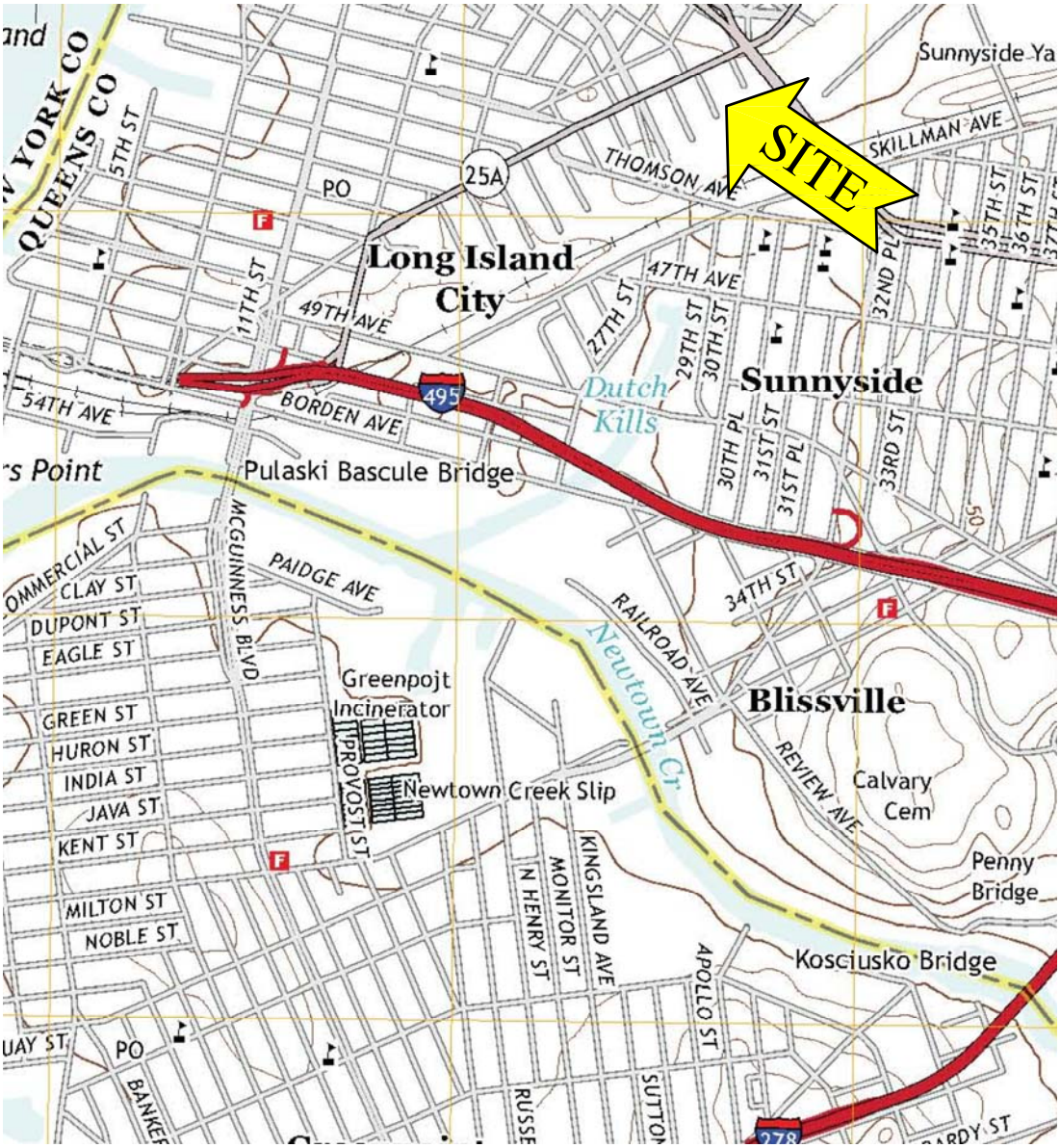
HOSPITAL

Mt Sinai Hospital of Queens: (718) 932-1000 (main line)
2510 30th Ave, Astoria
On 30th Avenue
Between Crescent Avenue and 29th Street
NY 11102, US

- Proceed northeast on NY-25A E toward Queens Blvd.
- Turn left onto 39th Ave.
- Turn right onto 31st St.
- Turn left onto 30th Ave.
- Destination will be on the left

Figure 3 provides a map and route to the hospital.

FIGURES



UTM GRID AND 2013 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
Grid Zone Designation 18T

1 0.5 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

QUADRANGLE LOCATION

Weehawken	Central Park	Flushing
Jersey City	Brooklyn	Jamaica
The Narrows	Coney Island	Far Rockaway

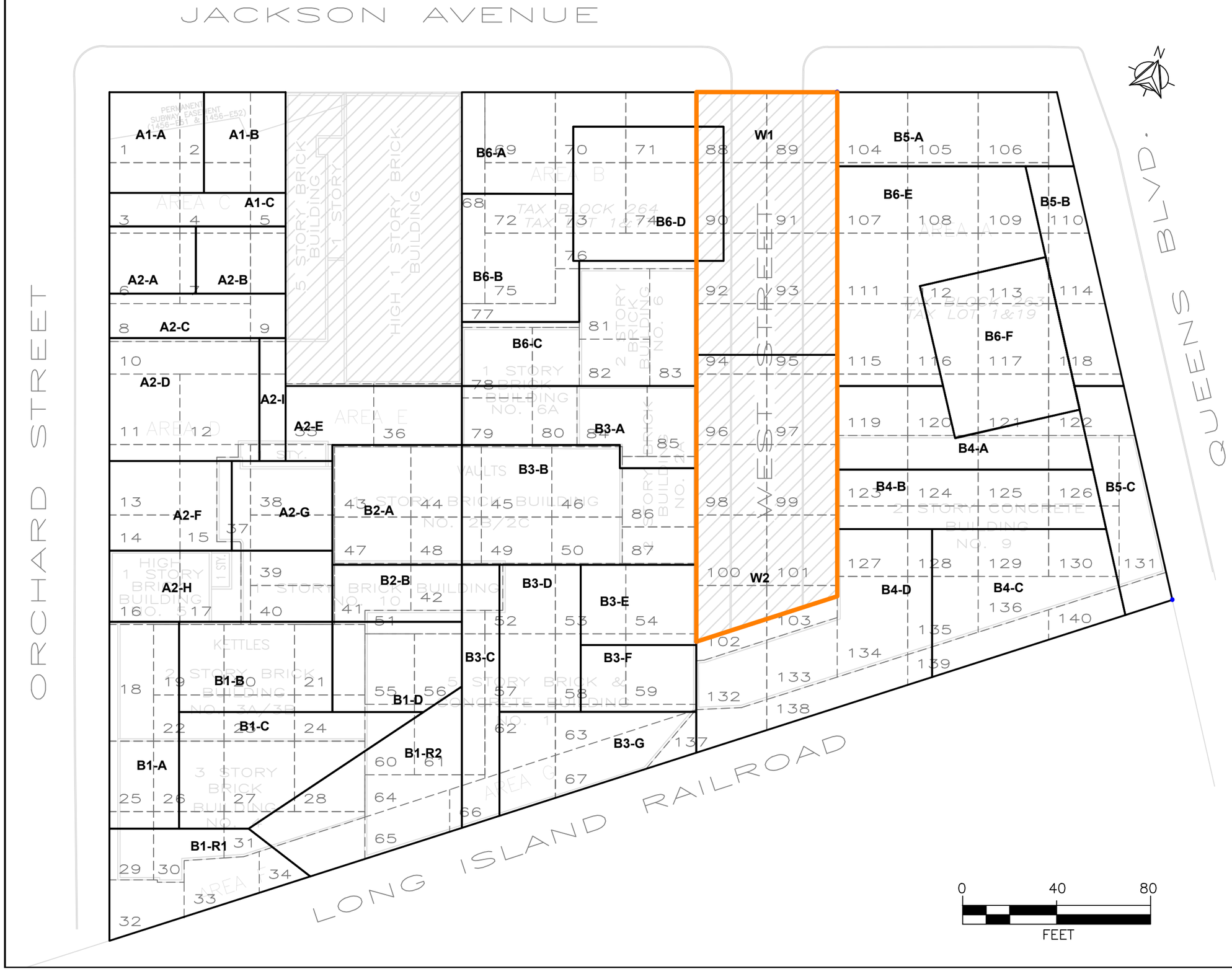
FIGURE 1: BROWNFIELD SITE LOCATION MAP

SITE: Queens Plaza Development
Long Island City, NY
CLIENT: TST LIC Development LLC

Fleming Lee Shue

Environmental Management & Consulting, 158 West 29th Street, New York, NY 10001

FILE: P:\Project Files\10112 – Tishman Consulting\001–10 – Site B\Reports\Health & Safety Plan\Health & Safety Plan, T. Eng, CIH\Figures\Figure 1 – Site Location Map.dwg DATE: 5/15/2014



FILE: P:\Project Files\99999 - Tishman\Reports\Site C - SMP\Figures\Figure 2 - Site Plan.dwg DATE: 8/5/2014

Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Queens Plaza Residential Development
Long Island City, NY
Site C- BCP No. C241169

FIGURE 2

SITE PLAN WITH REFERENCE GRIDS

Date
September 2015

Project Number
10112-005

LEGEND

- 79 — GRID CELL NUMBER
- A1-B — WASTE CLASS GRID NUMBER
- BCP SITE C BOUNDARY

Mt Sinai Hospital of Queens:
2510 30th Ave, Astoria, NY 11102, US

Directions Distance **Total Est. Time:** 8 minutes (without traffic) **Total Est. Distance:** 1.8 miles

START

1: Head northeast on NY-25A E toward West St
2: Turn left onto 39th Ave
3: Turn right onto 31st St
4: Turn left onto 30th Ave (Destination will be on the left)

END

End at **Mt Sinai Hospital of Queens:** 25-10 30th Ave, Astoria, NY 11102, US

Fleming Lee Shue

FIGURE 3: ROUTE TO THE MOUNT SINAI HOSPITAL OF QUEENS

SITE: Queens Plaza Residential Development
28-18 Jackson Avenue, Long Island City, Queens, NY
CLIENT: TST LIC Development LLC

TABLES

Table 1 – Tasks, Safety Hazards & Safety Requirements

Task/Activity	Hazards	Preventative Measures	Air Monitoring Requirements
Inspections	Trips and falls	PPE as required.	None.
Post-remediation soil vapor and groundwater sampling and monitoring	Trips, falls, materials handling, VOCs, SVOCs, metals, LNAPL, and DNAPL	PPE as required and use of normal sampling procedures.	None.
Soil Sampling, Test Pits, or Soil Borings	Subsurface utilities, vehicle hazards, trips, falls, materials handling, VOCs, SVOCs, and metals.	Clear utilities beforehand, use normal sampling procedures, exercise caution around equipment and excavations, wet area if necessary to control dust and odors. PPE as required.	PID measurements for VOCs, colorimetric tubes for benzene, particulate monitoring for SVOCs and metals, and Jerome measurements for Mercury (test pits only).
Excavation - Outside	Subsurface utilities, vehicle hazards, trips, falls, materials handling, VOCs, SVOCs, and metals. Falling objects, LNAPL, DNAPL, LEL, noise, vibration	Clear utilities beforehand, exercise caution around equipment and excavations, wet area if necessary to control dust and odors. PPE as required. Check for accumulation of vapors after period of inactivity.	PID measurements for VOCs, colorimetric tubes for benzene, particulate monitoring for SVOCs and metals, Jerome measurements for Mercury, and LEL measurements.
Excavation – Inside	Subsurface utilities, vehicle hazards, trips, falls, materials handling, VOCs, SVOCs, and metals. Falling objects, LNAPL, DNAPL, CO, CO_2, LEL, noise, vibration	Clear utilities beforehand, exercise caution around equipment and excavations, wet area if necessary to control dust and odors. PPE as required. Check for accumulation of vapors each morning and after period of inactivity.	PID measurements for VOCs, colorimetric tubes for benzene, particulate monitoring for SVOCs and metals, Jerome measurements for Mercury, and CO, CO_2, LEL measurements.

LEL - Lower Explosive Limit
PID - Photoionization detector
VOCs - Volatile organic compounds
SVOCs - Semi-volatile organic compounds
LNAPL - Light non-aqueous phase liquid
DNAPL - Dense non-aqueous phase liquid

Table 2 Air Monitoring, Action Levels, PPE

Instrument	Action Level	Response Action
Gas/Vapor		
PID	<0.5 ppm total VOCs in the workers' breathing zone (WBZ)	Continue work in Level D
PID	>0.5 ppm for a sustained period of 5 minutes in the WBZ	Use detector tube to measure benzene concentration
Colorimetric detector tube	> 0.5 ppm for benzene in the WBZ	Discontinue work and allow the work area to vent. Use mechanical ventilation as necessary. If after 15 minutes the benzene concentration is still greater than 0.5 ppm, upgrade to Level C, notify HSO
PID	1 to 10 ppm in the WBZ (no benzene)	Continue work in Level D
	> 10 ppm for a sustained period of 5 minutes in the WBZ (confirmed absence of benzene)	Discontinue work and allow the work area to vent. Use mechanical ventilation as necessary. If after 15 minutes the PID reading is still greater than 10 ppm, upgrade to Level C, notify HSO
	> 100 ppm for a sustained period of 5 minutes in the WBZ	Stop work. Resume work when readings are less than 100 ppm
Combustible Gas Indicator	Less than 20% LEL	Continue work
	Greater than 20% LEL	Stop work. Resume work when less than 20% LEL
Oxygen Monitor	Above 19.5% and less than 23.5%	Continue work
	Outside of this range	Stop work. Resume work when concentration is back in this acceptable range
Carbon Monoxide Monitor	Less than 25 ppm	Continue work
	Above 25 ppm	Stop work. Use mechanical ventilation as necessary. Resume work when less than 25 ppm.
Carbon Dioxide Monitor	<1000 ppm	Continue work
	>1000 ppm	Stop work. Use mechanical ventilation as necessary. Resume work when less than 1000 ppm.
Particulates		
Particulate Monitor	<100 µg/m^3 above background (upwind location)	Continue work, Level D
	> 100 µg/m3 above background for a period of 5 minutes in the WBZ	Stop work. Apply dust suppression measures. Resume work using Level D only if <100 µg/m^3 above background.
	>150 µg/m^3 above background for a sustained period of 5 minutes.	Stop work. Re-evaluate work. Collect air samples for As, Pb, Cd, and PAHs.
Mercury		
Jerome Monitor	<0.025 mg/m^3	Continue work, Level D
	> 0.025 mg/m3 for a period of 5 minutes in the WBZ	Stop work. Allow the work area to vent. Use mechanical ventilation as necessary. Resume work using Level D only if <0.025 mg/$m^{3.}$
	** Should Level C be necessary, contact the CIH as special coveralls and respirator cartridges are required.	

Table 3 – Key Personnel Emergency Phone Numbers

New York City Police Department	911
New York City Fire Department	911
New York University Medical Center 550 1st Avenue New York, NY	(212) 263-7300
Mount Sinai of Queens Hospital 25-10 30th Avenue Astoria, NY	(718) 932-1000
Emergency Medical Service (ambulance)	911
Patrick Shiels, Tishman Speyer	(212) 715-0361
Arnold F. Fleming, P. E., Project Director	(212) 675-3225
Steven Panter, FLS Project Manager	(212) 675-3225
Mark Hutson, Site Health and Safety Officer	(212) 675-3225
Tom Eng, CIH	(201) 417-3079
National Response Center	(800) 424-8802
NYSDEC Spill Hotline	(800) 457-7362

ATTACHMENT I
Acknowledgement Form

HASP ACKNOWLEDGMENT FORM

The following personnel have read the site-specific HASP and are familiar with its provisions.

Print Name	*Signature*	*Company*	*Function*	*Date*

ATTACHMENT II
Health Hazards for Contaminants of Concern

Attachment II - Health Hazards for Contaminants of Concern

Contaminant	Recognized and Suspected Health Hazards
Creosote	**Recognized** carcinogen
	Suspected respiratory toxicant and skin or sense organ toxicant
Volatile Organic Compounds (VOCs) Including BTEX Benzene, Toulene, Ethylbenzene and Xylene	**Suspected** carcinogen; cardiovascular or blood toxicant; gastrointestinal or liver toxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Semi- Volatile Organic Compounds (SVOCs) Including Poly Aromatic Hydrocarbons (PAHs)	**Suspected** carcinogen; cardiovascular or blood toxicant; gastrointestinal or liver toxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Arsenic	**Recognized** carcinogen; developmental toxicant
	Suspected cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Beryllium	**Recognized** carcinogen; developmental toxicant
	Suspected cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Copper	**Suspected** cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant
Chromium	**Suspected** cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Cyanide	**Suspected** cardiovascular or blood toxicant; endocrine toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Iron	**Suspected** cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant

Contaminant	Recognized and Suspected Health Hazards
Lead	**Recognized** carcinogen; developmental toxicant; reproductive toxicant
	Suspected cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Mercury	**Recognized** developmental toxicant
	Suspected cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Nickel	**Recognized** skin or sense organ toxicant and respiratory toxicant
Pesticides	**Recognized** developmental toxicant
	Suspected cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Polychlorinated Biphenyls	**Recognized** carcinogen, developmental toxicant
	Suspected endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Tetrachloroethylene	**Recognized** carcinogen; developmental toxicant; reproductive toxicant
	Suspected cardiovascular or blood toxicant; developmental toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Zinc	**Suspected** cardiovascular or blood toxicant; developmental toxicant; immunotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant

ATTACHMENT III
Profiles of Chemicals of Concern/Safety Data Sheets

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
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.	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 (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. 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	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	STORAGE	PACKAGING & LABELLING
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 (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof. Separated from food and feedstuffs, oxidants and halogens.	Do not transport with food and feedstuffs. F symbol T symbol R: 45-11-48/23/24/25 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0015

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1999. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

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.

