
REMEDIAL ACTION PLAN

**Parcel G1
Greenpoint Landing
37 Blue Slip
Brooklyn, New York
OER Project Number # 15EH-N082K**

**Hazardous Materials E-Designation (E-138)
CEQR No.: 04DCP003K
Greenpoint Williamsburg Rezoning**

Prepared For:

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LIST OF ACRONYMS

Acronym	Definition
AST	Aboveground Storage Tank
CAMP	Community Air Monitoring Plan
C&D	Construction & Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CO	Certificate of Occupancy
CPC	City Planning Commission
DSNY	Department of Sanitation
"E"	E-Designation
EAS	Environmental Assessment Statement
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EC/IC	Engineering Control and Institutional Control
ELAP	Environmental Laboratory Accreditation Program
FDNY	New York City Fire Department
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IDW	Investigation Derived Waste
Notice - NNO	Notice of No Objection
Notice - NTP	Notice To Proceed
Notice - NOS	Notice Of Satisfaction
Notice - FNOS	Final Notice of Satisfaction
NYC BSA	New York City Board of Standards and Appeals
NYC DCP	New York City Department of City Planning
NYC DEP	New York City Department of Environmental Protection
NYC DOB	New York City Department of Buildings
NYC DOF	New York City Department of Finance
NYC HPD	New York City Housing Preservation and Development
NYCRR	New York Codes Rules and Regulations

NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DEC PBS	New York State Department of Environmental Conservation Petroleum Bulk Storage
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
OSHA	United States Occupational Health and Safety Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
PM	Particulate Matter
QEP	Qualified Environmental Professional
RA	Register Architect
RAP	Remedial Action Plan
RCA	Recycled Concrete Aggregate
RCR	Remedial Closure Report
RD	Restrictive Declaration
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOCs	Semi-Volatile Organic Compounds
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	Underground Storage Tank
TAL	Target Analyte List
TCL	Target Compound List
TCO	Temporary Certificate of Occupancy
VB	Vapor Barrier
VOCs	Volatile Organic Compounds

CERTIFICATION

I, Jason J. Hayes, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for designing the remedial program for Greenpoint Landing Parcel G1 (37 Blue Slip, Brooklyn, NY) (Block 2472, Lot 80, p/o Lot 100 and p/o Lot 50) (OER Project #15EH-N082K). I certify to the following:

- I have reviewed this document, to which my signature and seal are affixed.
- Engineering Controls developed for this remedial action were designed by me or a person under my direct supervision and they achieve the goals established in this Remedial Action Plan (RAP) for this Site.
- The Engineering Controls to be constructed during this remedial action are accurately reflected in the text and drawings of the RAP and are of sufficient detail to enable proper construction.
- This RAP has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Jason J. Hayes

Name

089491

NYS PE License Number



Signature

3/24/2015

Date



EXECUTIVE SUMMARY

G Owner LLC established this Remedial Action Plan (RAP) and Site-specific Construction Health and Safety Plan (CHASP) to remediate an approximately 84,000-square-foot property (Parcel G1) at 37 Blue Slip, Brooklyn, New York (the Site). This parcel will be the third parcel of the Greenpoint Landing development project to be constructed (the total area of the Greenpoint Landing development project is referred to herein as the “development property”). The development project will eventually cover about 19 acres, and includes the construction of residential (affordable and market-rate housing) buildings, a public elementary/intermediate school, new street infrastructure, new combined sewer overflows (CSO) pipes and outfalls, a public promenade along the East River, public open space, as well as bulkhead reconstruction and shoreline stabilization. An E-Designation for Hazardous Materials and Noise (E-138) was assigned by the New York City Department of City Planning (DCP) as part of the May 11, 2005 Greenpoint-Williamsburg Rezoning (CEQR 04DCP003K). The Project Number assigned to Parcel G1 by the New York City Office of Environmental Remediation (OER) is 15EH-N082K.

An area-wide remedial investigation (RI), supplemental parcel-specific remedial investigations for Parcel G1 and Parcel F1, and waste characterization sampling were performed to compile and evaluate data and information necessary to develop this RAP in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. The remedial action described in this document achieves the remedial objectives, provides for the protection of public health and the environment and complies with applicable environmental standards, criteria and guidance, and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 37 Blue Slip in the Greenpoint neighborhood of Brooklyn, New York. Parcel G1, as named in previous investigations, encompasses an area of about 52,600 square feet on Lot 100 (formerly p/o Lot 100), about 14,300 square feet on Lot 80 (formerly p/o Lot 100), and about 17,400 square feet on Lot 50 (formerly p/o Lot 100) of Block 2472. The combined square footage of redefined Parcel G1, subject to this RAP, is about 84,000 square

feet.¹ The Site is currently vacant and paved and is bound by the confluence of the East River and Newtown Creek to the north, a vacant lot used by a film production vehicle and truck rental company to the east (Lot 70 of Block 2472 [Parcel H], formerly p/o Lot 100) and area F1B of Parcel F1 (vacant) to the east, a new 6-story building under construction (Lot 60 of Block 2472 [Parcel G2], formerly p/o Lot 100) and Commercial Street to the south, and area F1A of Parcel F1 (vacant) and a vacant lot (Lot 65 of Block 2472 [Parcel F2], formerly p/o Lot 100) to the west.

The elevation of Parcel G1 ranges from about el. 8.0 feet near the East River to about el. 12.5 feet near the southern perimeter of the Site. Groundwater elevation ranges from about el. 0.5 feet (about 8 feet below ground surface [bgs]) near the East River to about el. 2.5 feet (about 10 feet bgs) near the southern perimeter of the Site. An abandoned underground New York City Department of Environmental Protection (NYCDEP) combined sewer overflow (CSO) pipe runs under Parcel G2 (adjacent southeast parcel) and Parcel G1 from Commercial Street towards the East River, where it terminates as an outfall. The relocation of the CSO pipe will be completed in early 2015.