CHEMICAL DANGERS:
Reacts violently with oxidants and halogens causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm; 32 mg/m^3 (as TWA) A2 (ACGIH 1991-1992).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Potential occupational carcinogen 500 ppm

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

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersion, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates 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 system. Exposure far above the occupational exposure limit may result in unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the blood forming organs, liver and immune system. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES	Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.9 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: (c.c.) -11°C Auto-ignition temperature: about 500°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow: 2.13
ENVIRONMENTAL DATA		

N O T E S

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.

Transport Emergency Card: TEC (R)-7
NFPA Code: H2; F3; R0;

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

Material Safety Data Sheet

Beryllium, powder, -325 mesh, 99+%

ACC# 99072

Section 1 - Chemical Product and Company Identification

MSDS Name: Beryllium, powder, -325 mesh, 99+%
Catalog Numbers: AC317870000, AC317870050
Synonyms: None.
Company Identification:

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

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

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-41-7	Beryllium	>99	231-150-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: gray-white flakes.
Warning! Cancer hazard. Can be explosive when exposed to heat or flames. Causes eye, skin, and respiratory tract irritation. Inhalation of fumes may cause metal-fume fever.
Target Organs: Lungs.

Potential Health Effects

Eye: Causes eye irritation. May cause conjunctivitis and corneal inflammation.
Skin: Causes skin irritation. May cause contact dermatitis.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. If heated, dust or fume may cause respiratory tract irritation.
Chronic: Chronic beryllium disease, an immunologically mediated response occurring after a latent period ranging from a few weeks to many years, causes difficult breathing on exertion, weight loss, nonproductive cough, fatigue, chest pain, anorexia, and weakness.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin: Get medical aid immediately. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dust can be an explosion hazard when exposed to heat or flame. Flammable solid.
Extinguishing Media: Do NOT use carbon dioxide. Do NOT use halogenated agents. Use approved class D extinguishing agents or smother with dry sand, clay, or sodium bicarbonate. DO NOT USE WATER!
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Do not breathe dust. Keep away from heat, sparks and flame. Use only with adequate ventilation or respiratory protection.
Storage: Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs

Beryllium	0.002 mg/m3 TWA; 0.01 mg/m3 STEL	4 mg/m3 IDLH	2 ug/m3 TWA; 5 æg/m3 Ceiling

OSHA Vacated PELs: Beryllium: 2 ug/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Flakes
Appearance: gray-white
Odor: odorless
pH: Not available.
Vapor Pressure: 1.85 mm Hg
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 2970 deg C
Freezing/Melting Point:1287 deg C
Decomposition Temperature: Not available.
Solubility: Not available.
Specific Gravity/Density:1.85 @ 20C
Molecular Formula: Be
Molecular Weight:9.01

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: Ignition sources, dust generation, excess heat, exposure to flame.
Incompatibilities with Other Materials: Oxidizing agents, phosphorus, lithium, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), carbontetrachloride, chlorinated hydrocarbons, Contact with acids causes evolution of flammable hydrogen gas..
Hazardous Decomposition Products: Hydrogen gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-41-7: DS1750000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7440-41-7:

- **ACGIH:**
  A1 - Confirmed Human Carcinogen
- **California:**
  carcinogen, initial date 10/1/87
- **NTP:**
  Known carcinogen
- **IARC:**
  Group 1 carcinogen

Epidemiology: Epidemiologic studies have demonstrated a statistically significant increase in lung cancer mortality in beryllium-exposed workers.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: CAS# 7440-41-7: waste number P015.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DOT regulated - small quantity provisions apply (see 49CFR173.4)	BERYLLIUM POWDER
Hazard Class:		6.1
UN Number:		UN1567
Packing Group:		II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7440-41-7 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7440-41-7: 10 lb final RQ (no reporting of releases of this hazardous substance is required

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7440-41-7: immediate, delayed, fire.

Section 313

This material contains Beryllium (CAS# 7440-41-7, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7440-41-7 (listed as Beryllium compounds, n.o.s.) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7440-41-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-41-7 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7440-41-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Beryllium, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 7440-41-7: 0.1 æg/day NSRL

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T+

Risk Phrases:

R 25 Toxic if swallowed.
R 26 Very toxic by inhalation.
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 43 May cause sensitization by skin contact.
R 49 May cause cancer by inhalation.
R 48/23 Toxic : danger of serious damage to health by prolonged exposure through inhalation.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)

CAS# 7440-41-7: No information available.

Canada - DSL/NDSL

CAS# 7440-41-7 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B4, D2A, D1A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7440-41-7 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 1/21/1998
Revision #5 Date: 8/23/2004

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
Chloroform

ACC# 04770

Section 1 - Chemical Product and Company Identification

MSDS Name: Chloroform
Catalog Numbers: AC95232184, S79960, S79960-1, S79960HPLC-2, S79960SPEC-1, S79960SPEC-2, C2974LC, C297POP19, C297POP200, C297POP50, C297RS115, C297RS200, C297RS28, C297RS50, C297SS115, C297SS19, C297SS200, C297SS28, C297SS50, C29820LC, C298FB115, C298FB19, C298FB200, C298FB50, C298J1, C298POP19, C298POP200, C298POP50, C298POPB19, C298POPB200, C298POPB50, C298RB115, C298RB19, C298RB200, C298RB50, C298RB500, C298RS115, C298RS19, C298RS200, C298RS28, C298RS50, C298SS-11, C298SS19, C298SS28, C605-1, C605-4, C606POP19, C606POP200, C606POP50, C606RS115, C606RS200, C606RS28, C606RS50, C606SS115, C606SS19, C606SS200, C606SS28, C606SS50
Synonyms: Formyl Trichloride; Methane Trichloride; Methenyl Trichloride; Methyl Trichloride; Trichlormethan; Trichloroform; Trichloromethane.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-66-3	Chloroform	100	200-663-8
25377-72-4	Amylene	<1.0	246-916-6

Hazard Symbols: XN
Risk Phrases: 22 38 40 48/20/22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. May cause central nervous system depression. May cause cardiac disturbances. May cause cancer based on animal studies. This substance has caused adverse reproductive and fetal effects in animals. May be harmful if swallowed. **Caution!** Causes eye and skin irritation. Causes digestive and respiratory tract irritation. Light sensitive.
Target Organs: Blood, kidneys, heart, central nervous system, liver, cardiovascular system, excretory system, reproductive system.

Potential Health Effects

Eye: Causes moderate eye irritation. Contact with liquid causes immediate burning pain, tearing, and

reddening of the conjunctiva.
Skin: Causes mild skin irritation. Prolonged or repeated contact may dry/defat the skin and cause irritation. Absorption of liquid through intact skin is possible and may cause sys temic poisoning if contact with liquid is prolonged.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver damage. May cause cardiac disturbances. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. Possible aspiration hazard. May cause hallucinations and distorted perceptions.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause cardiac sensitization and possible failure. Inhalation of large amounts may cause respiratory stimulation, followed by respiratory depression, convulsions and possible death due to respiratory paralysis. May be absorbed through the lungs. Causes irritation of the mucous membrane and upper respiratory tract.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause reproductive and fetal effects. Effects may be delayed. Laboratory experiments have resulted in mutagenic effects. Toxicity may be increased by exposure to alcohol, steroids, and ketones. Prolonged exposure may cause liver, kidney, and heart damage.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine. Persons with liver, kidney, or central nervous system diseases may be at increased risk from exposure to this product. Alcoholic beverage consumption may enhance the toxic effects of this substance. Effects may be delayed.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Substance is nonflammable. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire. Do NOT get water inside containers. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use water spray, fog or regular foam. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Avoid contact with eyes, skin, and clothing. Do not breathe dust, vapor, mist, or gas. Do not ingest or inhale. Store protected from light.
Storage: Do not store in direct sunlight. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Separate from strong mineral acids.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chloroform	10 ppm TWA	500 ppm IDLH	50 ppm Ceiling; 240 mg/m3 Ceiling
Amylene	none listed	none listed	none listed

OSHA Vacated PELs: Chloroform: 2 ppm TWA; 9.78 mg/m3 TWA Amylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweet, fruity odor - ethereal odor
pH: Not available.
Vapor Pressure: 160 mm Hg @ 20 deg C
Vapor Density: 4.12 (Air=1)
Evaporation Rate:11.6 (Butyl acetate=1)

Viscosity: 0.58 cps @ 20 deg C
Boiling Point: 60.5-61.5 deg C
Freezing/Melting Point:-63 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:1.492 (Water=1)
Molecular Formula:CHCl3
Molecular Weight:119.366

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Light sensitive.
Conditions to Avoid: High temperatures, incompatible materials, light.
Incompatibilities with Other Materials: Strong oxidizing agents, aluminum, fluorine, magnesium, sodium potassium, lithium, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), dinitrogen tetraoxide, sodium + methanol, potassium-tert-butoxide, chemically active metals, Attacks some forms of plastics, rubbers, and coatings., nitrogen tetroxide, acetone + alkali, disilane, perchloric acid + phosphorus pentoxide, sodium methylate, triisopropylphosphine, sodium methoxide + methanol.
Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide, carbon dioxide, chlorine, phosgene gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-66-3: FS9100000
CAS# 25377-72-4 unlisted.
LD50/LC50:
CAS# 67-66-3:
Draize test, rabbit, eye: 148 mg;
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 47702 mg/m3/4H;
Oral, mouse: LD50 = 36 mg/kg;
Oral, rat: LD50 = 695 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;

CAS# 25377-72-4:

Carcinogenicity:
CAS# 67-66-3:
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 10/1/87
NIOSH: potential occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen CAS# 25377-72-4: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Oral, rat: TDLo = 13832 mg/kg/2Y-C (Tumorigenic - Carcinogen ic by RTECS criteria - Blood - leukemia).; Oral, mouse: TDLo = 127 gm/kg/92W-I (Tumorigenic - Carcinogenic by RTECS criteria - Liver - tumors).; Oral, rat: TD = 98 gm/kg/78W-I (Tumorigenic - neoplastic by RTECS

criteria - Kidney, Ureter, Bladder - Kidney tumors and Endocrine - thyroid tumors).; Oral, mouse: TD = 18 gm/kg/17W-I (Tumorigenic - neoplastic by RTECS criteria - Liver - tumor s).;
Teratogenicity: Oral, rat: TDL0 = 1260 mg/kg (female 6-15 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus) Specific Developmental Abnormalities - musculoskeletal system.; Inhalation, rat: TCLo = 100 ppm/7H (female 6-15 day(s) after conception) Specific Developmental Abnormalities - gastrointestinal system and homeostasis.; Inhalation, mouse: TCLo = 100 ppm/7H (female 8-15 day(s) after conception) Specific Developmental Abnormalities - craniofacial (including nose and tongue).
Reproductive Effects: Inhalation, rat: TCLo = 30 ppm/7H (female 6-15 day(s) after conception) Fertility - other measures of fertility.; Inhalation, rat: TCLo = 300 ppm/7H (female 6-15 day(s) after conception) Fertility - female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated) and post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Neurotoxicity: No information available.
Mutagenicity: DNA Inhibition: Human, HeLa cell = 19 mmol/L.; Sister Chromatid Exchange: Human, Lymphocyte = 10 mmol/L.; Micronucleus Test: Oral, rat = 4 mmol/kg.; Unscheduled DNA Synthesis: Oral, rat = 1 gm/kg.; Sister Chromatid Exchange: Hamster, Embryo = 100 umol/L.
Other Studies: Open irritation test: Administration onto the skin (rabbit) 10 mg/24H (Mild). Standard Draize Test: Administratio n onto the skin (rabbit) = 500 mg/24H (Mild). Standard D raize Test: Administration into the eye (rabbit) = 20 mg /24H (Moderate).

Section 12 - Ecological Information

Ecotoxicity: Fish: Channel catfish: LC50 = 75 ppm; 96 Hr; Unspecified Rainbow trout: LC50 = 43.8 mg/L; 96 Hr; Static bioassay Fathead Minnow: LC50 = 129.0 mg/L; 96 Hr; Static bioassay (pH = 7.6-8.3) Bluegill/Sunfish: LC50 = 100.0 mg/L; 96 Hr; Static bioassay flea Daphnia: EC50 = 28.9 mg/L; 48 Hr; Static bioassay The majority of the environmental releases from industrial uses are to the atmosphere; releases to water and land will be primarily lost by evaporation and will end up in the atmosphere. Release to the atmosphere may be transported long distances and will photodegrade with a half-life of a few months. Spills and other releases on land will also leach into the groundwater where it will reside for long periods of time.
Environmental: Chloroform will not be expected to bioconcentrate into the food chain but contamination of food is likely due to its use as an extractant and its presence in drinking water.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 67-66-3: waste number U044.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	CHLOROFORM				CHLOROFORM
Hazard Class:	6.1				6.1(9.2)
UN Number:	UN1888				UN1888

Packing Group:	III				II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 67-66-3 is listed on the TSCA inventory.
CAS# 25377-72-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 67-66-3: Effective Date: 6/1/87; Sunset Date: 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 67-66-3: 10 lb final RQ; 4.54 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 67-66-3: 10,000 lb TPQ
SARA Codes
CAS # 67-66-3: acute, chronic. CAS # 25377-72-4: acute, flammable.
Section 313
This material contains Chloroform (CAS# 67-66-3, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 67-66-3 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 67-66-3 is listed as a Hazardous Substance under the CWA. CAS# 67-66-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 67-66-3 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 67-66-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 25377-72-4 can be found on the following state right to know lists: New Jersey.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Chloroform, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 67-66-3: 20 ug/day NSRL (oral); 40 ug/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN
Risk Phrases:
R 22 Harmful if swallowed.
R 38 Irritating to skin.
R 40 Limited evidence of a carcinogenic effect.

R 48/20/22 Harmful : danger of serious damage to health by prolonged exposure through inhalation and if swallowed.

Safety Phrases:
S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)
CAS# 67-66-3: 3
CAS# 25377-72-4: No information available.
Canada - DSL/NDSL
CAS# 67-66-3 is listed on Canada's DSL List.
CAS# 25377-72-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2A, D1B.
Canadian Ingredient Disclosure List
CAS# 67-66-3 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 67-66-3: OEL-ARAB Republic of Egypt:TWA 10 ppm (50 mg/m3) OEL-AUSTRALIA:TWA 10 ppm (50 mg/m3);Carcinogen OEL-AUSTRIA:TWA 10 ppm (50 mg/m3) OEL-BELGIUM:TWA 10 ppm (49 mg/m3);Carcinogen JAN9 OEL-CZECHO SLOVAKIA:TWA 10 mg/m3;STEL 20 mg/m3 OEL-DENMARK:TWA 2 ppm (10 mg/m3); Carcinogen OEL-FINLAND:TWA 10 ppm (50 mg/m3);STEL 20 ppm;Skin;CAR OE L-FRANCE:TWA 5 ppm (25 mg/m3);STEL 50 ppm (250 mg/m3);CAR OEL-GERMANY :TWA 10 ppm (50 mg/m3);Carcinogen JAN9 OEL-HUNGARY:STEL 10 mg/m3 OEL -INDIA:TWA 10 ppm (50 mg/m3);Carcinogen OEL-JAPAN:TWA 50 ppm (240 mg/ m3);Carcinogen OEL-THE NETHERLANDS:TWA 10 ppm (50 mg/m3) OEL-THE PHI LIPPINES:TWA 50 ppm (240 mg/m3) OEL-POLAND:TWA 50 mg/m3 OEL-RUSSIA:T WA 50 ppm OEL-SWEDEN:TWA 2 ppm (10 mg/m3);STEL 5 ppm (25 mg/m3);CAR OEL-SWITZERLAND:TWA 10 ppm (50 mg/m3);STEL 20 ppm (100 mg/m3) OEL-THA ILAND:TWA 50 ppm (240 mg/m3) OEL-TURKEY:TWA 50 ppm (240 mg/m3) OEL-U NITED KINGDOM:TWA 2 ppm (9.9 mg/m3);Skin OEL IN BULGARIA, COLOMBIA, J ORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM c heck ACGIH TLV

Section 16 - Additional Information

MSDS Creation Date: 6/09/1999
Revision #7 Date: 9/11/2002

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

Chrome
Cr (metal)
Atomic mass: 52.0

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

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

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

particles).

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0029

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
STEEL GREY LUTROUS METAL.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
Reacts violently with strong oxidants such as hydrogen peroxide, causing fire and explosion hazard. Reacts with diluted hydrochloric and sulfuric acids. Incompatible with alkalis and alkali carbonates.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: ppm; 0.5 mg/m^3 (as TWA) (ACGIH 1994-1995).
OSHA PEL*: TWA 1 mg/m^3 See Appendix C *Note: The PEL also applies to insoluble chromium salts.
NIOSH REL: TWA 0.5 mg/m^3 See Appendix C
NIOSH IDLH: 250 mg/m^3 (as Cr)

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

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

EFFECTS OF SHORT-TERM EXPOSURE:

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

PHYSICAL PROPERTIES

Boiling point: 2642°C
Melting point: 1900°C
Relative density (water = 1): 7.14
Solubility in water: none

ENVIRONMENTAL DATA

N O T E S

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

ADDITIONAL INFORMATION

ICSC: 0029	**CHROMIUM**

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ALDRICH CHEMICAL CO -- DIELDRIN, TECH., CA. 90%, 29121-8 -- 6810-00N037359

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

Product ID:DIELDRIN, TECH., CA. 90%, 29121-8
MSDS Date:01/07/1992
FSC:6810
NIIN:00N037359
MSDS Number: BQRWJ
=== Responsible Party ===
Company Name:ALDRICH CHEMICAL CO
Box:355
City:MILWAUKEE
State:WI
ZIP:53201
Country:US
Info Phone Num:414-273-3850
Emergency Phone Num:414-273-3850
CAGE:60928
=== Contractor Identification ===
Company Name:ALDRICH CHEMICAL CO INC
Address:1001 WEST ST PAUL AVE
Box:355
City:MILWAUKEE
State:WI
ZIP:53233
Country:US
Phone:414-273-3850
CAGE:60928

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

Ingred Name:1,4:5,8-DIMETHANONAPHTHALENE, 1,2,3,4,10,10-HEXACHLORO-6,
7-EPOXY- 1,4,4A,5,6,7,8,8A-OCTAHYDRO, ENDO, EXO-; (ING 2)
CAS:60-57-1
RTECS #:IO1750000
Fraction by Wt: 90%
OSHA PEL:0.25 MG/M3, S
ACGIH TLV:0.25 MG/M3, S
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:ING 1: (DIELDRIN) (SARA III)
RTECS #:9999999ZZ

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

LD50 LC50 Mixture:LD50 (ORAL,RAT): 38300 UG/KG.
Routes of Entry: Inhalation:YES Skin:YES Ingestion:NO
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE:MAY BE FATAL IF INHALED,
SWALLOWED, OR ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION. CHRONIC:
CARCINOGEN. MAY ALTER GENETIC MATERIAL. OVEREXPOSURE MAY CAUSE
REPRODUCTIVE DISORDER(S) BASED ON TEST S WITH LABORATORY ANIMALS.
TARGET ORGANS: CENTRAL NERVOUS SYSTEM, LIVER, BLOOD. OVEREXPOSURE
CAN CAUSE (EFTS OF OVEREXP)
Explanation of Carcinogenicity:NOT RELEVANT.
Effects of Overexposure:HLTH HAZ: MALAISE, HEADACHE, NAUSEA, VOMITING,
DIZZINESS, TREMORS, CLONIC AND TONIC CONVULSIONS, COMA, RESPIRATORY
FAILURE.
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

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

First Aid:EYES: IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT
LEAST 15 MINUTES. SKIN: IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF

WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SH OES. INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGESTION: WASH OUT MOUTH W/WATER PROVIDED PERSON IS CONSCIOUS. CALL PHYS.

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

Extinguishing Media:WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT .
Unusual Fire/Explosion Hazard:EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

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

Spill Release Procedures:EVACUATE AREA. WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. SWEEP UP, PLACE IN BAG AND HOLD FOR WASTE DISPOSAL. AVOID RAISING DUST. VENTILATE AREA AND WASH SPILL SITE AFTER MAT ERIAL PICKUP IS COMPLETE.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

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

Handling and Storage Precautions:KEEP TIGHTLY CLOSED. STORE IN A COOL DRY PLACE.
Other Precautions:HIGHLY TOX.CARCIN. MUTAGEN. REPROD HAZ.MAY CAUSE CANCER.MAY CAUSE INHERITABLE GENETIC DMG. READILY ABSORB THRU SKIN. AVOID PRLNGD/RPTD EXPOS. DO NOT BRTH DUST. DO NOT GET IN EYES,ON SKIN,ON CLTHG.VERY TOX BY INHAL,IN CONT W/SKIN & (SUPDAT)

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

Respiratory Protection:WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation:USE ONLY IN A CHEMICAL FUME HOOD.
Protective Gloves:CHEMICAL-RESISTANT GLOVES.
Eye Protection:CHEM WORK GOG W/FULL LNGTH FCSHLD
Other Protective Equipment:OTHER PROTECTIVE CLOTHING. SAFETY SHOWER AND EYE BATH.
Work Hygienic Practices:WASH THOROUGHLY AFTER HANDLING.
Supplemental Safety and Health
OTHER PRECAUTIONS: IF SWALLOWED. IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE (SHOW THE LABEL WHERE POSSIBLE).

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

Melt/Freeze Pt:M.P/F.P Text:>289F,>143C
Vapor Density:13.2
Appearance and Odor:ORANGE-TAN POWDER.

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

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:TOXIC FUMES OF CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN CHLORIDE GAS.

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

Waste Disposal Methods:DISSOLVE OR MIX MATERIAL WITH COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCURBBER. DISPOSE OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS (FP N).

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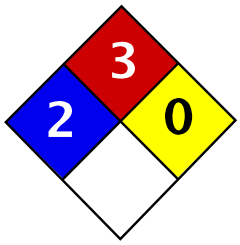

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

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

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

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

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

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

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

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

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

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

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

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

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

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

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

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

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

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

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

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

Incompatibility with various substances: Reactive with oxidizing agents.

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

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

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

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

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

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

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

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

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Can cause mild skin irritation. It can be absorbed through intact skin.
Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS)
Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987).
Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

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

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

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

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

Other Classifications:

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

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

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

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

Other Special Considerations: Not available.

Created: 10/09/2005 05:28 PM

Last Updated: 10/09/2005 05:28 PM

METAL

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: LL0070 LL0079 LL0080 LL0081 LL0082 LL0085 LL0086
Effective Date: March 29, 2005

SECTION I NAME

Product	Lead Metal
Chemical Synonyms	N/A
Formula	Pb
Unit Size	up to 2.5 Kg.
C.A.S. No.	7439-92-1

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC 800-424-9300
Day 585-226-6177

NFPA

Health	3
Fire	0
Reactivity	0

HMIS *

HAZARD RATING
MINIMAL 0 SLIGHT 1 MODERATE 2 SERIOUS 3 SEVERE 4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Lead metal, shot, granular, sheet, foil	99+%	See Section V.
CAUTION! MAY BE HARMFUL OR FATAL IF SWALLOWED		
OR INHALED AS FUMES OR DUST.		

SECTION III PHYSICAL DATA

Melting Point (°F)	Approx. 327.4°C (621°F)	Specific Gravity (H_2O = 1)	11.34 (20/4°C)
Boiling Point (°F)	1753°C (3187°F)	Percent Volatile by Volume (%)	0% at ambient temp.
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	Non-volatile (N/A).
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Bluish, silvery, gray soft metal, granular, shot, sheet, foil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable (N/A).	Flammable Limits in Air % by Volume	Lower --------	Upper --------
Extinguisher Media	Dry chemical or carbon dioxide should be used on surrounding fire. Do not use water on fires where molten metal is present.	N/A		

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

When heated emits toxic fumes of lead which can react vigorously with oxidizing materials.

D.O.T. Non Regulated.

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA LL0070

Threshold Limited Value
Lead as inorganic compounds, as Pb: TWA 0.05 mg/m^3 (ACGIH 2001).

Effects of Overexposure
SKIN: Not absorbed through skin. EYES: No specific hazard known. Contact may cause transient irritation. INGESTION: May produce anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. INHALATION: Of dust or fumes can cause lead poisoning. Target organs: Lungs, kidneys.

Emergency and First Aid Procedures
INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. EYES: Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. SKIN: Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability			Conditions to Avoid
	Unstable		High temperatures to produce fumes.
	Stable	X	

Incompatibility (Materials to Avoid) Strong oxidizing materials.

Hazardous Decomposition Products When heated, emits toxic fumes of lead.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled
Carefully sweep up without producing dust and recycle for use or place in a suitable container for disposal.

Waste Disposal Method
Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.
Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None should be needed in normal laboratory use at room temperature. If dusty conditions prevail, work in ventilation hood or wear a NIOSH/MSHA-approved dust mask or respirator.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves	Recommended - leather.	Eye Protection	Chemical safety glasses.

Other Protective Equipment Smock, apron, eye wash station, lab coat, ventilation hood.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.
Store in a cool, dry place away from fire hazards. Wash thoroughly after handling. Remove and wash contaminated clothing.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Lead can react violently with oxidizing materials. Water may become trapped within surface cracks which may cause an explosion when the metal is molten.

Revision No. 9	Date 03/29/05	Approved Michael Raszeja	Chemical Safety Coordinator MR

METAL

10 M

Material Safety Data Sheet
Mercury

ACC# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury
Catalog Numbers: S40672B, S41542, S41599, S41599B, S41599E, S41599G, S41599J, S41599K, S41599M, S41600P, S41600S, S41600W, S41630A, S41630B, S41630C, S41631, S41631A, S41631B, S41631C, S41645, S45245, S46981, S50443, S71966, S71967, S71968, S78777, 13501, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB, NC9534278
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	100	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.
Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause central nervous system effects. Inhalation of fumes may cause metal-fume fever. May cause liver and kidney damage. Possible sensitizer. This substance has caused adverse reproductive and fetal effects in animals.
Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects
Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation

of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.
Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling (vapor)

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: silver
Odor: odorless
pH: Not available.

Vapor Pressure: 0.002 mm Hg @ 25C
Vapor Density: 7.0
Evaporation Rate: Not available.
Viscosity: 15.5 mP @ 25 deg C
Boiling Point: 356.72 deg C
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:13.59 (water=1)
Molecular Formula: Hg
Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials.
Incompatibilities with Other Materials: Oxygen, sulfur, acetylene, ammonia, chlorine dioxide, azides, chlorates, nitrates, sulfuric acid, halogens, rubidium, calcium, 3-bromopropyne, ethylene oxide, lithium, methylsilane + oxygen, peroxyformic acid, tetracarbonylnickel + oxygen, copper, copper alloys, boron diiodophosphide, metals, nitromethane, sodium carbide, aluminum, lead, iron, metal oxides.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	MERCURY	MERCURY
Hazard Class:	8	8
UN Number:	UN2809	UN2809
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs

CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7439-97-6: acute, chronic.

Section 313

This material contains Mercury (CAS# 7439-97-6, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 23 Toxic by inhalation.

R 33 Danger of cumulative effects.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.

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

S 7 Keep container tightly closed.

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

Canadian Ingredient Disclosure List

CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #7 Date: 1/20/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

International Chemical Safety Cards

NICKEL

ICSC: 0062

NICKEL
(powder)
Ni
Molecular mass: 58.7

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

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

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

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0062

International Chemical Safety Cards

NICKEL

ICSC: 0062

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

NOTES

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

ADDITIONAL INFORMATION

ICSC: 0062 **NICKEL**

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

Material Safety Data Sheet

PAH Contaminated Soil

ACC# 17974

Section 1 - Chemical Product and Company Identification

MSDS Name: PAH Contaminated Soil
Catalog Numbers: SRS103100
Synonyms: API separator sludge
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
Not available	Soil	78-99	unlisted
120-12-7	Anthracene	0-2	204-371-1
129-00-0	Pyrene	0-2	204-927-3
132-64-9	Dibenzofuran	0-2	205-071-3
205-99-2	Benzo(b)fluoranthene	0-2	205-911-9
206-44-0	Fluoranthene	0-2	205-912-4
208-96-8	Acenaphthylene	0-2	205-917-1
218-01-9	1,2-benzphenanthrene	0-2	205-923-4
50-32-8	Benzo(a)pyrene	0-2	200-028-5
56-55-3	1,2-Benzanthracene	0-2	200-280-6
83-32-9	Acenaphthene	0-2	201-469-6
85-01-8	Phenanthrene	0-2	201-581-5
86-73-7	Fluorene	0-2	201-695-5
87-86-5	Pentachlorophenol	0-2	201-778-6
91-20-3	Naphthalene	0-2	202-049-5
91-57-6	2-methylnaphthalene	0-2	202-078-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: not available solid.
Warning! May cause allergic skin reaction. Causes eye and skin irritation. May cause cancer based on animal studies.
Target Organs: Eyes, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Naphthalene can cause cataracts, optical neuritis, and cornea injuries. Ingestion of large quantities may cause severe hemolytic anemia and
Inhalation: Causes respiratory tract irritation. May cause effects similar to those described for ingestion.
Chronic: May cause cancer according to animal studies. Prolonged exposure to respirable crystalline quartz may cause delayed lung injury/fibrosis (silicosis).

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: Not published.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Wash hands before eating. Use with adequate ventilation. Avoid contact with skin and eyes. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a cool, dry place.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Soil	none listed	none listed	none listed
Anthracene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Dibenzofuran	none listed	none listed	none listed
Benzo(b)fluoranthene	none listed	none listed	none listed
Fluoranthene	none listed	none listed	none listed
Acenaphthylene	none listed	none listed	none listed
1,2-benzphenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

Benzo(a)pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
1,2-Benzanthracene	none listed	none listed	none listed
Acenaphthene	none listed	none listed	none listed
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Fluorene	none listed	none listed	none listed
Pentachlorophenol	0.5 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.5 mg/m3 TWA 2.5 mg/m3 IDLH	0.5 mg/m3 TWA
Naphthalene	10 ppm TWA; 15 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 50 mg/m3 TWA 250 ppm IDLH	10 ppm TWA; 50 mg/m3 TWA
2-methylnaphthalene	none listed	none listed	none listed

OSHA Vacated PELs: Soil: No OSHA Vacated PELs are listed for this chemical. Anthracene: No OSHA Vacated PELs are listed for this chemical. Pyrene: No OSHA Vacated PELs are listed for this chemical. Dibenzofuran: No OSHA Vacated PELs are listed for this chemical. Benzo(b)fluoranthene: No OSHA Vacated PELs are listed for this chemical. Fluoranthene: No OSHA Vacated PELs are listed for this chemical. Acenaphthylene: No OSHA Vacated PELs are listed for this chemical. 1,2-benzphenanthrene: No OSHA Vacated PELs are listed for this chemical. Benzo(a)pyrene: No OSHA Vacated PELs are listed for this chemical. 1,2-Benzanthracene: No OSHA Vacated PELs are listed for this chemical. Acenaphthene: No OSHA Vacated PELs are listed for this chemical. Phenanthrene: No OSHA Vacated PELs are listed for this chemical. Fluorene: No OSHA Vacated PELs are listed for this chemical. Pentachlorophenol: 0.5 mg/m3 TWA Naphthalene: 10 ppm TWA; 50 mg/m3 TWA 2-methylnaphthalene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

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

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

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

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: not available
Odor: none reported
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density: Not available.
Molecular Formula: Mixture
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures.
Incompatibilities with Other Materials: None reported.
Hazardous Decomposition Products: No data available.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 120-12-7: CA9350000
CAS# 129-00-0: UR2450000; UR2450100
CAS# 132-64-9: HP4430000
CAS# 205-99-2: CU1400000
CAS# 206-44-0: LL4025000
CAS# 208-96-8: AB1254000; AB1254200
CAS# 218-01-9: GC0700000
CAS# 50-32-8: DJ3675000
CAS# 56-55-3: CV9275000
CAS# 83-32-9: AB1000000
CAS# 85-01-8: SF7175000
CAS# 86-73-7: LL5670000
CAS# 87-86-5: SM6300000; SM6314000; SM6321000
CAS# 91-20-3: QJ0525000
CAS# 91-57-6: QJ9635000
LD50/LC50:
CAS# 120-12-7:

Oral, mouse: LD50 = 4900 mg/kg;

CAS# 129-00-0:
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 170 mg/m3;
Inhalation, rat: LC50 = 170 mg/m3;
Oral, mouse: LD50 = 800 mg/kg;
Oral, rat: LD50 = 2700 mg/kg;

CAS# 132-64-9:

CAS# 205-99-2:

CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;
Skin, rabbit: LD50 = 3180 mg/kg;

CAS# 208-96-8:
Oral, mouse: LD50 = 1760 mg/kg;

CAS# 218-01-9:

CAS# 50-32-8:

CAS# 56-55-3:

CAS# 83-32-9:

CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;

CAS# 86-73-7:

CAS# 87-86-5:
Draize test, rabbit, eye: 100 uL/24H Mild;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, rat: LC50 = 355 mg/m3;
Inhalation, rat: LC50 = 200 mg/m3;
Inhalation, rat: LC50 = 335 mg/m3;
Oral, mouse: LD50 = 36 mg/kg;
Oral, mouse: LD50 = 117 mg/kg;
Oral, mouse: LD50 = 30 mg/kg;
Oral, rabbit: LD50 = 200 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 50 mg/kg;
Skin, rat: LD50 = 96

CAS# 91-20-3:
Draize test, rabbit, eye: 100 mg Mild;
Inhalation, rat: LC50 = >340 mg/m3/1H;
Oral, mouse: LD50 = 316 mg/kg;
Oral, rat: LD50 = 490 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rat: LD50 = >2500 mg/kg;

CAS# 91-57-6:
Oral, rat: LD50 = 1630 mg/kg;

Carcinogenicity:
CAS# 120-12-7:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 129-00-0:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 132-64-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 205-99-2:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 208-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 56-55-3:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

CAS# 83-32-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').

- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 86-73-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 87-86-5:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Not listed.
- **IARC:** Not listed.