Summary of Proposed Redevelopment Plan

The proposed development on Parcel G1 includes the construction of a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The proposed development also includes a waterfront park/esplanade on Lot 80 (about 14,300 square feet), private roadway on Lot 100 (Bell Slip) (about 26,600 square feet), and a private roadway on part of Lot 50 (Blue Slip) (about 17,400 square feet). The tower will include 372 market-rate housing units and three levels of aboveground parking. The cellar will be used for parking, storage, amenity space and building systems. The waterfront park/esplanade will consist of a primary waterfront walkway, planted terraces, a secondary walkway, and a picnic area (including an asphalt area and planted area). Bell Slip, a private roadway will consist of a road (about 24 feet wide by about 300 feet long) and two 18-foot wide sidewalks. Blue Slip, another private roadway will consist of a road (about 60 feet wide by 300 feet long), and one 18-foot wide sidewalk. New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) will be

¹ Parcel G1 as described in the Supplemental RIR for Parcel G1, included a portion of Lot 90, which is described in the RAP for Parcel F1 as area F1B. Parcel F1 as described in the Supplemental RIR for Parcel F1 included portions of Lots 50 and Lot 80, which are described in this RAP for Parcel G1.

constructed under the private roadways. The proposed end use of the Site is consistent with the property's zoning classification.

The construction will require removing the existing asphalt pavement and excavating an approximately 26,000-square-foot area to about el. 2.95 feet (about 8 to 10 feet below grade surface [bgs]) to accommodate the foundation slab.

The Site will be excavated to the following development elevations/depths:

In the area of the proposed building:

- Approximately el. 2.95 feet (approximately 8 to 10 feet bgs) to accommodate the foundation slab;
- Approximately el. -2.5 feet (approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
- Approximately el. -4 feet (approximately 14 feet bgs) to accommodate the elevator pits; and
- Approximately el. 2 feet (approximately 10 feet bgs) to accommodate the parking lift pits.

In the area of the proposed private roadways:

- Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways; and
- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3).

In the area of the proposed esplanade:

- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities.

About 11,250 tons (7,500 cubic yards) of soil/fill material will be excavated to accommodate the proposed building and disposed off-Site in accordance with local, state, and federal laws and regulations. About 2,500 tons (1,650 cubic yards) of soil/fill material will be excavated to accommodate the proposed utilities and associated structures. The remainder of the proposed utilities will be constructed above the current Site grades in the imported fill layer. Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Dewatering is anticipated during construction because excavation of

foundation components (including slab, pile caps, grade beams, elevator pits, and parking lift pits) will extend below the groundwater table. The development will require importing soil/fill material to raise the grade of the private roadway, and waterfront park/esplanade to achieve final development grades consistent with the OER-approved Soil/Materials Management Plan (SMMP), New York State Department of Environmental Conservation (NYSDEC) laws and regulations and any special conditions established by the NYSDEC, and those of any other agency with jurisdiction over the Site and/or the project. About 9,200 cubic yards of soil/fill material will be imported to achieve the final development grades of the private roadways (about 7,500 cubic yards) and the waterfront park/esplanade in Lot 80 (about 1,700 cubic yards).

Summary of Environmental Findings

1. The elevation of Parcel G1 ranges from about el. 8.0 feet near the East River to about el. 12.5 feet near the southern perimeter of the Site.
2. Groundwater elevation ranges from about el. 0.5 feet (about 8 feet below ground surface [bgs]) near the East River to about el. 2.5 feet (about 10 feet bgs) near the southern perimeter of the Site.
3. The stratigraphy comprises a surficial layer of historic fill material overlying native fine- to coarse-grained sandy soil and silty soil. The surficial historic fill material generally extends from ground surface to about 10 feet below grade surface (bgs) and is composed of varying amounts of sand, silt, and gravel, and slag, coal, and wood fragments.
4. The geophysical survey did not identify subsurface anomalies with reflections or signatures consistent with underground storage tanks (USTs).
5. Four previous environmental investigations were performed at the Site, including AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental remedial investigation of Parcel G1, Langan's supplemental remedial investigation of the former area described as Parcel F1, and Langan's waste characterization investigation of the proposed building footprint of Parcel G1. A summary of all previous environmental investigation results for soil, groundwater, and soil vapor is presented by media type as follows:

- Maximum concentrations, or where appropriate, concentration ranges, of contaminants in soil detected above their 6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UU SCOs). Concentrations also exceeding their 6 NYCRR Part 375-6.8(b) Restricted-Use Restricted-Residential Use SCOs (RR SCO) are bolded.
- Maximum concentrations, or where appropriate, concentrations ranges of contaminants in groundwater detected above their NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA waters.
- Maximum concentrations, or where appropriate, concentration ranges of contaminants in soil vapor detected above their New York State Department of Health (NYSDOH) Air Guidance Values (AGV) .

6. Soil:

- VOCs
 - 1,2-Dichloroethane - < 0.02 mg/kg to 1.1 mg/kg (G1_SB-03B_4-4.5) (UU SCO 0.02 mg/kg)
 - Acetone - < 0.05 mg/kg to 0.26 mg/kg (G1_SB-03B_4-4.5) (UU SCO 0.05 mg/kg)
 - Benzene - < 0.06 mg/kg to 0.21 mg/kg (G1_SB-05B_3-3.5) (UU SCO 0.06 mg/kg)
 - Methylene Chloride – < 0.05 mg/kg to 0.21 mg/kg (G1_SB-04A_2-2.5) (UU SCO 0.05 mg/kg)
 - Naphthalene - < 12 mg/kg to 100 mg/kg (G1_SB-06A_3-3.5) (UU SCO 12 mg/kg)
 - Toluene - < 0.7 mg/kg to 0.77 mg/kg (G1_SB-06A_7-7.5) (UU SCO 0.7 mg/kg)
 - Trichloroethene - < 0.47 mg/kg to 1.1 mg/kg (SB-44_0-2) (UU SCO 0.47 mg/kg)
 - Xylene (Total) - < 0.26 mg/kg to 0.59 mg/kg (G1_SB-05B_3-3.5) (UU SCO 0.26 mg/kg)
- SVOCs
 - 3-Methylphenol - < 0.33 mg/kg to 0.87 mg/kg (G1_COMP-10D_5-10) (UU SCO 0.33 mg/kg)
 - Acenaphthene - < 20 mg/kg to 22 mg/kg (G1_COMP-10D_5-10) (UU SCO 20 mg/kg)
 - Benzo(a)anthracene - < 1 mg/kg to **80 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)
 - Benzo(a)pyrene - < 1 mg/kg to **82 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)
 - Benzo(b)fluroanthene - < 1 mg/kg to **88 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)

- Benzo(k)fluoranthene - < 0.8 mg/kg to **35 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.8 mg/kg, RR SCO 3.9 mg/kg)
- Chrysene - < 1 mg/kg to **75 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 3.9 mg/kg)
- Dibenz(a,h)anthracene - < 0.33 mg/kg to **20 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.33 mg/kg, RR SCO 0.33 mg/kg)
- Dibenzofuran - < 7 mg/kg to 25 mg/kg (G1_COMP-10D_5-10) (UU SCO 7 mg/kg)
- Fluoranthene - < 100 mg/kg to **180 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Indeno(1,2,3-c,d)pyrene - < 0.5 mg/kg to **66 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.5 mg/kg, RR SCO 0.5 mg/kg)
- Naphthalene - < 12 mg/kg to 35 mg/kg (G1_COMP-10D_5-10) (UU SCO 12 mg/kg)
- Phenanthrene - < 100 mg/kg to **220 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Pyrene - < 100 mg/kg to **140 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Total SVOCs - < 1.464 mg/kg (SB-21_3.5-5.5) to 1245.17 mg/kg (G1_COMP-10D_5-10)
- No PCBs exceeded their Unrestricted Use SCOs.
- Pesticides
 - p,p'-DDT - < 0.0033 mg/kg to 0.0318 mg/kg (G1_COMP-02S_0-5) (UU SCO 0.0033 mg/kg)
 - 4,4'-DDD - < 0.0033 mg/kg to 0.00775 mg/kg (SB-23_0-2) (UU SCO 0.0033 mg/kg)
 - 4,4'-DDE - < 0.0033 mg/kg to 0.0073 mg/kg (SB-21_0-2) (UU SCO 0.0033 mg/g)
 - 4,4'-DDT - < 0.0033 mg/kg to 0.0101 mg/kg (SB-21_0-2) (UU SCO 0.0033 mg/kg)
- No herbicides were detected above the reporting limit.
- Metals
 - Arsenic - < 13 mg/kg to **54 mg/kg** (G1_COMP-01D_5-10) (UU SCO 13 mg/kg, RR SCO 16 mg/kg)
 - Barium - < 350 mg/kg to **550 mg/kg** (SB-22_0-2) (UU SCO 350 mg/kg, RR SCO 400 mg/kg)
 - Beryllium - < 7.2 mg/kg to 15 mg/kg (SB-22_0-2) (UU SCO 7.2 mg/kg)
 - Cadmium - < 2.5 mg/kg to **22 mg/kg** (SB-22_3.5-5.5) (UU SCO 2.5 mg/kg, RR SCO 4.3 mg/kg)
 - Chromium Trivalent - < 30 mg/kg to 170 mg/kg (SB-22_0-2) (UU SCO 30 mg/kg)
 - Copper - < 50 mg/kg to **2,500 mg/kg** (SB-22_0-2) (UU SCO 50 mg/kg, RR SCO 270 mg/kg)
 - Lead - < 63 mg/kg to **3,300 mg/kg** (SB-22_0-2) (UU SCO 63 mg/kg, RR SCO 400 mg/kg)
 - Mercury - < 0.18 mg/kg to **2.2 mg/kg** (SB-22_3.5-5.5) (UU SCO 0.18 mg/kg, RR SCO 0.81 mg/kg)

- Nickel - < 30 mg/kg to **320 mg/kg** (SB-22_0-2) (UU SCO 30 mg/kg, RR SCO 310 mg/kg)
- Selenium - < 3.9 mg/kg to 4.8 mg/kg (G1_COMP-01D_5-10) (UU SCO 3.9 mg/kg)
- Zinc - < 109 mg/kg to **19,000 mg/kg** (SB-22_0-2) (UU SCO 109 mg/kg, RR SCO 10,000 mg/kg)
- TCLP Metals
 - Lead, TCLP – **5.4 mg/L** (G1_COMP-05S_0-5) (Maximum Concentration of Contaminants for the Toxicity Characteristic, 5.0 mg/L)

7. Groundwater:

- VOCs
 - p-Isopropyltoluene - < 5 µg/L to 27 µg/L (MW-21) (TOGS SGVs – Class GA 5 µg/L)
 - trans-1,2-Dichloroethene - < 5 µg/L to 16 µg/L (MW-34) (TOGS SGVs – Class GA 5 µg/L)
- SVOCs
 - Benzo(a)pyrene – ND to 0.32 µg/L (MW-21) (TOGS SGVs – Class GA ND)
 - Benzo(b)fluoranthene - < 0.002 µg/L to 0.3 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Benzo(k)fluoranthene - < 0.002 µg/L to 0.18 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Bis(2-Ethylhexyl)phthalate - < 5 µg/L to 5.6 µg/L (MW-22) (TOGS SGVs – Class GA 5 µg/L)
 - Chrysene - < 0.002 µg/L to 0.33 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Indeno(1,2,3-cd)Pyrene - < 0.002 µg/L to 0.21 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
- No PCBs were detected above the reporting limit.
- No pesticides were detected above the reporting limit.
- No herbicides were detected above the reporting limit.
- Metals
 - Arsenic - < 25 µg/L to 58.5 µg/L (MW-34) (TOGS SGVs – Class GA 25 µg/L)
 - Iron – 1,970 µg/L (MW-22) to 33,500 (MW-28) (TOGS SGVs – Class GA 300 µg/L)
 - Lead - < 25 µg/L to 69.01 µg/L (MW-23) (TOGS SGVs – Class GA 25 µg/L)
 - Magnesium - 43,400 µg/L (MW-22) to 143,000 µg/L (MW-23) (TOGS SGVs – Class GA 35,000 µg/L)
 - Manganese – 902 µg/L (MW-28) to 1,687 µg/L (MW-34) (TOGS SGVs – Class GA 300 µg/L)
 - Sodium – 285,000 µg/L (MW-23) to 368,000 µg/L (MW-34) (TOGS SGVs – Class GA 20,000 µg/L)
- Dissolved Metals
 - Antimony - < 3 µg/L to 11.99 µg/L (MW-21) (TOGS SGVs – Class GA 3 µg/L)