CAS# 91-20-3:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/19/02
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 91-57-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.
CAS# 218-01-9: waste number U050.
CAS# 50-32-8: waste number U022.
CAS# 56-55-3: waste number U018.
CAS# 91-20-3: waste

Section 14 - Transport Information

US DOT	Canada TDG

Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

Soil is not listed on the TSCA inventory. It is for research and development use only.
CAS# 120-12-7 is listed on the TSCA inventory.
CAS# 129-00-0 is listed on the TSCA inventory.
CAS# 132-64-9 is listed on the TSCA inventory.
CAS# 205-99-2 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 206-44-0 is listed on the TSCA inventory.
CAS# 208-96-8 is listed on the TSCA inventory.
CAS# 218-01-9 is listed on the TSCA inventory.
CAS# 50-32-8 is listed on the TSCA inventory.
CAS# 56-55-3 is listed on the TSCA inventory.
CAS# 83-32-9 is listed on the TSCA inventory.
CAS# 85-01-8 is listed on the TSCA inventory.
CAS# 86-73-7 is listed on the TSCA inventory.
CAS# 87-86-5 is listed on the TSCA inventory.
CAS# 91-20-3 is listed on the TSCA inventory.
CAS# 91-57-6 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 129-00-0: Effective 6/1/87, Sunset 6/1/97 CAS# 91-20-3: Effective 6/1/87, Sunset 6/1/97

Chemical Test Rules

CAS# 91-20-3: Testing required by manufacturers, processors

Section 12b

CAS# 91-20-3: Section 4

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 120-12-7: 5000 lb final RQ; 2270 kg final RQ CAS# 129-00-0: 5000 lb final RQ; 2270 kg final RQ CAS# 132-64-9: 100 lb final RQ; 45.4 kg final RQ CAS# 205-99-2: 1 lb final RQ; 0.454 kg final RQ CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ CAS# 208-96-8: 5000 lb final RQ; 2270 kg final RQ CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ CAS# 56-55-3: 10 lb final RQ; 4.54 kg final RQ CAS# 83-32-9: 100 lb final RQ; 45.4 kg final RQ CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ CAS# 86-73-7: 5000 lb final RQ; 2270 kg final RQ CAS# 87-86-5: 10 lb final RQ; 4.54 kg final RQ CAS# 91-20-3: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 129-00-0: 1000 lb TPQ (lower threshold); 10000 lb TPQ (upper thre shold)

SARA Codes

CAS # 120-12-7: acute.
CAS # 129-00-0: acute, chronic.
CAS # 206-44-0: acute.

CAS # 50-32-8: acute, chronic.
CAS # 56-55-3: chronic.
CAS # 83-32-9: acute.
CAS # 85-01-8: acute.
CAS # 91-20-3: acute, chronic, flammable.
CAS # 91-57-6: acute.

Section 313

This material contains Anthracene (CAS# 120-12-7, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Dibenzofuran (CAS# 132-64-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Benzo(b)fluoranthene (CAS# 205-99-2, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Fluoranthene (CAS# 206-44-0, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains 1,2-benzphenanthrene (CAS# 218-01-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Benzo(a)pyrene (CAS# 50-32-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains 1,2-Benzanthracene (CAS# 56-55-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Phenanthrene (CAS# 85-01-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Pentachlorophenol (CAS# 87-86-5, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Naphthalene (CAS# 91-20-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 132-64-9 is listed as a hazardous air pollutant (HAP).

CAS# 87-86-5 is listed as a hazardous air pollutant (HAP).
CAS# 91-20-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 87-86-5 is listed as a Hazardous Substance under the CWA. CAS# 91-20-3 is listed as a Hazardous Substance under the CWA. CAS# 120-12-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 129-00-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 205-99-2 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 208-96-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 56-55-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 86-73-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Priority Pollutant under the Clean Water Act. CAS# 91-20-3 is listed

as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 91-20-3 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 120-12-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 129-00-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 132-64-9 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 205-99-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 208-96-8 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 56-55-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 83-32-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 86-73-7 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 87-86-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-20-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-57-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

WARNING: This product contains Benzo(b)fluoranthene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-benzphenanthrene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzo(a)pyrene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-Benzanthracene, a chemical known to the state of California to cause cancer. WARNING: This product contains Pentachlorophenol, a chemical known to the state of California to cause cancer. WARNING: This product contains Naphthalene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 205-99-2: 0.096 æg/day NSRL (oral) CAS# 218-01-9: 0.35 æg/day NSRL (oral) CAS# 50-32-8: 0.06 æg/day NSRL CAS# 56-55-3: 0.033 æg/day NSRL (oral) CAS# 87-86-5: 40 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 120-12-7: 2
CAS# 129-00-0: No information available.
CAS# 132-64-9: No information available.
CAS# 205-99-2: No information available.
CAS# 206-44-0: No information available.
CAS# 208-96-8: No information available.
CAS# 218-01-9: No information available.
CAS# 50-32-8: No information available.
CAS# 56-55-3: No information available.
CAS# 83-32-9: No information available.
CAS# 85-01-8: No information available.
CAS# 86-73-7: No information available.
CAS# 87-86-5: 3
CAS# 91-20-3: 2
CAS# 91-57-6: No information available.

Canada - DSL/NDSL

CAS# 120-12-7 is listed on Canada's DSL List.
CAS# 129-00-0 is listed on Canada's DSL List.
CAS# 132-64-9 is listed on Canada's DSL List.
CAS# 218-01-9 is listed on Canada's DSL List.
CAS# 50-32-8 is listed on Canada's DSL List.
CAS# 83-32-9 is listed on Canada's DSL List.
CAS# 85-01-8 is listed on Canada's DSL List.
CAS# 86-73-7 is listed on Canada's DSL List.
CAS# 87-86-5 is listed on Canada's DSL List.
CAS# 91-20-3 is listed on Canada's DSL List.
CAS# 91-57-6 is listed on Canada's DSL List.
CAS# 206-44-0 is listed on Canada's NDSL List.
CAS# 208-96-8 is listed on Canada's NDSL List.
CAS# 56-55-3 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

Canadian Ingredient Disclosure List

CAS# 120-12-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 129-00-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 205-99-2 is listed on the Canadian Ingredient Disclosure List.
CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 208-96-8 is not listed on the Canadian Ingredient Disclosure List.
CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 56-55-3 is listed on the Canadian Ingredient Disclosure List.
CAS# 83-32-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 86-73-7 is not listed on the Canadian Ingredient Disclosure List.
CAS# 87-86-5 is not listed on the Canadian Ingredient Disclosure List.
CAS# 91-20-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #3 Date: 3/18/2003

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

3 PCB

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

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

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.		Powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from food and feedstuffs. Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Severe marine pollutant. Note: C Xn symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 2000. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
LIGHT YELLOW VISCOUS LIQUID.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes in a fire producing irritating and toxic gases.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: ppm; 0.5 mg/m^3 A3 (skin) (ACGIH 1999).
OSHA PEL: TWA 0.5 mg/m^3 skin
NIOSH REL: Ca TWA 0.001 mg/m^3 See Appendix A *Note: The REL also applies to other PCBs.
NIOSH IDLH: Potential occupational carcinogen 5 mg/m^3

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

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES

Relative density (water = 1): 1.5
Solubility in water: none

Vapour pressure, Pa at 25°C: 0.01
Octanol/water partition coefficient as log

	Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in water organisms. It is strongly advised not to let the chemical enter into the environment. 

N O T E S

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C.

Transport Emergency Card: TEC (R)-914

ADDITIONAL INFORMATION

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

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

21 VOC

Material Safety Data Sheet
Tetrachloroethylene

ACC# 22900

Section 1 - Chemical Product and Company Identification

MSDS Name: Tetrachloroethylene
Catalog Numbers: C182 20, C182 4, C182-20, C182-4, C18220, C1824, O4586 4, O4586-4, O45864
Synonyms: Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene; Perchlorethylene
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
127-18-4	Tetrachloroethylene	99.0+	204-825-9

Hazard Symbols: XN N
Risk Phrases: 40 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Irritant. May cause severe eye and skin irritation with possible burns. May cause central nervous system depression. May cause liver and kidney damage. May cause reproductive and fetal effects. May cause cancer based on animal studies. **Caution!** May cause respiratory tract irritation.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects
Eye: Contact with eyes may cause severe irritation, and possible eye burns.
Skin: May cause severe irritation and possible burns.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause

adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames

and other sources of high temperatures that may cause material to form vapors or mists.
Storage: Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm TWA; 100 ppm STEL	150 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Tetrachloroethylene: 25 ppm TWA; 170 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor
pH: Not available.
Vapor Pressure: 15.8 mm Hg
Vapor Density: 5.2
Evaporation Rate:9 (ether=100)
Viscosity: 0.89 mPa s 20 deg C
Boiling Point: 121 deg C
Freezing/Melting Point:-22.3 deg C
Decomposition Temperature:150 deg C
Solubility: Nearly insoluble in water.
Specific Gravity/Density:1.623
Molecular Formula:C2Cl4
Molecular Weight:165.812

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, excess heat.
Incompatibilities with Other Materials: Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 127-18-4: KX3850000
LD50/LC50:
CAS# 127-18-4:
Draize test, rabbit, eye: 162 mg Mild;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 810 mg/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 5200 ppm/4H;
Inhalation, rat: LC50 = 34200 mg/m3/8H;
Oral, mouse: LD50 = 8100 mg/kg;
Oral, rat: LD50 = 2629 mg/kg;
Carcinogenicity:
CAS# 127-18-4:
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: potential occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen
Epidemiology: Epidemiologic studies have given inconsistent results. Studi es have shown that tetrachloroethylene has not caused canc er in exposed workers. The studies have serious weakne sses such as mixed exposures. In tests with rats and mice, i t appeared that tissue destruction or peroxisome prolifera tion rather than genetic mechanisms were the cause of the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.
Teratogenicity: Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mol/L in a study using rat embryos.
Reproductive Effects: Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.
Neurotoxicity: No information available.
Mutagenicity: Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.
Other Studies: A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 5.28 mg/L; 96 Hr.; Static Condition, 12 degrees C Fathead Minnow: LC50 = 18.4 mg/L; 96 Hr.; Flow-through condition Bluegill/Sunfish: LC50 = 12.9 mg/L; 96 Hr.; Static Condition ria: Phytobacterium phosphoreum: EC50 = 120.0 mg/L; 30 minutes; Microtox test No data available.

Environmental: In soil, substance will rapidly evaporate. In water, it will evaporate. In air, it can be expected to exist in the vapor phase.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 127-18-4: waste number U210.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TETRACHLOROETHYLENE				TETRACHLOROETHYLENE
Hazard Class:	6.1				6.1
UN Number:	UN1897				UN1897
Packing Group:	III				III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 127-18-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 127-18-4: Effective Date: 6/1/87; Sunset Date: 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 127-18-4: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 127-18-4: acute.
Section 313
This material contains Tetrachloroethylene (CAS# 127-18-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
CAS# 127-18-4 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 127-18-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 127-18-4: 14 ug/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN N
Risk Phrases:
R 40 Limited evidence of a carcinogenic effect.
R 51/53 Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 127-18-4: 3
Canada - DSL/NDSL
CAS# 127-18-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, D2A.
Canadian Ingredient Disclosure List
CAS# 127-18-4 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin OEL-AUSTRALIA:TWA 50 ppm (335 mg/m3);STEL 150 ppm;CAR OEL-BELGIUM:TWA 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3) OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3 OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin OEL-FRANCE:TWA 50 ppm (335 mg/m3) OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen OEL-JAPAN:TWA 50 ppm (340 mg/m3) OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3) OEL-POLAND:TWA 60 mg/m3 OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3 OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3) OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin OEL-THAILAND:TWA 100 ppm;STEL 200 ppm OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA

check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/17/1999
Revision #3 Date: 3/18/2003

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MSDS Number: **T3913** * * * * * *Effective Date:* ***10/05/06*** * * * * * *Supercedes:* ***08/03/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

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4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.1
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full

facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Aromatic benzene-like.
Solubility:
0.05 gm/100gm water @ 20C (68F).
Specific Gravity:
0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction

with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 5.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **X2000** * * * * * *Effective Date:* ***02/16/06*** * * * * * *Supercedes:* ***04/01/03***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 5377, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8802, V052

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	Yes
o-Xylene	95-47-6	15 - 20%	Yes
p-Xylene	106-42-3	< 20%	Yes
Ethyl Benzene	100-41-4	15 - 25%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)

Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:

lel: 1.0; uel: 7.0
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

---

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
xylene: 100 ppm (TWA) 150 ppm (STEL), A4 - Not classifiable as a human carcinogen.
ethyl benzene: 100 ppm (TWA) 125 ppm (STEL), A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

The following physical data is for xylene.
Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @ 20C/4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
137 - 140C (279 - 284F)
Melting Point:
-25C (-13F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
8 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.
Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**

Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **Z0858** * * * * * *Effective Date: 05/07/03* * * * * * *Supercedes: 11/02/01*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ZINC METAL POWDER

1. Product Identification

Synonyms: Powdered zinc; blue powder; CI77945; CI Pigment Black 16
CAS No.: 7440-66-6
Molecular Weight: 65.37
Chemical Formula: Zn
Product Codes:
J.T. Baker: 4282
Mallinckrodt: 8681

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc	7440-66-6	96 - 97%	Yes
Zinc Oxide	1314-13-2	0 - 3%	Yes
Lead	7439-92-1	0 - 0.3%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR. WATER REACTIVE. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM (lead component).

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 2 - Moderate

Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; CLASS D EXTINGUISHER
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
No adverse effects expected but dust may cause mechanical irritation. The effects may be expected to resemble those of inhaling an inert dust; possible difficulty in breathing, sneezing, coughing. When heated, the fumes are highly toxic and may cause fume fever.
Ingestion:
Extremely large oral dosages may produce gastrointestinal disturbances, due both to mechanical effects and the possibility of reaction with gastric juice to produce zinc chloride. Pain, stomach cramps and nausea could occur in aggravated cases.
Skin Contact:
May cause irritation.
Eye Contact:
May cause irritation.
Chronic Exposure:
No adverse health effects expected.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

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5. Fire Fighting Measures

Fire:
Autoignition temperature: ca. 460C (ca. 860F)
The listed autoignition temperature is for Zinc powder (layer); dust cloud is ca. 680C (1255F). Zinc powder is not pyrophoric but will burn in air at elevated temperatures. Bulk dust in damp state may heat spontaneously and ignite on exposure to air. Releases flammable hydrogen gas upon contact with acids or alkali hydroxides. Contact with strong oxidizers may cause fire.
Explosion:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Fire Extinguishing Media:
Smother with a suitable dry powder (sodium chloride, magnesium oxide, Met-L-X).
Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Remove all sources of ignition and provide mild ventilation in area of spill. Substance may be pyrophoric and self-ignite. Clean-up personnel require protective clothing, goggles and dust/mist respirators. Sweep or vacuum up the spill in a manner that does not disperse zinc powder in the air and place the zinc in a closed container for recovery or disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None for Zinc metal.
-OSHA Permissible Exposure Limit (PEL):
10 mg/m3 (TWA), for zinc oxide fume
-ACGIH Threshold Limit Value (TLV):
10 mg/m3 (TWA), Inhalable fraction, A4 Not classifiable as a human carcinogen for zinc oxide.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids. glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Gray or bluish-gray powder.
Odor:
Odorless.

Solubility:
Insoluble in water.
Density:
7.14
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
907C (1665F)
Melting Point:
419C (786F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1 @ 487C (909F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Moist zinc dust can react exothermically and ignite spontaneously in air.
Hazardous Decomposition Products:
Hydrogen in moist air, zinc oxide with oxygen at high temperature. Zinc metal, when melted, produces zinc vapor which oxidizes and condenses in air to form zinc fume.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Zinc powder can react violently with water, sulfur and halogens. Dangerous or potentially dangerous with strong oxidizing agents, lower molecular weight chlorinated hydrocarbons, strong acids and alkalis.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Zinc: Irritation skin, human: 300 ug/3D-I mild; investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Zinc (7440-66-6)	No	No	None
Zinc Oxide (1314-13-2)	No	No	None
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	Yes	Yes
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	No	Yes
Lead (7439-92-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\-----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Zinc (7440-66-6)	No	No	Yes	No
Zinc Oxide (1314-13-2)	No	No	No	Zinc compoun
Lead (7439-92-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\-----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Zinc (7440-66-6)	1000	No	No
Zinc Oxide (1314-13-2)	No	No	No
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
Reactivity: Yes (Mixture / Solid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 4Y
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **1** Reactivity: **1** Other: **Water reactive**

ATTACHMENT IV
Heat Stress/Cold Stress and Related Illnesses

Attachment IV – Heat Stress / Cold Stress

1.0 HEAT STRESS

Excessive exposure to a hot environment can bring about a variety of heat-induced disorders. The four main types of heat stress related illnesses: heat rash, heat cramps, heat exhaustion, and heat stroke, are discussed below.

1.1 Heat Rash

Heat rash also know as prickly heat, is likely to occur in hot, humid environments where sweat is not readily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by an infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

1.2 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs or abdomen, but tired muscles (those used to perform the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth, such as the variety of sports drinks on the market.