- Arsenic - < 25 µg/L to 28.15 µg/L (MW-34) (TOGS SGVs – Class GA 25 µg/L)
 - Iron - < 300 µg/L to 16,200 µg/L (MW-23) (TOGS SGVs – Class GA 300 µg/L)
 - Magnesium – 46,600 µg/L (MW-34) to 134,000 µg/L (MW-23) (TOGS SGVs – Class GA 35,000 µg/L)
 - Manganese – 788.2 µg/L (MW-28) to 1684 µg/L (MW-34) (TOGS SGVs – Class GA 300 µg/L)
 - Sodium – 31,300 µg/L (MW-23) to 427,000 µg/L (MW-21) (TOGS SGVs – Class GA 20,000 µg/L)
8. Soil Vapor:
- VOCs
 - Trichloroethene - < 5 µg/m³ to 338 µg/m³ (SV-11) (NYSDOH AGV 5 µg/m³)
9. The VOCs, SVOCs, pesticides and metals found in soil above their Unrestricted Use and/or Restricted-Residential Use SCOs are attributed to the quality of historic fill and are characteristic of the urban environment. The VOCs found in groundwater above their TOGS SGVs are likely attributable to historic fill, which extends into the groundwater table in areas across the Site, or to upgradient and off-Site source(s). The SVOCs found in groundwater above their TOGS SGVs are attributed to historic fill, which extends into the groundwater table in areas across the Site. The metals found in groundwater above their TOGS SGVs are consistent with brackish and naturally-occurring groundwater conditions and demonstrate that groundwater directly communicates with the estuarine waters of the East River and Newtown Creek. The TCE concentrations in soil vapor can be attributed to the low-level concentrations of TCE in historic fill or to upgradient and off-Site source(s).

Summary of the Remedy

The proposed remedy will achieve the remedial action objectives established for the Site and will be completed in accordance with applicable laws and regulations. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry.

The proposed remedial action consists of:

1. Performance of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds;

2. Establishment of Site-specific soil cleanup objectives (SCOs) for contaminants of concern;
3. Site mobilization involving security setup, equipment mobilization, utility mark outs and marking excavation areas;
4. Implementation of stormwater and soil erosion control measures in compliance with applicable laws and regulations;
5. Excavation to the following development elevations/depths:
 - In the area of the proposed building:
 - Approximately el. 2.95 feet (Approximately 8 to 10 feet bgs) to accommodate the foundation slab;
 - Approximately el. -2.5 feet (Approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
 - Approximately el. -4 feet (Approximately 14 feet bgs) to accommodate the elevator pits;
 - Approximately el. 2 feet (Approximately 10 feet bgs) to accommodate the parking lift pits; and
 - In the area of the proposed private roadways:
 - Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways; and
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3).
 - In the area of the proposed esplanade:
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual and olfactory observation and monitoring with a photoionization detector (PID);
7. Excavation and off-Site disposal of soil identified as hazardous waste. Post-excavation endpoint samples will be collected for laboratory analysis to confirm that the hazardous

waste was removed. Depending on the results of post-excavation endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER;

8. Excavation and off-Site disposal of soil/fill material (both hotspot² and non-hotspot material) removed for construction purposes;
9. No hotspot endpoint samples will be collected around areas within the mass excavation where soil exceeds Site-specific SCOs, unless required for petroleum spills or other circumstances under the authority of NYS DEC, as these areas will be over-excavated to reach development depth. Post-excavation confirmation endpoint samples will be collected, consistent with DER-10, at development subgrade to determine the performance of the remedy with respect to attainment of the Site-specific SCOs. At locations outside of the mass excavation where soil exceeds Site-specific SCOs, hotspot endpoint confirmation samples will be collected, consistent with DER-10, to document performance of the remedy with respect to attainment of the Site-specific SCOs. Depending on the results of hotspot endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The OER may approve a proposal for management in-place of soil that exceeds Site-specific SCOs based upon a proposal demonstrating that management in-place is protective of public health and the environment;
10. Management of excavated materials, including screening of construction and demolition (C&D) debris, as defined by 6 NYCRR Part 360-1.2(b)(38), temporary stockpiling and segregation of materials to prevent commingling of contaminated materials and non-contaminated materials, in compliance with applicable laws and regulations and with any special conditions established by the NYSDEC. Prior to performing screening/segregation activities on-Site, the means and methods will be presented to the OER, whose approval will be obtained;

² A hotspot is defined as a previous soil boring location from either AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental parcel-specific remedial investigations of Parcels G1 and F1, or Langan's waste characterization investigation of Parcel G1 where sampled soil exceeded the site-specific SCOs defined in this RAP. A hotspot is also defined as a new area at which soil exceeding the Site-specific SCOs defined in this RAP is identified during construction.

11. Transportation and off-Site disposal of excavated soil and fill material at permitted facilities in accordance with this plan and applicable laws and regulations for handling, transport, and disposal. Sampling and analysis of soil and fill material designated for off-Site disposal will be conducted, as required by disposal facilities. Excavated materials will be segregated based on the characterization results;
12. Off-Site recycling or disposal of other uncontaminated construction and demolition (C&D) debris at a registered Part 360-16 C&D debris processing facility or permitted C&D landfill in accordance with applicable laws and regulations for handling, transport, and disposal, this plan, and with any special conditions established by the NYSDEC;
13. Dewatering and disposal of water through one or more of the following methods: containerization and off-Site disposal, discharge to the East River, discharge to the NYCDEP municipal sewer system, and/or discharge to groundwater, in accordance with applicable laws and regulations, including any permits and pretreatment requirements;
14. Removal of underground storage tanks (if encountered), and closure of petroleum spills, in compliance with applicable local, state and federal laws and regulations;
15. Import of materials for backfilling excavations and raising land elevations and for clean cover material in compliance with this RAP and in accordance with applicable laws and regulations;
16. Residual (existing) soil and fill material outside of the proposed building footprint will be demarcated in accordance with the SMMP;
17. Construction and maintenance of an engineered composite cover system consisting of concrete or asphalt pavement³, a 18-inch-thick concrete building slab, or 2 feet of certified clean soil⁴ imported from an OER-approved source to prevent human exposure to residual (existing) soil/fill material;

³ The private roadways, sidewalks, and primary and secondary walkways on Parcel G1 will be comprised of impervious surfaces (concrete and/or asphalt). See Figures 4A – 4E for detail.

⁴ The landscaped areas, including planted terraces, planted areas in the picnic area, and tree beds in the sidewalks of the private roadways, will be capped with 2 feet of certified clean soil.

18. Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20 mils) as per manufacturer's specifications under the new building slab (including elevator pits), grade beams, and pile caps, extending along all subsurface walls of the foundation from the base of excavation to the surface grade level;
19. Submission of a Remedial Closure Report (RCR) that describes the remedial activities, certifies that the remedial requirements have been achieved, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAP;
20. Submission for OER approval of a Site Management Plan (SMP) in the RCR for the inspection and certification of engineering controls and reporting at a specified frequency; and
21. Continuation of the E-Designation requiring ongoing site management, establishment of engineering controls and institutional controls, including a requirement that management of engineering and institutional controls must be in compliance with the approved SMP.

REMEDIAL ACTION PLAN

1.0 SITE BACKGROUND

This Remedial Action Plan (RAP) and Site-specific Construction Health and Safety Plan (CHASP) were developed for the property at 37 Blue Slip (Parcel G1) in the Greenpoint section of Brooklyn, New York (the "Site"). A Site location map is included as Figure 1. This parcel will be one of the first portions of the Greenpoint Landing development project to be constructed (the total area of the Greenpoint Landing development project is referred to herein as the "development property"). The development project will eventually cover approximately 19 acres, and includes the construction of residential (affordable and market-rate housing) buildings, a public elementary/intermediate school, new street infrastructure, new NYCDEP combined sewer overflows (CSO) and outfalls, a public promenade along the East River, public open space, as well as bulkhead reconstruction and shoreline stabilization. The development property plan is presented on Figure 2.

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan) was retained by G Owner LLC to develop this RAP and Construction Health and Safety Plan (CHASP) and is the Remedial Engineer responsible for oversight and certification of implementation of this RAP. An area-wide remedial investigation (RI) and supplemental parcel-specific remedial investigations for Parcel G1 and Parcel F1⁵ were performed to compile and evaluate data and information necessary to develop this RAP in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use.

This RAP describes the remediation and mitigation to be implemented in coordination with the OER for the purposes of satisfying the requirements of the Hazardous Materials E-Designation and obtaining a Notice to Proceed (NTP). The remedial action described in this document provides for the protection of public health and the environment and complies with applicable environmental standards, criteria, guidance, laws and regulations. The Site is under the regulatory oversight of the OER pursuant to E-Designations for Hazardous Materials and Noise (E-138) that were placed on the Site by the New York City Department of City Planning (DCP) as part of the May 11, 2005 Greenpoint-Williamsburg Rezoning (CEQR 04DCP003K). This

⁵ The supplemental parcel-specific remedial investigation for Parcel F1 was also used to develop this RAP because the construction activity planned for Parcel G1 will also disturb soil/fill material on Parcel F1.

project was assigned New York City Office of Environmental Remediation (OER) Project Number 15EH-N082K. The Site-specific CHASP (Appendix B) addresses Site-specific hazards, identifies contaminants of concern, and summarizes safety requirements associated with remediation and mitigation, in accordance with ASTM and OSHA guidelines.

1.1 Site Location and Current Usage

The Site is located at 37 Blue Slip in the Greenpoint neighborhood of Brooklyn, New York. Parcel G1, as named in previous investigations, encompasses an area of about 52,600 square feet on Lot 100 (formerly p/o Lot 100), about 14,300 square feet on Lot 80 (formerly p/o Lot 100 and Parcel F in previous investigations), and about 17,400 square feet on Lot 50 (formerly p/o Lot 100) of Block 2472. The combined square footage of redefined Parcel G1, subject to this RAP, is about 84,000 square feet.⁶ A Site location map is included as Figure 1. The Site is currently vacant and paved and is bound by the confluence of the East River and Newtown Creek to the north, a vacant lot used by a film production vehicle and truck rental company to the east (Lot 70 of Block 2472 [Parcel H], formerly p/o Lot 100) and area F1B of Parcel F1 (vacant) to the east, a new 6-story building under construction (Lot 60 of Block 2472 [Parcel G2], formerly p/o Lot 100) and Commercial Street to the south, and area F1A of Parcel F1 (vacant) and a vacant lot (Lot 65 of Block 2472 [Parcel F2], formerly p/o Lot 100) to the west.

The elevation of Parcel G1 ranges from about el. 8.0 feet⁷ near the East River to about el. 12.5 feet near the southern perimeter of the Site. Groundwater elevation ranges from about el. 0.5 feet (about 8 feet bgs) near the East River to about el. 2.5 feet (about 10 feet bgs) near the southern perimeter of the Site. An abandoned underground NYCDEP (CSO pipe currently runs under Parcel G2 (adjacent southeast parcel) and Parcel G1 from Commercial Street towards the East River, where it terminates as an outfall. The relocation of the CSO pipe will be completed in early 2015.

1.2 Proposed Redevelopment Plan

⁶ Parcel G1 as described in the Supplemental RIR for Parcel G1, included a portion of Lot 90 which is described in the RAP for Parcel F1 as area F1B. Parcel F1 as described in the Supplemental RIR for Parcel F1 included portions of Lots 50 and Lot 80, which are described in the RAP for Parcel G1.

⁷ National Vertical Datum of 1988 (NAVD88). Datum refers to the National Vertical Datum of 1988 which is approximately 1.1 feet above mean sea level datum at Sandy Hook, New Jersey as defined by the United States Geologic Survey (USGS NGVD 1929).