CAUTION SHOULD BE EXERCISED BY PEOPLE WITH HEART PROBLEMS OR THOSE ON LOW SODIUM DIETS WHO WORK IN HOT ENVIRONMENTS. THESE PEOPLE SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

1.3 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from this condition still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

A summary of the key symptoms of heat exhaustion is as follows:

- Clammy skin
- Confusion
- Dizziness
- Fainting

- Fatigue
- Heat Rash
- Light-headedness
- Nausea
- Profuse sweating
- Slurred Speech
- Weak Pulse

In most cases, treatment involves having the victim rest in a cool place and drink plenty of fluids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.
AS WITH HEAT CRAMPS, CERTAIN PERSONS SHOULD CONSULT WITH THEIR PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

1.4 Heat Stroke

This is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105oF or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

A summary of the key symptoms of heatstroke is as follows:

- Confusion
- Convulsions
- Incoherent Speech
- Staggering Gait
- Unconsciousness
- Sweating stops
- Hot skin, high temperature (yet extremities may feel chilled)

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes moving the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should include continuation of the cooling process and the monitoring of complications that often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

1.5 Preparing for the Heat

Humans, to a large extent, are capable of adjusting to heat. This acclimation to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more tolerable.

On the first day of exposure, body temperature, pulse rate, and general discomfort will be higher. With each succeeding day of exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body does become acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

A gradual exposure to heat gives the body time to become accustomed to higher temperatures, such as those encountered in chemical protective clothing.

1.6 Protecting Against Heat Stress

There are several methods that can be used to reduce heat stress:

- Limit duration of work periods
- Use protective clothing with cooling devices
- Enforce the use of the "Buddy System"
- Consume electrolyte solutions prior to suiting up
- Monitor workers for pulse recovery rates, body fluid loss, body weight loss, and excess fatigue
- Screen for heat stress susceptible candidates in your medical surveillance program
- Have all personnel know the signs and symptoms of heat stress

2.0 COLD STRESS

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold injury, ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at minus 18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

2.1 Frostbite

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost Nip or Initial Frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial Frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite: tissues are cold, pale, and solid; extremely serious injury.

2.2 Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95°F)
- Unconsciousness, glassy stage, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia. Blankets and warm drinks (other than caffeinated coffee) are also recommended.

Measures shall be taken to keep workers from getting wet, such as issuance of rain gear. Workers whose cloths become wet shall be given the opportunity to dry off and change clothes.

ATTACHMENT V
Construction Equipment Safety Rules

Attachment V - Construction Equipment Safety Rules

1.0 ELECTRICAL

1. Live electrical parts shall be guarded against accidental contact by cabinets, enclosure, location, or guarding. Cabinet covers will be replaced.

2. Working and clear space around electric equipment and distribution boxes will be kept clear and assessable.

3. Circuit breakers, switch boxes, etc. will be legibly marked to indicate their purpose.

4. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground-fault circuit interrupters for personnel protection. If the prime contractor has not provided this protection with GFCI receptacles at the temporary service drop, employees will ensure portable GFCI protection is provided. (Employers may wish to use assured equipment grounding conductor program in lieu of this GFCI protection.) This requirement is in addition to any other electrical equipment grounding requirement or double insulated protection.

5. All extension cords will be three-wire (grounded) type and designed for hard or extra hard usage (Type S, ST, SO, STO, or SJ, SJO, SJT, SJTO).

6. Ground prongs will not be removed.

7. Cords and strain relief devices/clamps will be in good condition.

8. All lamps for general illumination will have the bulbs protected against breakage.

9. Electrical cords will not suspend temporary lights unless cords and lights are designed for such suspension. Flexible cords used for temporary and portable lights will be designed for hard or extra hard usage.

10. Employees will not work in such close (able to contact) proximity to any part of an electric power circuit unless the circuit is de-energized, grounded, or guarded by insulation.

11. Equipment or circuits that are de-energized will be locked out and tagged out. The tags will plainly identify the equipment or circuits being worked on.

2.0 COMPRESSED GAS CYLINDERS

1. All gas cylinders will have their contents clearly marked on the outside of each cylinder.

2. Cylinders must be transported, stored, and secured in an upright position. They will never be left laying on the ground or floor, nor used as rollers or supports.

3. Cylinder valves must be protected with caps and closed when not in use.

4. All leaking or defective cylinders must be removed from service promptly, tagged as inoperable and placed in an open space removed from the work area.

5. Oxygen cylinders and fittings will be kept away from oil or grease.

6. When cylinders are hoisted, they will be secured in a cradle, sling-board, or pallet. Valve protection caps will not be used for lifting cylinders from one vertical level to another.

3.0 LADDERS

1. A competent person to identify any unsafe conditions will periodically inspect ladders.

2. Those ladders with structural defects will be removed from service, and repaired or replaced.

3. Straight ladders used on other than stable, level, and dry surfaces must be tied off, held, or secured for stability.

4. Portable ladder side rails will extend at least three feet above the upper landing to which the ladder is used to gain access.

5. The top or top step of a stepladder will not be used as a step.

4.0 AERIAL LIFTS

1. Aerial lifts include cherry pickers, extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers, and any combinations of the above.

2. Only authorized and trained persons will operate aerial lifts.

3. Lift controls will be tested each day before use.

4. Safety harness will be worn when elevated in the aerial lift.

5. Lanyards will be attached to the boom or basket.

6. Employees will not belt off to adjacent poles, structures, or equipment while working from an aerial lift.

7. Employees will always stand firmly on the floor of the basket, and will not sit or climb on the edge of the basket.

8. Planks, ladders, or other devices will not be used for work position or additional working height.

9. Brakes will be set and outriggers will be used.

10. The aerial lift truck will not be moved with the boom elevated and employees in the `basket, unless the equipment is specifically designed for such.

5.0 CRANES

1. A competent person prior to each use/during use to make sure it is in safe operating condition will inspect all cranes. Also, a certification record of monthly inspections to include date, inspector signature, and crane identifier will be maintained.

2. A thorough annual inspection of hoisting machinery will be made by a competent person, or by a government or private agency, and records maintained.

3. Loads will never be swung over the heads of workers in the area.

4. Employees will never ride hooks, concrete buckets, or other material loads being suspended or moved by cranes.

5. Hand signals to crane operators will be those prescribed by the applicable ANSI standard to the type of crane in use.

6. Tag lines must be used to control loads and keep workers away.

7. Loads, booms, and rigging will be kept at least 10 feet from energized electrical lines rated 50 KV or lower unless the lines are de-energized. For lines rated greater that 50 KV follow OSHA Rules and Regulations, 1926.550(a)(15).

8. Cranes will always be operated on firm, level surfaces, or use mats/pads, particularly for near-capacity lifts.

9. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, will be barricaded in such a manner as to prevent employees from being struck or crushed by the crane.

10. If suspended personnel platforms are to be lifted with a crane, reference 1926.550(g) for general and specific requirements.

11. Rigging equipment (chains, slings, wire rope, hooks, other attachments, etc.) will be inspected prior to use on each shift to ensure it is safe. Defective rigging and equipment will be removed from service.

12. Job or shop hooks or other makeshift fasteners using bolts, wire, etc. will not be used.

13. Wire rope shall be taken out of service when one of the following conditions exist:

- In running ropes, 6 random distributed broken wires in one lay or 3 broken wires in one strand or one lay.
- Wear of one-third the original diameter of outside individual wires.
- Kinking, crushing, bird caging, heat damage, or any other damage resulting in distortion of the rope structure.
- In standing ropes, more than two broken wires in one lay in sections beyond end connections, or more than one broken wire at an end connection.

6.0 WELDING and BRAZING

1. Combustible material will be cleared from the area around cutting or welding operations.

2. Welding helmets and goggles will be worn for eye protection and to prevent flash burns.

3. Eye protection to guard against slag while chipping, grinding and dressing of welds will be worn.

4. Only electrode holders specifically designed for arc welding will be used.

5. All parts subject to electrical current will be fully insulated against the maximum voltage encountered to ground.

6. A ground return cable shall have a safe current carrying capacity equal to, or exceeding, the specified maximum output capacity of the arc-welding unit that it services.

7. Cables, leads, hoses, and connections will be placed so that there are no fire or tripping hazards.

7.0 TOOLS

1. Take special precautions when using power tools.

2. Defective tools will be removed form service.

3. Electric power tools will be the grounded-type or double insulated.

4. Power tools will be turned off and motion stopped before setting tool down.

5. Tools will be disconnected from power source before changing drills, blades or bits, or attempting repair or adjustment. Never leave a running tool unattended.

6. Power saws, table saws, and radial arm saws will have operational blade guards installed and used.

7. Unsafe/defective hand tools will not be used. These include sprung jaws on wrenches, mushroomed head of chisels/punches, and cracked/broken handles of any tool.

8. Portable abrasive grinders will have guards installed covering the upper and back portions of the abrasive wheel. Wheel speed ratings will never be less than the grinder RPM speed.

9. Compressed air will not be used for cleaning purposes except when pressure is reduced to less than 30 psi by regulating or use of a safety nozzle, and then only with effective chip guarding and proper personal protective equipment.

10. Abrasive blasting nozzles will have a valve that must be held open manually.

11. Only trained employees will operate powder-actuated tools.

12. Any employee furnished tools of any nature must meet all OSHA and ANSI requirements.

8.0 SAFETY RAILINGS AND OTHER FALL PROTECTION

1. All open sided floors and platforms six feet or more above adjacent floor/ground level will be guarded by a standard railing (top and mid rail, toeboard if required).

2. A stairway or ladder will be provided at any point of access where there is a break in elevation of 19 inches or more.

3. All stairways of four or more risers or greater than 30 inches high will be guarded by a handrail or stair rails

4. When a floor hole or opening (greater than two inches in its least dimension) is created during a work activity, through which a worker can fall, step into, or material can fall through, a cover or a safety guardrail must be installed immediately.

5. Safety nets will be provided when workplaces are more than 25 feet above the ground, water, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts, is impractical.

6. Safety harnesses, lanyards, lines, and lifelines may be used in lieu of other fall protection systems to provide the required fall protection.

7. Adjustment of lanyards must provide for not more than a six-foot fall, and all tie off points must be at least waist high.

8.1 Scaffolds

1. Scaffolds will be erected, moved, dismantled, or altered only under the supervision of a competent person qualified in scaffold erection, moving, dismantling, or alteration.

2. Standard guardrails (consisting of top-rail and mid-rail) will be installed on all open sides and ends of scaffold platforms and/or work levels more than ten feet above the ground, floor, or lower level.

3. Scaffolds four to ten feet in height with a minimum horizontal dimension in any direction less than 45 inches will have standard railings installed on all open sides/ends.

4. Platforms at all working levels will be fully planked. Planking will be laid tight with no more than one inch space between them, overlap at least 12 inches, and extend over end supports 6 - 12 inches.

5. The front edge of all platforms will be no more than 14 inches from the face of the work, except plastering/lathing may be 18 inches.

6. Mobile scaffolds will be erected no more than a maximum height of four times their minimum base dimension.

7. Scaffolds will not be overloaded beyond their design loadings.

8. Scaffold components should not be used as tie-off/anchor points for fall protection devices.

9. Portable ladders, hook-on ladders, attachable ladders, integral prefabricated scaffold frames, walkways, or direct access from another scaffold or structure will be used for access when platforms are more than two feet above or below a point of access.

10. Cross braces will not be used as a mean of access to scaffolds.

11. Scaffolds will not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines than the following:

    - Three feet from insulated lines of less than 300 volts;
    - Ten feet plus for any other insulated or un-insulated lines.

8.2 Excavations and Trenches

1. Any excavation or trench five feet or more in depth will be provided cave-in protection through shoring, sloping, benching, or the use of hydraulic shoring, trench shields, or trench boxes.

2. Trenches less than five feet in depth and showing potential of cave-in will also be provided cave-in protection. Specific requirements of each system are dependent upon the soil classification as determined by a competent person.

3. A competent person will inspect each excavation/trench daily prior to start of work, after every rainstorm or other hazard-increasing occurrence, and as needed throughout the shift.

4. Means of egress will be provided in trenches four feet or more in depth so as to require no more than 25 feet of lateral travel for each employee in the trench.

5. Spoil piles and other equipment will be kept at least two feet from the edge of the trench or excavation.

9.0 MOTOR VEHICLES AND MECHANIZED EQUIPMENT

1. All vehicles and equipment will be checked at the beginning of each shift, and during use, to make sure it is in safe operating condition.

2. All equipment left unattended at night adjacent to highways in normal use shall have lights or reflectors, or barricades with lights or reflectors, to identify the location of the equipment.

3. When equipment is stopped or parked, parking brakes shall be set. Equipment on inclines shall have wheels chocked as well as having parking brakes set.

4. Operators shall not use earth-moving or compaction equipment having an obstructed rear view unless vehicle has an audible reverse signal alarm, or is backed only when observer says it is safe to do so.

5. All vehicles shall have in operable condition:

- Horn (bi-directional equipment)
- Seats, firmly secured, for the number of persons carried. Passengers must ride in seats.
- Seat belts properly installed.
- Service, parking and emergency brake system.
- All vehicles with cabs will be equipped with windshields with safety glass.
- All material handling equipment will equipped with rollover protective structures.

10.0 MISCELLANEOUS

1. All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the impalement hazard.

2. Enclosed chutes will be used when material, trash, and debris are dropped more than 20 feet outside the exterior walls of a building. A substantial gate will be provided near the discharge end of the chute, and guardrails at the chute openings into which workers drop material.

3. Only trained employees will service large truck wheels. A cage or other restraining device plus an airline assembly consisting of a clip-on chuck, gauge, and length of hose will be used to inflate any large truck tires.

4. Only trained employees will operate forklifts and other industrial trucks.

ATTACHMENT VI
OSHA Form 301

OSHA's Form 301
Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone (_____)_____--_____ **Date** ____/ ____/ ____

Information about the employee

1) **Full name** _____

2) **Street** _____

City _____ **State** _____ **ZIP** _____

3) **Date of birth** _____ / _____ / _____

4) **Date hired** _____ / _____ / _____

5) ❒ **Male**
❒ **Female**

Information about the physician or other health care professional

6) **Name of physician or other health care professional** _____

_____

7) **If treatment was given away from the worksite, where was it given?**

Facility _____

Street _____

City _____ **State** _____ **ZIP** _____

8) **Was employee treated in an emergency room?**
❒ **Yes**
❒ **No**

9) **Was employee hospitalized overnight as an in-patient?**
❒ **Yes**
❒ **No**

Information about the case

10) **Case number from the *Log*** _____ *(Transfer the case number from the Log after you record the case.)*

11) **Date of injury or illness** _____ / _____ / _____

12) **Time employee began work** _____ **AM / PM**

13) **Time of event** _____ **AM / PM** ☐ **Check if time cannot be determined**

14) ***What was the employee doing just before the incident occurred?*** **Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific.** ***Examples:*** **"climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."**

15) ***What happened?*** **Tell us how the injury occurred.** ***Examples:*** **"When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."**

16) ***What was the injury or illness?*** **Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore."** ***Examples:*** **"strained back"; "chemical burn, hand"; "carpal tunnel syndrome."**

17) ***What object or substance directly harmed the employee?*** ***Examples:*** **"concrete floor"; "chlorine"; "radial arm saw."** ***If this question does not apply to the incident, leave it blank.***

18) ***If the employee died, when did death occur?*** **Date of death** _____ / _____ / _____

APPENDIX F

Quality Assurance Project Plan

Queens Plaza Residential Development - Site C
Long Island City, New York

NYSDEC Site Number: C241169

QUALITY ASSURANCE PROJECT PLAN

Prepared for:
LIC Development Owner, L.P.
c/o Tishman Speyer Properties
45 Rockefeller Plaza
New York, NY 10111

FLS Project Number: 10112-006

Prepared By:
Arnold F. Fleming, P.E. &
Fleming-Lee Shue, Inc.
158 West 29th Street, 9th Floor
New York, NY 10001

March 2016

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New York, New York 10001
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1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) outlines the protocols and procedures that will be followed during Site Management at the Queens Plaza Residential Development Site C (hereafter referred to as the "Site"). The Site is part of the Brownfield Cleanup Program (BCP), administered by New York State Department of Environmental Conservation. The Site was remediated in accordance with Brownfield Cleanup Agreement (BCA) Index# C241169-03-15, Site #C241169, which was executed on March 19, 2015.

A Site Location Map is included as Figure 1. This QAPP has been prepared in order to ensure Quality Assurance (QA) and Quality Control (QC) for the environmental sampling activities which will be conducted as outlined in the Draft Site Management Plan (SMP), dated January 2016.

2.0 PROJECT TEAM

The project team will consist of Fleming Lee-Shue Inc. (FLS) personnel and subcontractors. All field personnel and subcontractors will have completed a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and the annual HAZWOPER 8-hour refresher in accordance with the Occupational Safety and Health Administration (OSHA) regulations and will have the training required for their respective duties as outlined for this investigation. The project team qualifications are provided in Appendix A

2.1 Remedial Engineer

The oversight of all aspects of the project will be conducted by the Remedial Engineer (RE). The RE is responsible for compliance with the SMP. Arnold F. Fleming, P.E., will act as the RE for the site management action at the Site.

2.2 Project Manager

All components of the site management will be directed and coordinated by the Project Manager. The Project Manager will ensure a smooth flow of information between all parties involved in the investigation by communicating regularly with professionals from the NYSDEC, the site management personnel, and all members of the FLS project team. Mark Hutson will act as Project Managers for the project.

2.3 Field Team Leader

Daily onsite sampling and health and safety activities will be supervised by a Field Team Leader. The Team Leader's responsibilities will include ensuring adherence to the SMP

and Health and Safety Plan (HASP) and regularly reporting daily progress and deviations from the SMP to the Project Manager. Adam Conti, Jeffrey Liebowitz, and Ed Ryan will act as field team leaders.