The proposed development on Parcel G1 includes the construction of a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The proposed development also includes a waterfront park/esplanade on Lot 80 (about 13,800 square feet), private roadway on Lot 100 (Bell Slip) (about 26,600 square feet), and a private roadway on part of Lot 50 (Blue Slip) (about 17,400 square feet). The tower will include 372 market-rate housing units and three levels of above ground parking. The cellar will be used for parking, storage, amenity space and building systems. The waterfront park/esplanade will consist of a primary waterfront walkway,⁸ planted terraces,⁹ a secondary walkway,¹⁰ and a picnic area (including an asphalt area¹¹ and planted area¹²). Bell Slip, a private roadway,¹³ will consist of a road (about 24 feet wide by about 300 feet long) and two 18-foot wide sidewalks.¹⁴ Blue Slip, another private roadway,¹⁵ will consist of a road (about 60 feet wide by 300 feet long), and one 18-foot wide sidewalk.¹⁶ New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) will be constructed under the private roadways.

The proposed end use is consistent with the Site's zoning classification. The proposed development plan is included as Figure 3. The proposed Site cover system details are included as Figure 4A through 4E. The architectural plans for the proposed development are included as Appendix A.

⁸ Concrete pavers underlain in descending order by about 8 inches of binding course, a 2-foot thick concrete slab, about 2 feet 8 inches of compacted aggregate base.

⁹ Top soil and mulch underlain by a minimum 2 feet of certified clean soil.

¹⁰ Concrete underlain in descending order by about 8 inches of binding course, about 2 feet of asphalt base.

¹¹ About 8 inches of coarse aggregate asphalt, underlain in descending order by about 2 feet of asphalt base, about 2 feet 8 inches of compacted aggregate base.

¹² Top soil and mulch underlain in descending order by minimum 2 feet of certified clean soil.

¹³ Concrete pavers underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁴ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁵ Concrete cobbles (roadway) and concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁶ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

The construction will require removing the existing asphalt pavement and excavating an approximately 26,000-square-foot area to about el. 2.5 feet (about 8 to 10 feet below grade surface [bgs]) to accommodate the foundation slab. The Site will be excavated to the following development elevations/depths:

In the area of the proposed building:

- Approximately el. 2.95 feet (approximately 8 to 10 feet bgs) to accommodate the foundation slab;
- Approximately el. -2.5 feet (approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
- Approximately el. -4 feet (approximately 14 feet bgs) to accommodate the elevator pits; and
- Approximately el. 2 feet (approximately 10 feet bgs) to accommodate the parking lift pits.

In the area of the proposed private roadways:

- Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways;
- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3);

In the area of the proposed esplanade:

- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities.

About 11,250 tons (7,500 cubic yards) of soil/fill material will be excavated to accommodate the proposed construction and disposed off-Site in accordance with local, state, and federal laws and regulations as well as with the OER-approved Soil/Materials Management Plan (SMMP) (Appendix C), and in compliance with applicable laws and regulations and with any special conditions established by the NYSDEC. About 2,500 tons (1,650 cubic yards) of soil/fill material will be excavated to accommodate the proposed utilities and associated structures. The remainder of the proposed utilities will be constructed above the current Site grades in the imported fill layer. Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Dewatering is anticipated during construction because excavation of foundation components (including slab, pile caps, grade beams, elevator pits, and parking lift pits) will extend below the groundwater table. The development will

require importing soil/fill material to raise the grade of the private roadways and waterfront park/esplanade to achieve final development grades. Soil/fill import will be conducted in accordance with the OER-approved Soil/Materials Management Plan (SMMP), New York State Department of Environmental Conservation (NYSDEC) laws and regulations and with any special conditions established by the NYSDEC, and those of any other agency with jurisdiction over the Site and/or project. About 9,200 cubic yards of soil/fill material will be imported to raise the grade to achieve final development grades of the private roadways (about 7,500 cubic yards) and the waterfront park/esplanade in Lot 80 (about 1,700 cubic yards). A cut-fill diagram is included in Appendix B.

1.3 Description of Surrounding Property

The Site is currently vacant and paved and is bound by the confluence of the East River and Newtown Creek to the north, a vacant lot used by a film production vehicle and truck rental company to the east (Lot 70 of Block 2472 [Parcel H], formerly p/o Lot 100) and area F1B of Parcel F1 (vacant) to the east, a new 6-story building under construction (Lot 60 of Block 2472 [Parcel G2], formerly p/o Lot 100) and Commercial Street to the south, and area F1A of Parcel F1 (vacant) and a vacant lot (Lot 65 of Block 2472 [Parcel F2], formerly p/o Lot 100) to the west. The East River and Newtown Creek are the two closest ecological receptors. The property one block southeast across Commercial Street from Parcel G1, is the former NuHart Plastics Manufacturing facility located at 280 Franklin Street, Brooklyn, NY (Block 2487 Lots 1, 10 and 78). The NuHart site is listed as an NYSDEC inactive hazardous waste disposal site.

The Site is located in a dense urban area generally improved with multi-story commercial, residential and industrial buildings in zoning districts designated for commercial, residential and manufacturing uses, which are summarized in the following table:

Direction	Adjacent Properties	Surrounding Properties
North	Confluence of the East River and Newtown Creek	
East	Parcel H(Lightnin' Production Rentals) Area F1A (Vacant)	Metropolitan Transit Authority- Department of Subways- Division of Car Equipment's Office of Emergency Response Motor vehicle storage lot Industrial and manufacturing
South	Parcel G2 (a new 6-story building under construction)	Multi-story mixed-use residential and commercial Industrial and manufacturing Former NuHart plastics manufacturing facility Greenpoint Playground
West	Area F1A (Vacant) Parcel F2 (Vacant)	Vacant land Newtown Barge Playground

The surrounding properties beyond the adjoining properties consist of multi-story residential buildings, some with ground-level retail stores and restaurants; houses of worship; office buildings; television and movie production studios; small-scale industrial and manufacturing facilities; and park land owned and operated by the New York City Department of Parks and Recreation. The zoning classifications of the surrounding area include R6, R6A, R6B, R8, M1-1, and M1-2.

A search was performed for sensitive receptors, including, but not limited to, schools, daycare facilities, parks, hospitals, and senior care facilities, within an approximate 500-foot radius of the Site boundary. Three sensitive receptors were identified within the search radius:

- Newtown Barge Playground;
- Greenpoint Playground; and
- Mary D's Senior Housing.

The land use of the surrounding area and the three sensitive receptors identified within an approximate 500-foot radius of the Site boundary are identified on Figure 5.

1.4 Summary of Past Uses of the Site

The Site was historically used for light industrial activities including the transfer and storage of lumber, coal, and construction materials and equipment. Coal and lumber storage were the primary uses for more than 100 years from the late 1800s until approximately 1980. The lumber yard operations were phased out during the 1980s when the former owner (Lumber Exchange Terminal, Inc.) began to lease the Site to tenants to use for materials and heavy equipment storage. During the 1980s, the Site was leased to the New York City Housing Authority and construction contractors to store materials and heavy equipment as well as trucking companies for materials storage, truck parking, and basic auto repair (e.g. oil changing, truck washing, and tire changing). Most recently, the Site was leased to HBO for film/television production.

1.5 Summary of Previous Environmental Documents and Correspondence

The following environmental reports (in chronological order) are associated with the Site:

- *Phase I Environmental Site Assessment Report - Greenpoint Lumber Yard, Brooklyn New York, July 2001, prepared by AKRF, Inc.*
- *Phase II Site Investigation Report – Greenpoint Lumber Yard, Brooklyn, New York, October 2001, prepared by AKRF, Inc.*
- *Supplemental Subsurface (Phase II) Investigation Report – Greenpoint Lumber Yard, Brooklyn, New York, April 2004, prepared by AKRF, Inc.*

AKRF, Inc. (AKRF) implemented a supplemental Phase II environmental site investigation (ESI) across the development property in 2003. As part of AKRF's investigation, two soil borings (B5 and B14) were installed and two soil samples were collected for laboratory analysis. The soil analytical results are presented in Figure 6. The results of the Phase II ESI specific to Parcel G1 are summarized below.

1. The stratigraphy includes a surficial layer of historic fill material overlying native fine- to coarse-grained sandy and silty soil. The historic fill generally extends from ground surface to about ten feet below grade surface (bgs) and consists of varying amounts of sand, silt, gravel, and slag, coal, and wood fragments.

2. At soil boring B5, no volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and pesticides exceeded their 6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs) in surface soil (2-4 feet below grade surface [bgs]) and subsurface soil (5-7 feet bgs). Two metals (lead and zinc) exceeded their Unrestricted Use SCO (63 mg/kg and 109 mg/kg, respectively) at concentrations of 291 mg/kg and 129 mg/kg, respectively. The subsurface soil sample collected at B5 was not analyzed for PCBs and pesticides. No constituents exceeded their 6 NYCRR Part 375-6.8(b) Restricted Use Restricted-Residential Use SCOs.
3. At soil boring B14, no VOCs and SVOCs exceeded their 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs. No polychlorinated biphenyls (PCBs) and pesticides were detected. In the surficial soil sample (2-3.5 feet bgs), five metals (barium, copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs. Barium exceeded its Restricted-Residential Use SCO (400 milligrams per kilogram [mg/kg]) at a concentration of 518 mg/kg. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) at a concentration of 1,870 mg/kg. No metals were detected above their respective Unrestricted Use SCOs in the deeper soil sample (6-8 feet bgs).

1.6 Summary of Area-Wide Remedial Investigation

Langan implemented a remedial investigation (RI) in 2013-2014 for six development parcels (Parcels D1, D2, E3, F, G and H) in accordance with Langan's *Remedial Investigation Work Plan* (RIWP), dated July 24, 2013, which was approved by the OER on August 7, 2013. The area-wide remedial investigation was performed in a two-phased approach starting with the Phase 1 RI (geophysical survey and a soil vapor sampling) and ending with the Phase 2 RI (soil and groundwater sampling).

The following scope of work was performed in areas addressed by this RAP:

- Completion of a geophysical survey;
- Installation of 3 soil borings (SB-21, SB-22, and SB-23) and collection of 3 soil samples for laboratory analysis;
- Installation of 3 monitoring wells (MW-21, MW-22, and MW-23) and collection of 3 groundwater samples, as well as the collection of 1 groundwater sample from 1 existing monitoring well (MW-28) for laboratory analysis; and

- Installation of 2 soil vapor sampling points (SV-10 and SV-11) and collection of 2 soil vapor samples for laboratory analysis.

The RI results are presented in Figures 6, 7, and 8. The sampling methodology, field observations and results of Langan's Area-Wide Phase 1 RI and Phase 2 RI are documented in the "*Remedial Investigation Report for Parcels D1, D2, E3, F, G and H of Greenpoint Landing, Brooklyn, New York,*" dated May 20, 2014. The following section summarizes the results of the RI.

1.6.1 Summary of the RI Results

The environmental findings presented below were derived from Langan's RI only and are specific to Parcel G1.

1. The geophysical survey did not identify subsurface anomalies with reflections or signatures consistent with underground storage tanks (USTs).
2. The stratigraphy underlying Parcel G1 consists of a surficial layer of historic fill material overlying native fine- to coarse-grained sandy soil and silty soil. The surficial historic fill material generally extends from ground surface to about 10 feet bgs (about el. 2 feet) and is composed of varying amounts of sand, silt, gravel, coal, coal ash, cinders, slag, and brick, wood, concrete, and asphalt fragments. Depth to bedrock is expected to be more than 50 feet below existing Site grade.
3. Groundwater elevation ranges from about el 0.5 feet near the East River to about el. 1.5 feet near the southern perimeter of the Site, based on measurements recorded during the RI. Depth to groundwater is about 8 feet below existing grade. Groundwater elevation data across the development property indicate the direction of groundwater flow is to the north and west towards the East River.
4. At soil boring SB-21, no VOCs, PCBs or herbicides were detected in soil above their Unrestricted Use SCOs. One SVOC (indeno(1,2,3-c,d)pyrene) exceeded its Unrestricted Use SCO in surface soil (0-2 feet bgs). Two pesticides (4,4'-DDD and 4,4'-DDE) exceeded their Unrestricted Use SCOs (0.0033 mg/kg) in surface soil only. Three metals (copper, lead, and zinc) exceeded their Unrestricted Use SCO in the surface soil. Lead also exceeded its Restricted-Residential SCO (400 mg/kg) in surface soil at a concentration of 770 mg/kg.

Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil (3.5-5.5 feet bgs). Mercury also exceeded its Restricted-Residential SCO (0.81 mg/kg) in subsurface soil at a concentration of 1.4 mg/kg.