2.4 Project Quality Assurance / Quality Control Officer

Adherence to the QAPP will be ensured by a FLS QA/QC Officer. Tasks will include reviewing the QA procedures with all personnel before any fieldwork is conducted onsite as well as completing periodic site visits in order to assess the implementation of these procedures. Mark Hutson will act as the QA/QC officer for the project.

2.5 Laboratory Quality Assurance / Quality Control Officer

Quality control procedures will be ensured by the selected laboratory, Accutest, QA/QC officer. This officer will be responsible for the adherence to laboratory protocols, quality control procedures, and checks in the laboratory. The officer will track the movement of the samples from check-in to issue of the analytical results, conducting a final check on the analytical calculations. The laboratory groups performing the respective analyses will complete their own QA/QC and sign off on the data.

3.0 LABORATORY PROCEDURES

3.1 Laboratory Methods

The sample container type, preservation, applicable holding time, and laboratory methods of analysis of the field samples have been included as Table 1. Holding times are based on the SW-846 analytical method which, when adjusted to account for an assumed 2-day sample shipping time, match NYSDEC Analytical Services Protocol (ASP) holding times. Sample analyses will be completed by a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) certified laboratory and reported as NYSDEC ASP Category B deliverables. The data will be submitted to NYSDEC in EqUIS Electronic Data Deliverable format.

A data usability review and validation of the laboratory analytical results will be performed by a third party. The purpose of the data usability review is to determine whether or not the data meets the Site-specific criteria for data quality and use. A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC DER-10 - Appendix 2B Guidance for Data Deliverables of Data Usability Summary Reports.

3.2 Quality Control Sampling

Additional analysis will be conducted for quality control assurance in addition to the laboratory analysis of the groundwater samples. Quality control samples will include:

equipment rinsate blanks, duplicate samples, and trip blanks. The quantities of field samples and quality control samples have been summarized in Table 2.

The equipment blank and duplicate samples will be analyzed for the same parameters as the samples, as shown on Table 1.

4.0 STANDARD OPERATING PROCEDURES

The standard operating procedures for the groundwater monitoring, groundwater sampling, sampling equipment decontamination, well repair and decommissioning, and soil vapor sampling have been described in the following sections. Safety monitoring will be performed in accordance with the site-specific HASP, which mandates that all field personnel wear the appropriate personal protective equipment (PPE).

4.2 Sample Handling

4.2.1 Sample Identification

All sample containers will be labeled with the following information:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Samplers initials

Collected and labeled samples will be placed in ice-filled coolers away from direct sunlight to await shipment/delivery to the laboratory.

Prior to shipment each sample will be placed in a sealable plastic bag. Fresh ice will be placed in two sealable plastic bags, or "blue ice" blocks will be put into the cooler along with the COC form. The samples may be shipped overnight (e.g., via Federal Express) or transported by a laboratory courier. Any coolers that are shipped to the laboratory will be sealed with tape and a COC seal to ensure that the coolers remain sealed during delivery.

4.2.2 Sample Custody

The field personnel will be responsible for maintaining the sample coolers in a secured area until arrival at the laboratory. Sample possession record from the time of obtainment in the field to the time of delivery to the laboratory or shipping off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times

of transfers. The laboratory personnel will examine the custody seal's condition at sample check-in.

4.3 Decontamination Procedures

Decontamination will be performed on plastic sheeting or other containment area that is deemed to prevent runoff to the ground. Prior to use onsite and between sampling locations, pump, water-level meter and other non-disposable sampling equipment will be decontaminated using the following protocol:

1. Scrub using tap water /non-phosphate detergent mixture and bristle brush.
2. Rinse with tap water.
3. Repeat step 1 and 2.
4. Final rinse with distilled water.
5. Air-dry.

4.4 Field Instrumentation

All field instruments will be calibrated at the start of each day of field work in accordance with the manufacturer's specifications. In the instance that an instrument fails calibration, the Project Manager or QA/QC Officer must be contacted so as to arrange repairs or obtain a replacement instrument. A calibration log will be maintained onsite in the field book in order to record specific details regarding instrument calibration, including: dates, problems, and corrective actions. The PID will be calibrated each day using standards of 100 parts per million (ppm) isobutylene, zeroed as per manufacturer specifications.

All field personnel will be trained in the proper operation of all field instruments at the start of the field program; however, instruction manuals for all equipment will be stored onsite as a reference of the proper procedures for operation, maintenance and calibration.

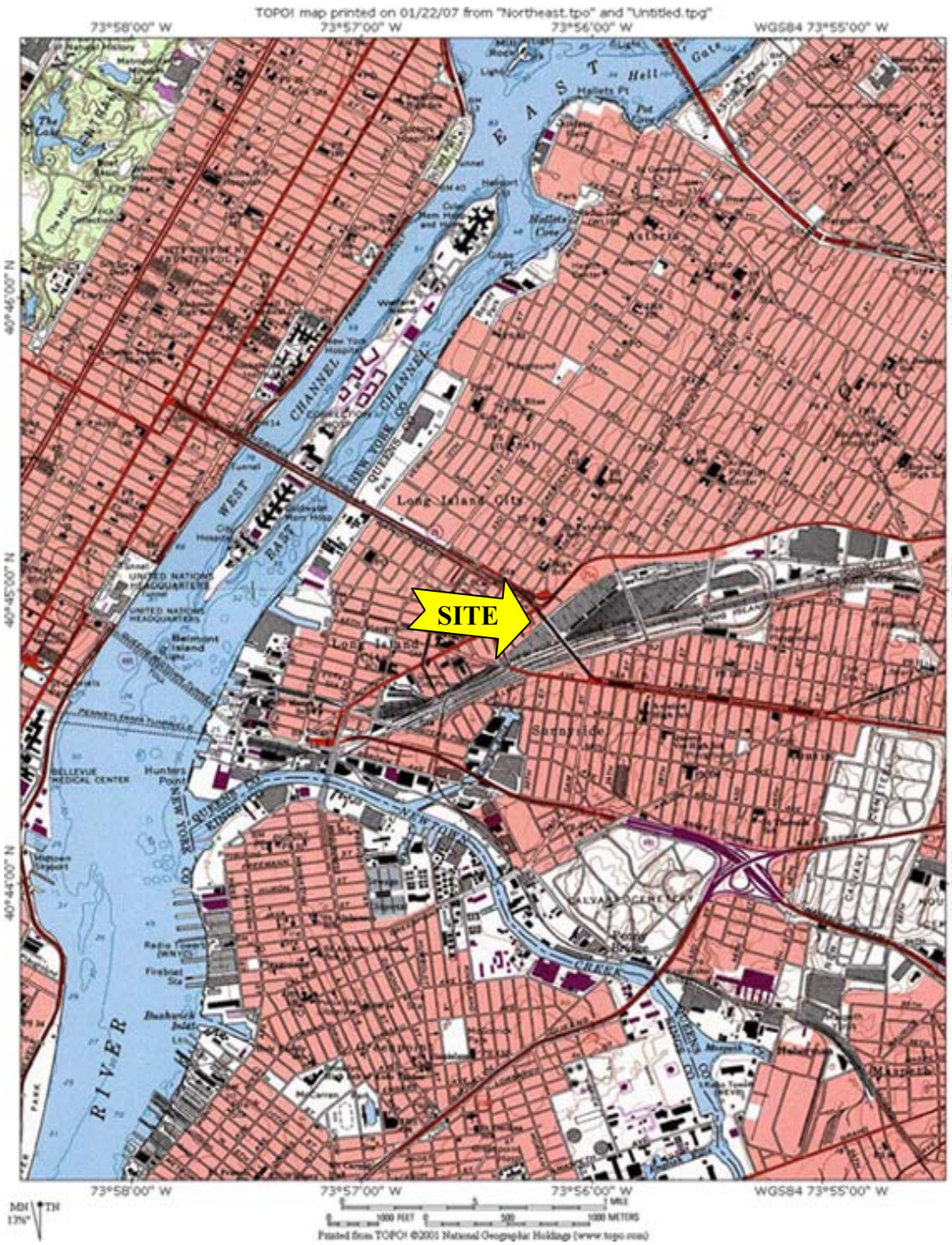

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FIGURE 1: SITE LOCATION

SITE: Queens Plaza Residential Development
Brownfield Cleanup Site NO. C241169
Long Island City, NY

CLIENT: TST LIC Development LLC

Table 1
Summary of Analytical Methods/Quality Assurance
Queens Plaza Residential Development

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Soil	VOCs, TCL or NYS STARS	Post-Ex. Grab	50	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	TCL Pesticides & PCBs	Post-Ex. Grab	50	SW-846 Method 8082 & 8081	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	SVOCs, TCL	Post-Ex. Grab	50	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Metals, TCL	Post-Ex. Grab	50	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Solid Waste	TCLP VOCs	Grab	TBD	SW-846 Methods 1311/8260B	Cool to 4^0 C; no headspace	14 days to TCLP extraction; 14 days from TCLP extraction to analysis	(1) 60 ml VOC vial
Solid Waste	TCLP SVOCs	Grab	TBD	SW-846 Methods 1311/ 8270C	Cool to 4^0 C	14 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Pesticides	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Herbicides	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar

Table 1
Summary of Analytical Methods/Quality Assurance
Queens Plaza Residential Development

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Solid Waste	TCLP Metals	Grab	TBD	SW 846 Methods 1311/ 6010B/7000 Series	Cool to 4^0 C	Hg: 28 days to TCLP extraction; 28 days from TCLP extraction to analysis Other Metals: 6 months to TCLP extraction; 6 months from TCLP extraction to analysis	(1) 500 mL amber glass jar
Solid Waste	Ignitability	Grab	TBD	SW-846 Method 1010	Cool to 4^0 C	None specified	(1) 500 mL amber glass jar
Solid Waste	Corrosivity	Grab	TBD	SW-846 Method 9045C	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste	Reactive cyanide	Grab	TBD	SW-846 Chapter 7, Section 7.3.3	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste	Reactive sulfide	Grab	TBD	SW-846 Chapter 7, Section 7.3.4	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar

[1] Actual number of samples may vary depending on field conditions, sample material availability, and field observations

[2] From date of sample collection

[3] MS/MSDs require duplicate volume for all parameters for solid matrices; MS/MSDs require triplicate volume for organic parameters for aqueous matrices and duplicate volume for inorganic parameters for aqueous matrices

TBD - To Be Determined

TCL – Target Compound List

Table 2
Summary of Quality Control Samples
Queens Plaza Residential Development

Sample Matrix	Analytical Parameter	Sample Type	No. of QA/QC Samples
Water.	VOCs	Trip Blank	1 per shipment
Soil, Post-Ex.	VOC, SVOC, Metals	Duplicate	1 per 20 samples
Water	VOC, SVOC, Metals	Equipment Blank	1 per 20 samples

Fleming Lee Shue

Environmental Management & Consulting

Arnold F. Fleming, PE
Owner

Education
- Bachelor of Science, Civil Engineering, Manhattan College (1968)
- Masters of Engineering, Manhattan College (1969)

Professional Registration
Professional Engineer, New York

General Expertise
Arnold F. Fleming is an environmental engineer with over 30 years of experience in the areas of water quality and planning studies, domestic and industrial wastewater treatment and disposal, environmental impact analysis, contaminated materials assessment and remediation, and environmental permitting. Mr. Fleming was one of the founders of Allee King Rosen & Fleming, Inc., AKRF, Inc., and AKRF Engineering P.C. For over 20 years, Mr. Fleming has provided these firms with engineering expertise in all technical areas relating to permitting and hazardous waste assessment and management and the assessment of impacts in these technical areas. Mr. Fleming has been Principal in charge for Phase II Environmental Assessments for over 100 residential, commercial and industrial sites in the Metropolitan New York area. Duties include design of sampling program, oversight of means and methods of sample collection, and preparation of final reports including recommendations for remediation. He has also been involved with the design for over 50 remediation systems including UST tank removals, contaminated soil disposal, soil vapor extraction systems, sparged air/ soil vapor extraction systems. Remedial designs include approximately 20 sites remediated under the State of New York Voluntary Clean-up program, and two sites on the Registry of Inactive Hazardous Waste Sites. Mr. Fleming has been the Principal in charge of the preparation of Phase I Environmental Assessments for several hundred residential, commercial and industrial properties, as well as several hospitals throughout the New York Metropolitan Area. He has been the Project manager for the preparation of 208 wastewater facility planning studies, and has prepared the infrastructure and utility assessments for over 100 EIS's in the Metropolitan New York Area.

PROJECT EXPERIENCE

535 West 23rd Street Development
Prepared the Phase I and asbestos surveys for this Manhattan development site. Designed the Phase II sampling program, executed the sampling and on the basis of the findings obtained approval to remediate an extensive oil spill via bio-remediation. The system was designed and installed under the new building with operation to begin upon occupancy of the building. The approach allowed the construction schedule to proceed without delay due to the discovered contamination.

Queens West Redevelopment
Technical representative to the Queens West Development Corporation (QWDC) a subsidiary to the Empire State Development Corporation charged with developing the 78 area redevelopment of the Hunters Point waterfront into a mixed commercial/residential development. Mr. Fleming developed a model remediation plan for the first residential building in 1995 and has applied this model to the next three residential development sites in Stage 1 of the development, the first having opened for residency in the summer of 2002. Mr. Fleming is assisting QWDC in selecting a developer for Stage 2 and 4 and is advising them on the remediation of Stage 2, a former oil refinery and paint factories. Development of Stage 2 is to occur simultaneous to the remediation efforts in the refinery portion of the site.

Staten Island Muss Site Redevelopment
Managed the initial Phase II sampling for this former industrial site re-zoned for single family residential development. The site was listed on the Registry of Inactive Hazardous Waste Sites. Prepared in Remedial Investigation and Feasibility Studied that led to a Record of Decision (ROD) setting forth the remediation for the site. Prepared the remedial Design to satisfy the ROD and managed the oversight of the remediation leading up to the removal of the site from the registry. Designed a revetment system to protect the capping material that was an integral part of the remediation from storm related erosion from the adjacent Raritan Bay. Petitioned the Federal Emergency Management Agency to remove the site from the 100-year flood plain on the basis of the new elevations and erosion measures implemented on the site.

Rego Park, Queens Remediation
Prepared a Voluntary Clean-up Application, performed additional sampling and developed a remedial work plan to remove solvent contaminated soils from this development site. Designed a sparged air/ Vapor Extraction System to remediated contaminated groundwater and site soils. Operated the system for two years reducing the groundwater contamination by over 90%. The sparged air / VES was designed to be installed under the building avoiding the delay of remediation the site prior to construction.

Hudson River Park Redevelopment
For this new park stretching from Battery Park City to 59th Street, Mr. Fleming oversaw the preparation of the US Army Corps of Engineers and the New York State Department of Environmental Conservation permit application s and responses to comments leading to issuance of this waterfront development permit. This permit was unique in that it addressed the first segment that was designed and ready to be built as well as the entire park for which no design was available. To address the future segments, schematic design drawings were submitted showing conceptual designs that would be refined as the park was designed and build. A permit condition to submit each segment design for review and determination of consistency with the master permit was included to assure that no impacts were introduced in the design process. If a determination on any segment were made that the design was not consistent with the master permit, a new permit process would be initiated.

Greenpoint Brooklyn Waterfront Development Planning
For a private developer, Mr. Fleming has prepared an evaluation of the permitting concerns including a jurisdictional assessment of the existing waterfront edge, to assist in the establishing of a development plan that will be compatible with the requirements of federal and state permits.

Queens West Redevelopment
Mr. Fleming led the permitting effort to allow redevelopment of the waters edge associated with this 78 acre mixed Commercial/Residential waterfront development. The project has three stages, the first under construction and permitted in 1995. Mr. Fleming managed the permitting effort for this first waterfront permit. The current application to the state and federal permitting agencies is for a project wide permit covering the remaining 3 stages of which 2 are under design. The final stage of the project was the subject to a schematic design only. Notable in the current permit is the reconstruction of collapsed platforms that are to become a site wide park and esplanade providing water access to this portion of the east river for the first time in over a century.

West Side Ferry Terminal
For the New York City Economic Development Corporation, Mr. Fleming led the permit effort to allow a new public ferry terminal located within the bounds of the Hudson River Park. Because the ferry terminal was not approved when the Park permit was issued, this project was carved out of the park permitting process and followed a separate permit track. The permit application was assembled using updated submissions from the Park permit application and addressed the specific concerns of the State and federal permitting

Jersey City Colgate Site Redevelopment
For this mixed commercial/residential waterfront redevelopment project, Mr. Fleming prepared the state Coastal Zone Development permit and a US army Corp of Engineers dredge and fill permit to allow a marina, esplanade and a new combined sewer manifold to be built. The sewer manifold was placed in the river because of space limitations and was permitted, the first fill permit in this portion of the Hudson River in 20 years.

River East Environmental Permits for Shoreline Protection
For this 10 acre site obtained the permits to install 500 feet of revetment to allow a 1.4 million square foot residential development on a former oil terminal. Also prepared the Remedial Action Work Plan to remove historic spilled oil simultaneous to Vernon Realty shoreline construction.

Fleming Lee Shue

Environmental Management & Consulting

Steven E. Panter, CGWP

- Senior Consultant/Hydrogeologist

Education

- Master of Science, Environmental Engineering, Concentration in Hydrogeology New Jersey Institute of Technology (1990)
- Graduate Studies, Soil Sciences, Rutgers University (1979)
- Bachelor of Science, Forest Science, University of Wisconsin (1978)

Certifications/Training

- OSHA 40-Hour HAZWOPER Training
- OSHA 8-Hour Supervisor Training
- Fracture Trace and Lineament Analysis, April 1995
- Intensive training course in identifying fractures and lineaments in rocks of Pennsylvania.
- The course emphasized the importance of identifying these features in order to assess and understand ground water movement and to understand contaminant migration in geologic settings where these features can play a key role.
- Treatment Technology for Contaminated Soils and Ground Water, February 1995.
- Assessment, Control and Remediation of LNAPL Contaminated Sites, October 1994.
- Ground Water Flow through Fractured Media, University of Wisconsin, 1993.
- Hydrogeology of the Glacial Deposits of New Jersey: An Applied Field Course, presented by Cook College in Cooperation with Rutgers University, 1993.
- Design and Analysis of Aquifer Pumping Tests - Association of Ground Water Scientists and Engineers, Dublin, Ohio, 1991.

Professional Registration

- Certified Ground Water Professional (CGWP No. 437) by the National Ground Water. Association (NGWA), June 1993

General Expertise

Steven Panter is a Hydrogeologist with over 28 years of experience in environmental consulting. Mr. Panter has supervised or played a key technical role in many soil and ground water investigations involving investigations and remediation of fuel oil, PCE, TCE, polychlorinated biphenyls (PCBs), cumene, gasoline, organic compounds, metals, dioxins, and coal tar. They have been performed for landfills, chemical processing plants, underground storage tanks (UST), fuel oil terminals, manufacturing plants and power production facilities. The clients have been primarily large corporations, utilities, or municipalities, although some work has been done for small businesses. He is responsible for projects that range from less than $20K to more than $2,000,000. Mr. Panter has developed sampling and analysis programs for a variety of ground water and subsurface soil investigations. His expertise also extends to technical oversight and legal

support; and environmental auditing. Mr. Panter also has worked on environmental impact statements for several proposed power plant facilities and power plant upgrades in New York State.

PROJECT EXPERIENCE

Queens West Parcel 8 Remediation
Mr. Panter oversaw and directed the investigation of a Brownfield Cleanup Program site contaminated with 80,000 pounds of coal tar waste. He developed an innovative *in situ* remediation approach, RemMetrik[SM], which eliminated excavation and saved the client $7 to $9 million dollars in cleanup costs and eliminated community exposure. The treatment focused on oxidation of 47,000 pounds of coal tar contaminant in the treatment interval. This was the first remediation of its kind in New York State. NYSDEC approved the results and issued a Certificate of Completion within 14 months of the beginning of cleanup. Treatment lasted five months in one application.

Queens West Center Boulevard Remediation
Mr. Panter oversaw and directed the investigation of a Voluntary Cleanup Site contaminated with 18,500 pounds of coal tar waste. He developed an innovative *in situ* remediation approach, RemMetrik[SM], which eliminated excavation of the street and disruption to the community and eliminated public exposure. This was the second remediation of its kind in New York State. NYSDEC review is ongoing. Treatment lasted two months in one application.

Queens West Redevelopment
Mr. Panter oversees environmental compliance for a very large scale redevelopment of the New York City waterfront, and entails remediation of numerous parcels of former industrial waterfront that are heavily contaminated with petroleum, coal tar, and numerous other wastes. The site will be redeveloped into commercial and residential space with parks and green spaces. Mr. Panter advises QWDC on all aspects of environmental compliance, contaminated site investigation, hazardous materials management, and remediation.

Long Island City, Queens, New York Redevelopment
Mr. Panter prepared a detailed assessment of soil disposal options and costs for a facility contaminated with creosote and metals. He used a statistical analysis approach to advise the client on the most cost effective means of selecting soil disposal options depending on the type and degree of soil contamination.

West 23rd Street 10th Avenue Redevelopment
On a site contaminated with gasoline and fuel oil, Mr. Panter prepared an analysis differentiating the sources of on-site and off-site contamination in order to justify closing the spill number. This was a multivariate analysis demonstrating that the on-site contamination was clearly different from the off-site contamination. What was unique about the analysis is that conventional reporting of results did not distinguish between the different sources, but the multivariate analysis—using the same data—showed a distinct difference.

West 30th Street and 11th Avenue Redevelopment
On a site contaminated with metals near a former coal gas plant slated for a major residential development, Mr. Panter analyzed groundwater issues stemming from benzene contamination and successfully predicted contaminant plume behavior during dewatering. He developed an indoor air monitoring program for a neighboring residential building as a protective measure against inducing contamination to residents. He also presented data supporting the case that chromium levels were the result of natural conditions rather than contamination.

Gansevoort Street to West 23rd Street; The High Line
Mr. Panter managed the waste characterization portion of the High Line project in New York City, where a defunct elevated industrial railway is being converted into a major urban park and green space. Mr. Panter directed testing, removal, and management of contaminated track ballast and was a key individual in planning waste management for all track bed materials. He was responsible for directing and planning inspections for hazardous materials throughout the entire program and also directed air sampling and monitoring for the construction phase.

Astoria, Queens, NY Astoria Gas Turbines Well Reconnaissance Program
Mr. Panter managed a well reconnaissance program at the Astoria Gas Turbine facility to assist the development of a remediation program to close out petroleum spills inherited from the previous site owner. The program encompassed evaluation of more than 70 monitoring wells, groundwater and product level measurements, groundwater sampling, a summary of the findings, and recommendations for improving the monitoring network and resolving ambiguities in the well information. Mr. Panter effectively coordinated meetings between station representatives, off-site NRG managers, and an independent project manager working for NRG. He also facilitated very productive meetings between the previous site owner and NRG in order to obtain additional well information and secure permission to access wells in off-site, adjacent areas.

Staten Island, NRG Arthur Kill Generating Station, Staten Island Ignition Oil Area Recovery Program
Mr. Panter has been assisting NRG at the Arthur Kill Generating Station with a product recovery/monitoring in the Ignition Oil Area. This effort entails monthly monitoring, recovery, and reporting of product levels in five recovery wells installed by a consulting firm when the plant belonged to Con Edison. At NRG's request, the program was recently extended. Station personnel often call the Mr. Panter to discuss other environmental matters because of his extensive site knowledge and excellent rapport with the Station managers and staff.

Staten Island, Transformer Explosion Remediation Program
Following a transformer fire and rupture that released PCBs in concentrations exceeding 300,000 ppm, Mr. Panter managed a major remediation program encompassing massive interior and exterior portions of the power plant including soils, pavement, and walls. This was done under a Consent Order and had potential penalties of $500,000,000. Mr. Panter oversaw and directed all aspects of the field program and represented Con Edison at numerous meetings with regulatory personnel. This portion of the remedial program lasted one year.

Staten Island, Property Sale Site Assessment
Project manager for a large-scale expedited site assessment of the Arthur Kill Generating Station as part of the property sale to Visy Paper Company and the New York City Economic Development Corporation. Directed, planned, and coordinated the investigation. Played a critical role in numerous meetings with representatives of the New York State Department of Environmental Conservation (NYSDEC) from the Acting Regional Director and Director of Hazardous Waste to NYSDEC field staff. Rapidly and thoroughly completed the site investigation and remedial assessment to a level whereby the findings and recommendations were easily accepted by NYSDEC. Acceptance of results and remedial strategies was facilitated by the excellent rapport with NYSDEC representatives.

All Boroughs, Site Investigation, New York City Housing Authority
Supervised and coordinated the investigation of 20 housing project sites with leaking USTs and pipelines for the New York City Housing Authority. Provided client contact, prepared work plans, supervised field programs, interpreted and analyzed data, and prepared final reports and recommendations. The focus of the program was to characterize and delineate the extent of oil-contaminated soils and ground water contamination, prior to remediation. Program included installation of monitoring wells and interpretation of soil and ground water contamination in a variety of geologic settings throughout the five boroughs including marine deposits, bedrock, glacial outwash and till.

Manhattan and Brooklyn, Environmental Assessment, New York City School Construction Authority
Project Manager for an environmental assessment of three properties proposed for an elementary and two middle schools in New York City. Directed technical and administrative aspects of the project. Program consisted of installation of deep monitoring wells in glacial outwash deposits and evaluation of ground water flow and quality.

Environmental Assessment, New York City Economic Development Corporation.
Managed environmental assessments of two NYC-owned properties slated for commercial development. Directed technical aspects of the project including soil gas testing and monitoring well installation and sampling.

All Boroughs, Site Investigations, New York City Housing Authority
Supervised the investigation of 20 sites with leaking USTs for the New York City Housing Authority.

Fuel Oil Terminal Demolition, Paragon Cable Company/Rucci Oil Company
Oversaw the demolition of two fuel oil terminals in NYC. Prepared a remedial action and sampling plan to expedite the cleanup process and comply with New York State Department of Environmental Conservation regulations. Supervised and directed the activities of several contractors with field crews of 10 to 20 people. Advised corporate principals on project progress, issues and alternatives. Met with regulatory officials on behalf of the client. One facility contained more than 18 large aboveground and underground fuel oil tanks. Total storage capacity was 2.3 million gallons. The second

facility had seven underground storage tanks and one aboveground tank. Total storage capacity was 385,000 gallons.

Rockaway (NJ) Borough Superfund Site Ground Water Investigation Program
Developed a ground water investigation program for a buried glacial aquifer system in northern New Jersey. Designed the investigation to examine the effect of TCE contamination on a local aquifer. The program consisted of a network of shallow, deep and intermediate level monitoring wells and associated ground water sampling.

All Boroughs, Ground Water and Soil Sampling, New York City Housing Authority
Developed a ground water and soils sampling program to assess fuel oil contamination at approximately 20 New York City Housing Authority sites.

Site Investigation, New York City School Construction Authority
Conducted site investigations of soils and ground water in Manhattan and Brooklyn.

Soil Sampling Program, Paragon Cable/Rucci Oil Company
Conducted a soil sampling program as part of the demolition of two fuel oil terminals in NYC. The program included the sampling of waste soil piles and the excavations.

Expert Witness Testimony and Report Preparation
Mr. Panter testified as an expert witness as part of a technical panel before the New York State Board of Public Utilities as part of a power plant siting hearing. In this capacity, Mr. Panter was cross-examined on his written testimony by a panel of attorney's on the side of the opposition. He testified on technical matters involving hazardous materials and contamination of soil and groundwater and the impacts to the community depending on the project. Mr. Panter also served as a fact expert for a New York State agency in a contamination lawsuit against a Fortune 100 company. Mr. Panter was deposed as part of this case. He drafted and corroborated on two expert reports prepared and prepared counter arguments for the case. The case had a successful outcome for the client.

Fleming Lee Shue

Environmental Management & Consulting

Mark Hutson
Project Manager

Education
B.I.S., Geological Sciences and Applied Biological Sciences, Arizona State University, Tempe, AZ

Awards / Certifications / Training
- OSHA 40-HAZWOPER Training
- OSHA 10-Hour Construction Safety

General Expertise
Mark Hutson a Project Manager with 9 years of experience in environmental consulting, primarily environmental liability management. Mark provides clients with innovative, cost effective strategies to manage their environmental liability and compliance issues. His expertise includes site characterization, sub-surface investigations, soil and ground water remediation, remedial design and implementation, data management and interpretation, regulatory compliance and reporting, stakeholder management, and insurance claim investigations. He has considerable leadership and supervisory experience including direct interface with clients, and additional third party stakeholders such as property owners, real estate developers and regulatory agencies including the NYSDEC, NYCDEP, NYCOER, and various county health departments.

PROJECT EXPERIENCE

Project Manager for Retail Petroleum Facilities, New York

Served as project manager for numerous active and former retail petroleum facilities in varying lifecycle stages including characterization, remedial design and implementation, and closure for a major petroleum client. Responsibilities include scope development, remedial design and implementation, data management and interpretation, budget forecasting and management, regulatory compliance and reporting, and management of project teams and subcontractors.

Project Manager for Insurance Claim Investigation and Support, NY & NJ
Served as the regional lead and project manager for an international insurance company acting as environmental expert to assist the insurer in claim determinations. Responsibilities include claim investigation and technical support on projects associated with petroleum and industrial chemical releases, remediation, and UST removals in New York and New Jersey. Responsible for developing cost to incident closure estimates, determining what is reasonable and necessary regarding an insured's response to a claim,

preparation of claim recommendations and reports including reviewing insured's invoices and invoice tracking.

Project Lead, Commingled Plume Investigation/Remediation, Blythe, CA

Acted as field geologist/environmental scientist for a public municipality client responsible for a commingled gasoline/diesel plume emanating from multiple sources. Responsibilities included plume characterization, site investigation, remedial design, implementation and operation, permitting, data collection and analysis, and waste management. Oversaw the installation of five multi-phase extraction (MPE) systems and was responsible for the operation, maintenance and optimization of the MPE systems operating simultaneously.

Fleming Lee Shue

Environmental Management & Consulting

Daniel DiRocco
Project Manager

Education

- Bachelor of Arts (BA), Environmental Science (Geology), Minor economics, Hobart College, Geneva, NY

Awards / Certifications / Training

- OSHA 40-HAZWOPER Training

General Expertise

Dan DiRocco is a Project Manager with 13 years of experience in environmental site investigation and remediation, regulatory compliance, brownfields redevelopment and hydrogeology as a project manager, supervisor and client manager for a wide range of multidisciplinary projects. Mr. DiRocco has extensive experience with sites under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Clean-up Program (BCP) and New York City Office of Environmental Remediation (OER) E-Designated sites, including hazardous materials, noise attenuation, and air quality. He has considerable leadership experience including extensive client communications, participating in negotiations with regulatory agencies, large-scale cost estimating and long term management of large development projects, and remedial design and implementation.

PROJECT EXPERIENCE

Glass Manufacturing Plant Redevelopment, Dayville, CT

Oversight of remediation of the former Glass factory converted to 25 acre mall under CTDEEP. Ecological investigation of wetland impacts and preparation of an ecological wetlands assessment. Preparation of a remedial action work plan and oversight of the remediation of wetlands impacted by former glass manufacturing operations. Oversight of the demolition, waste characterization and remedial cleanup phases of the project. Managed post groundwater monitoring.

Landfill and Glass Manufacturing Plant Redevelopment, Carteret, NJ

Preparation of a New Jersey Department of Environmental Protection (NJDEP) Landfill Closure Report and Operation & Maintenace Plan. Wetland mitigtaion and phytoremdiaiton barrier design. Environemntal Health & Safety Oversight of Construction on an environemntal impacted and senstive site.

Wetlands Restoration, Chester, NY

Assisted with the cost estimate, design and implementation of a freshwater wetlands restoration project to bring a property into compliance with NYSDEC. Property owner

had illegally filled wetlands and NYSDEC required property owner to restore wetlands to an equal or higher value. Project completd in 2004 with ongoing maintenance requirements.

Mixed Use Redevelopment, Long Island City, NY (Mutiple Sites)
Conducted complete Remedial services from Phase I preliminary investigations through completion of remedial cleanup and post remediation site management at multiple Sites throughout the five boroughs under NYSDEC or NYCOER (formerly NYCDEP). With FLS conducting same remedial services on new NYC projects.

Former Asphalt Plant Waterfront Redevelopment, Queens, NY
Oversight of the remdial investigation and cleanup of a 21 acre waterfront redevelopment project in the NYSDEC Brownfield Cleanup Program.

511 West 21st Street Redevelopment
Submitted application for BCP program. Oversaw completion of RAWP and Remedial Investigation (RI) report for new residential high-rise building. Direct and oversee groundwater, soil, and soil vapor sampling and submitted reports to NYSDEC as required.

Jackson Avenue Fleet Redevelopment
Oversee the implementation the Community Air Monitoring Program according to the Remedial Action Work Plan and coordination of intricate soil disposal while site was undergoing massive excavation and foundation building.

550 W 29th Street Redevelopment
Oversaw the completion of RAWP and Remedial Investigation (RI) report for new mixed use high-rise building with a hazardous materials, air, and noise E-Designation.

Fleming Lee Shue

Environmental Management & Consulting

Raphael J. Rosenbaum
Environmental Scientist I

Education

- Master of Science (MS), Environmental Science, The City University of New York, Brooklyn College (2017 Anticipated Graduation)
- Bachelor of Arts (BA), Environmental Studies, The State University Of New York at Buffalo (2010)

Health and Safety Training

- OSHA 40-Hour HAZWOPER Training
- OSHA 8-Hour HAZWOPER Supervisor Training
- OSHA 10-Hour Construction Safety Training
- Confined Space Awareness Training
- Amtrak Contractor Safety Training

General Expertise

Raphael J. Rosenbaum is currently an Environmental Scientist I with Fleming Lee-Shue. As an Environmental Scientist, Mr. Rosenbaum has been responsible for conducting remedial investigations, soil, soil vapor and groundwater monitoring and sampling, air monitoring, implementation of Community Air Monitoring Program (CAMP) implementation, sub-slab depressurization system (SSDS) and soil vapor extraction (SVE) system monitoring, overseeing underground storage tank (UST) removals and closures, soil excavation, regulatory reporting, analytical data review, cost estimating, and general experience in subcontractor oversight and contractor relations. Raphael has approximately 5 years of experience in the field of environmental consulting.

PROJECT EXPERIENCE

Eagle Electronics Warehouse Redevelopment

Completed Phase II investigation, waste characterization sampling and additional soil vapor investigations. Oversight of the closure of large volume aboveground storage tanks and the restoration of a coal furnace. Drafted reports to documents investigation and characterization results and completed petroleum bulk storage registration and closure.

Court Square Fleet Site Residential Development

Conducted waste characterization of the city-block sized site. Initiated and supervised the implementation of CAMP and remedial oversight by a team of peers and subcontractors.

Harlem River Brownfield Opportunity Area Redevelopment

Participated in collaborative efforts to assess the environmental liabilities and opportunities in the redevelopment of properties along the Bronx side of the Harlem

River Brownfield Opportunity Area. Tabulated Phase I background information on sites of interest and generated submission documents for presentation to the project team.

500 West 30th Street Redevelopment
Conducted waste characterization sampling, implemented CAMP uniquely designed in consideration of the High Line Park, a high-traffic public space which passed directly through and overhead of the Site. Completed daily, weekly and monthly reporting to the New York City Office of Environmental Remediation (OER), oversaw the removal of multiple USTs, oversaw and reported on the manifesting of over 5,000 tons of hazardous soil and approximately 15,000 tons of non-hazardous soil.

Coney Island Seaside Park
Ensured compliance with a RAWP to remediate a group of properties to be redeveloped into a public amphitheater. Implemented CAMP while overseeing the excavation of hot spots and the import of soil under OER's Clean Soil Bank program.

517 West 28th Street Redevelopment
Oversaw the installation of injection and groundwater monitoring wells. Conducted pre-treatment and post-treatment groundwater monitoring and sampling to determine baseline groundwater parameters and measure effect of remedial treatment. Measured groundwater elevation and drafted figures illustrating groundwater contours and flow direction.

3595 Broadway Redevelopment
Oversaw the project life cycle. conducted a remedial investigation, a supplemental remedial investigation, and waste characterization sampling to classify nature and extent of contamination. Implemented the RAWP, supervised CAMP monitoring, oversaw SSDS system installation and assisted in system design. Drafted the Remedial Action Report to culminate project completion.

529 West 29th Street Redevelopment
Implemented and oversaw CAMP structured for contractor implementation of visual particulate monitoring and roaming PID monitoring during intrusive soil activities.

Skillman Avenue Environmental Liability Assessment & Remediation
Implemented site-specific groundwater sampling protocols, including dosing and application of field preservation. Provided oversight during a supplemental remedial investigation utilizing membrane interface probe technology to determine the extent and distribution of chlorinated volatile organics in a complex geologic setting. Developed groundwater monitoring wells and conducted slug testing to determine hydraulic conductivity. Drafted and formatted analytical data tables and iso-contour maps. Provided cost estimating for well abandonment.

Queens West Redevelopment
Conducted quarterly groundwater monitoring as required under the SMP. Inspected and maintained a recovery system for light non-aqueous phase liquid. Completed annual inspection of engineering controls for inclusion in Periodic Review Reports.

Queens West Parcel 8 Remediation
Provided environmental oversight to installation of geothermal test well through residually impacted soil management zone, as required under SMP, and oversaw the implementation of quarterly groundwater monitoring.

167 North Broadway Remediation
Completed UST closure report after performing and providing oversight to remedial investigation and tank closure activities. Conducted five quarters of groundwater monitoring and completed reporting to meet monitoring requirements.

200 East 16th Street Vapor Intrusion Investigation
Completed proposal for and conducted a complete vapor intrusion investigation on a former dry cleaning operation inside of a residential use building with multiple commercial tenants occupying neighboring spacing.

Oak Point Properties Storm Water Pollution Prevention Plan
Conducted monthly inspections of the waterfront property for compliance with the Storm Water Pollution Prevention Plan.

650 Fountain Avenue Remediation
Provided subcontractor oversight, air monitoring and regulatory reporting for indoor and outdoor UST removal and closure.

1112 Myrtle Avenue
Conducted additional groundwater sampling as requested by client, to successfully contest findings of previous Phase II Investigation.

388 Bridge Street Redevelopment
Conducted SSDS/SVE systems inspections and vapor sampling.

APPENDIX G

Site Management Forms

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

ENCLOSURE 1
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
INSTITUTIONAL AND ENGINEERING CONTROLS CERTIFICATION FORM

SITE DETAILS

SITE NO.

SITE NAME

SITE ADDRESS: ZIP CODE:

CITY/TOWN: Long Island City

COUNTY: Queens

CURRENT USE: Mixed Use (commercial and residential)

CURRENT CERTIFICATION FREQUENCY: EVERY 1 YEAR(S)

VERIFICATION OF SITE DETAILS

		YES	NO
1.	Are the SITE DETAILS above, correct?	☐	☐
	If NO, are changes handwritten above or included on a separate sheet?	☐	
2.	Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment since the initial/last certification?	☐	☐
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
3.	Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property since the initial/last certification?	☐	☐
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
4.	Has a change-of-use occurred since the initial/last certification?	☐	☐
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
5.	Has any new information come to your attention to indicate that assumptions made in the qualitative exposure assessment for offsite contamination are no longer valid (applies to non-significant threat sites subject to ECL 27-1415.7(c))? **NA**	☐	☐
	If YES, is the new information or evidence that new information has been previously submitted included with this certification?	☐	
6.	Are the assumptions in the qualitative exposure assessment still valid (must be certified every five years for non-significant threat sites subject to ECL 27-1415.7(c))?**NA**	☐	☐
	If NO, are changes in the assessment included with this certification?	☐	

SITE NO.

Description of Institutional/Engineering Control	Control Certification
ENVIRONMENTAL EASEMENT	☐
DEED RESTRICTIONS	☐
OTHER CONTROLS (Engineering Controls)	☒

CONTROL CERTIFICATION STATEMENT

For each institutional or engineering control listed above, I certify by checking "Yes" that all of the following statements are true:

(a) the institutional control and/or engineering control employed at this site is unchanged from the date the control was put in-place, or last approved by the Department;

(b) nothing has occurred that would impair the ability of such control to protect public health and the environment;

(c) nothing has occurred that would constitute a violation or failure to comply with any Site Management Plan for this control; and

(d) access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;

(e) if a financial assurance mechanism is required under the remedial work plan for the site, the mechanism remains valid and sufficient for their intended purpose under the work plan.

CONTROL CERTIFICATIONS
SITE NO.

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I _____(print name), _____

(print business address), am certifying as _____ (Owner or Owner's Designated Site Representative (if the site consists of multiple properties, I have been authorized and designated by all site owners to sign this certification) for the Site named in the Site Details section of this form.

_____ _____

Signature of Site Owner or Representative Rendering Certification Date

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QUALIFIED ENVIRONMENTAL PROFESSIONAL (QEP) SIGNATURE

I certify that all information and statements in this Certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I _____(print name), _____

(print business address), am certifying as a Qualified Environmental Professional for the_____

_____ (Owner or Owner's Representative) for the Site named in the Site Details section of this form.

Signature of Qualified Environmental Professional, for the Owner or the Owner's Representative, Rendering Certification | Stamp (if Required) | Date

Enclosure

Certification of Institutional Controls/ Engineering Controls (ICs/ECs) Step-by-Step Instructions, Certification Requirements and Definitions

The Site owner, or site owner's representative, and when necessary, a Professional Engineer (P.E.), or the Qualified Environmental Professional (QEP), must review and complete the IC/EC Certification Form, sign it, and return it, along with the Periodic Site Management Report, within 45 days of the date of this notice.

Institutional Controls (defined below) are organized into 4 categories: Governmental Controls (e.g., groundwater-use restrictions), Proprietary Controls (e.g., Environmental Easements), Enforcement and Permit Tools (e.g., Consent Orders), and Informational Devices (e.g., State Registries of Inactive Hazardous Waste Sites). The Certification Form shows the Control information the Department has for this Site. Please use the following instructions to complete the IC/EC Certification.

I. Verification of Site Details (First and Second Boxes)

1. Verify the accuracy of information in the **Site Details** section by answering the 6 questions. If necessary, you and/or your P.E. or QEP may handwrite changes and submit supporting documentation.

II. Verification of Institutional / Engineering Controls (Third and Fourth Boxes)

1. Review the listed Institutional / Engineering Controls and select "YES" or "NO" for **Control Certification** for each IC/EC, based on Sections (a)-(d) of the **Control Certification Statement**.

2. If you cannot certify "Yes" for each Control, please continue to complete the remainder of this **Control Certification** form. Attach supporting documentation that explains why the **Control Certification** cannot be rendered, as well as a statement of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Control Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is conducted.

   If the Department concurs with the explanation, the corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued. If the Department has any questions or concerns regarding the completion of the certification, the Project Manager will contact you.

III. Certification by Signature (Fifth and Sixth Boxes):

1. WHY IC/EC Certification is required:
   The Section of the New York Environmental Conservation Law that includes the requirement of a periodic certification of IC(s) and EC(s) is as follows:

   For Environmental Restoration Projects: N.Y. Envtl Conserv.Law Section 56-0503 (Environmental restoration projects; state assistance)

   For State Superfund Projects: Envtl Conserv.Law Section 27-1318. (Institutional and engineering controls)

   For Brownfields Cleanup Program Projects: Envtl Conserv.Law Section 27-1415. (Remedial program requirements)

   Voluntary Cleanup Program: Applicable program guidance.

2. To determine WHO signs the **Control Certification**, please use the following table:

Signature Requirements for IC/EC Certification Form		
Type of Control	**Example of IC/EC**	**Required Signatures**
IC	Environmental Easement Deed Restriction.	Site Owner or their designated representative, e.g., a Property Manager.
EC with no treatment system, or engineered caps	Fence, Clean Soil Cover.	Site Owner or their designated representative, and QEP. (P.E. license not required)
EC that includes treatment systems, or engineered caps.	Pump & Treat System providing hydraulic control of a plume, Part 360 Cap.	Site Owner or his designated representative, and QEP with P.E. License.

3. WHERE to mail the signed Certification Form within 45 days of the date of the notice:

New York State Department of Environmental Conservation
Division of Environmental Remediation
47-40 21st Street
Long Island City, NY 11101-5401
Attention: Daniel Walsh

Please note that extra postage may be required.

IV. Definitions:

"Engineering Control" (EC), means any physical barrier or method employed to actively or passively contain, stabilize, or monitor any hazardous waste or petroleum waste to ensure the long-term effectiveness of an inactive site remedial program or brownfield site remedial program or environmental restoration project, or to eliminate potential exposure pathways to any such hazardous waste or petroleum waste. Engineering Controls include, but are not limited to: pavement, caps, covers, subsurface barriers and slurry walls; building ventilation systems; fences, other barriers and access controls; and provision of alternative water supplies via connection to an existing public water supply, addition of treatment technologies to an existing public water supply, and installation of filtration devices on an existing private water supply.

"Institutional Control" (IC), means any non-physical means of enforcing a restriction on the use of real property, that limits human or environmental exposure to any hazardous waste or petroleum waste, restricts the use of groundwater; provides notice to potential owners, operators, or members of the public; or prevents actions that would interfere with the effectiveness of an inactive site remedial program or brownfield site remedial program or environmental restoration project, or with the effectiveness and/or integrity of Site Management activities at or pertaining to any site.

"Professional Engineer" means a person, including a firm headed by such a person, who holds a current New York State Professional Engineering license or registration, and has the equivalent of three (3) years of full-time relevant experience in site investigation and remediation of the type detailed in this Control Certification.

"Property Owner" means, for purposes of an IC/EC certification, the actual owner of a property. If the site has multiple properties with different owners, the Department requires that the owners be represented by a single representative to sign the certification.

"Oversight Document" means any document the Department issues pursuant to each Remedial Program (see below) to define the role of a person participating in the investigation and/or remediation of a site or area(s) of concern. Examples for the various programs are as follows:

BCP (after approval of the BCP application by DEC) - Brownfield Site Cleanup Agreement.
ERP (after approval of the ERP application by DEC) - State Assistance Contract.
Federal Superfund Sites - Federal Consent Decrees, Administrative Orders on Consent or Unilateral Orders issued pursuant to CERCLA.
Oil Spill Program - Order on Consent, or Stipulation pursuant to Article 12 of the Navigation Law (and the New York Environmental Conservation Law).
State Superfund Program - Administrative Consent Order.
VCP (after approval of the VCP application by DEC) - Voluntary Cleanup Agreement.

RCRA Corrective Action Sites- Federal Consent Decrees, Administrative Orders on Consent or permit conditions issued pursuant to RCRA.

"Qualified Environmental Professional" (QEP), means a person, including a firm headed by such a person, who possesses sufficient specific education, training, and experience necessary to exercise professional judgment, to develop opinions and conclusions regarding the presence of releases or threatened releases to the surface or subsurface of a property or off-site areas, sufficient to meet the objectives and performance factors for the areas of practice identified by this guidance (DER10 Technical Guide).

1. Such a person must:
   i. Hold a current Professional Engineering or a Professional Geologist license or registration, and have the equivalent of three (3) years of full-time relevant experience in site investigation and remediation of the type detailed in this guidance; or
   ii. Be a site remediation professional licensed or certified by the federal government, a state; or a recognized, accrediting agency, to perform investigation or remediation tasks identified by this guidance, and have the equivalent of three (3) years of full-time relevant experience. Examples of such license or certification include, but are not limited to, the following titles:
      - Licensed Site Professional, by the State of Massachusetts
      - Licensed Environmental Professional, by the State of Connecticut
      - Qualified Environmental Professional, by the Institute of Professional Environmental Practice
      Certified Hazardous Materials Manager, by the Institute of Hazardous Materials Management

2. The definition of QEP provided above does not preempt State Professional licensing or registration requirements such as those for a Professional Geologist, Engineer, or Site Remediation Professional. Before commencing work, a person should determine the applicability of State professional licensing or registration laws to the activities to be undertaken pursuant to section 1.5 (DER10 Technical Guide).

3. A person who does not meet the above definition of a QEP under the foregoing definition may assist in the conduct of all appropriate investigation or remediation activities in accordance with this document if such person is under the supervision or responsible charge of a person meeting the definition provided above.

"Remedial Party" means any person or persons, as defined in 6NYCRR 375, who executes, or is otherwise subject to, an oversight document (State Superfund, BCP, ERP or VCP Program). For purposes of this guidance, remedial party also includes:

1. Any person or persons who is performing the investigation and/or remediation, or has control over the person (for example, contractor or consultant) who is performing the investigation and/or remediation, including, without limitation, an owner, operator or volunteer; and

2. The DER for State-funded investigation and/or remediation activities.

"Site Management" (SM) means the activities included in the last phase of the remediation of a site, in accordance with a Site Management Plan, which continue until the remedial action objectives for the project are met and the site can be closed-out. Site Management includes the management of the institutional and engineering controls required for a site, as well as the implementation of any necessary long-term monitoring and/or operation and maintenance of the remedy. (Formerly referred to as Operation and Maintenance (O&M)).

"Site Management Plan" (SMP) means a document which details the steps necessary to assure that the institutional and engineering controls required for a site are in-place, and any physical components of the remedy are operated, maintained and monitored to assure their continued effectiveness, developed pursuant to Section 6 (DER10 Technical Guide).

"Site Owner" means the actual owner of a site. If the site has multiple owners of multiple properties with ICs and/or ECs, the Department requires that the owners designate a single representative for IC/EC Certification activities.

"Site Owner's Designated Representative" means a person, including a firm headed by such a person, who has been designated in writing by the Site Owner(s) to complete and sign the Institutional and Engineering Controls Certification Form.

APPENDIX H

Responsibilities of Owner and Remedial Party

APPENDIX H
RESPONSIBILITIES of
OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the Queens Plaza Residential Development Brownfield Cleanup Program Site C (the "site"), number Site No. C241169, are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as: LIC Development Owner, L.P. c/o Tishman Speyer, 45 Rockefeller Plaza, New York, NY (the "owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

Fleming-Lee Shue, Inc.

212-675-3225

158 West 29th Street, Floor 9, New York, NY 10001

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in a(n) Environmental Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3-Notifications.

6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3-Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the RP and the NYSDEC.

9) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3-Notifications of the SMP.

7) The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Section 5.0 (Operation, Monitoring and Maintenance Manual) of the SMP.

8) The RP is responsible for the proper monitoring and maintenance of any installed drinking water treatment system associated with the site, as required in Section 5.0 (Operation, Monitoring and Maintenance Manual).

9) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

10) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX I

Historic Groundwater Elevations

Groundwater elevations QPRD, 11/20/14

Groundwater Elevation, ft. NAVD88

year	N	min	p25	p50	mean	p75	p95	max
1988	6.0	6.0	6.7	8.1	7.6	8.2	8.6	8.6
1990	0.0	.	.	.	.	.	.	.
1998	0.0	.	.	.	.	.	.	.
2001	0.0	.	.	.	.	.	.	.
2006	40.0	4.9	5.8	6.3	6.6	7.5	8.2	8.4
2007	41.0	5.2	6.3	7.6	7.7	8.4	10.4	14.1
2008	1.0	8.5	8.5	8.5	8.5	8.5	8.5	8.5
2009	12.0	5.6	7.9	8.3	8.1	9.1	9.6	9.6
2011	0.0	.	.	.	.	.	.	.
2013	0.0	.	.	.	.	.	.	.
2014	22.0	2.7	6.7	7.7	7.2	8.3	9.8	10.3
Total	122.0	2.7	6.1	7.4	7.3	8.2	9.6	14.1