5. At soil boring SB-22, three soil samples were collected from the intervals of 0-2 feet bgs, 3.5-5.5 feet bgs and 6-8 feet bgs. No PCBs were detected above the Unrestricted Use SCO and no herbicides were detected. One VOC, trichloroethene (TCE), was detected slightly above its Unrestricted Use SCO, but below its Restricted-Residential Use SCO, in the intermediate soil sample. Eight SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, and indeno(1,2,3-c,d)pyrene, were detected above their Unrestricted Use SCOs in surface soil. Seven of these PAHs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, also slightly exceeded their Restricted-Residential Use SCOs in surface soil. The total SVOC concentration detected in surface soil was 306.38 mg/kg. Seven PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, exceeded their Restricted-Residential Use SCOs in intermediate soil. Total SVOCs in intermediate soil were detected at a concentration of 178.49 mg/kg. No SVOCs were detected above their Unrestricted Use SCOs in subsurface soil (6-8 feet bgs). This interval was collected from native soil. One pesticide (4,4-DDT) was detected above its Unrestricted Use SCO (0.0033 mg/kg), but below its Restricted-Residential Use SCO (7.9 mg/kg), at a concentration of 0.00705 mg/kg in surface soil only. Ten metals (arsenic, barium, beryllium, cadmium, trivalent chromium, copper, lead, mercury, nickel and zinc) were detected above their Unrestricted Use SCOs in surface soil, intermediate soil, and/or subsurface soil. Eight metals also exceeded their Restricted-Residential Use SCOs in subsurface soil, and are summarized below (Restricted Residential SCO is presented in parentheses):

- Arsenic concentrations ranging from 17 – 33 mg/kg in surface, intermediate and subsurface soil (16 mg/kg).
- Barium concentration of 550 mg/kg in surface soil only (400 mg/kg).
- Cadmium concentration of 22 mg/kg in intermediate soil (4.3 mg/kg).
- Copper concentration of 2,500 mg/kg in surface soil only (270 mg/kg).
- Lead concentrations ranging from 460 – 3,300 mg/kg in surface, intermediate and subsurface soil. The highest lead concentration was in surface soil (400 mg/kg).

- Mercury concentration of 2.2 mg/kg in intermediate soil (0.81 mg/kg).
 - Nickel concentration of 320 mg/kg in surface soil only (310 mg/kg).
 - Zinc concentrations ranging from 14,000 – 19,000 mg/kg in surface and intermediate soil (10,000 mg/kg).
6. At soil boring SB-23, herbicides were not detected in soil. VOCs and PCBs were not detected in soil at concentrations above their Unrestricted Use SCOs. Four SVOCs, all PAHs including benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, exceeded their Unrestricted Use SCOs in surface soil (0-2 feet bgs); benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential Use SCOs. Seven SVOCs, all PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, exceeded their Unrestricted Use SCOs in subsurface soil (6.5-8.5 feet bgs); benzo(k)fluoranthene and chrysene also exceeded their Restricted-Residential Use SCOs. The total SVOC concentration detected in surface and subsurface soil was 12.27 mg/kg and 42.39 mg/kg, respectively. The pesticide 4,4-DDD was detected above its Unrestricted Use SCO in surface soil only. Five metals (arsenic, copper, lead, mercury, and zinc) were detected above their Unrestricted Use SCOs in surface and subsurface soil. Mercury also exceeded its Restricted-Residential Use SCO (0.81 mg/kg) in subsurface soil at a concentration of 1.4 mg/kg.
7. At monitoring well MW-21, one VOC, p-isopropyltoluene, was detected in groundwater above its TOGS SGV (5 µg/L) at a concentration of 27 µg/L. No PCBs, pesticides, or herbicides were detected. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs. Benzo(a)pyrene was detected at a total concentration of 0.32 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.3 µg/L, 0.18 µg/L, 0.33 µg/L, and 0.21 µg/L, respectively. Bis(2-ethylhexyl)phthalate also slightly exceeded its TOGS SGV (5 µg/L) at a concentration of 5.2 µg/L. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:
- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 11,100 µg/L.
 - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 53,900 µg/L.

- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 987.8 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 304,000 µg/L.

Four metals (antimony, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

- Antimony exceeded its TOGS SGV (3 µg/L) at a dissolved concentration of 11.99.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 69,800 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,208 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 427,000 µg/L.

8. At monitoring well MW-22, no VOCs, PCBs, pesticides, or herbicides were detected in groundwater. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs. Benzo(a)pyrene was detected at a total concentration of 0.2 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.13 µg/L, 0.11 µg/L, 0.12 µg/L, and 0.15 µg/L, respectively. Bis(2-ethylhexyl)phthalate was detected at a concentration also slightly exceeding its TOGS SGV (5 µg/L) at a concentration of 5.6 µg/L. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:

- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,970 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 43,400 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,023 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 310,000 µg/L.

Four metals (antimony, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

- Antimony exceeded its TOGS SGV (3 µg/L) at a dissolved concentration of 7.28.

- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 46,900 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,037 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 237,000 µg/L.

9. At MW-23, no VOCs, PCBs, pesticides, or herbicides were detected in groundwater. Two PAHs, including benzo(a)pyrene and benzo(k)fluoranthene, slightly exceeded their TOGS SGVs. Benzo(a)pyrene exceeded its TOGS SGV (0 µg/L) at a concentration of 0.13 µg/L. Benzo(k)fluoranthene exceeded its TOGS SVG (0.002 µg/L) at a concentration of 0.07 µg/L. Five metals (iron, lead, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.

- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 30,400 µg/L.
- Lead exceeded its TOGS SGV (25 µg/L) at a total concentration of 58.18 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 143,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 902.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 285,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs.

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 12,200 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 134,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 747 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 268,000 µg/L.

10. At monitoring well MW-28, no VOCs were detected in groundwater at concentrations above their TOGS SGVs. No PCBs, pesticides, or herbicides were detected. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs.

Benzo(a)pyrene was detected at a total concentration of 0.15 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.09 µg/L, 0.08 µg/L, 0.07 µg/L, and 0.12 µg/L, respectively. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:

- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 33,500 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 117,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 902 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 352,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 16,000.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 104,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 788.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 318,000 µg/L.

11. No VOCs exceeded their New York State Department of Health (NYSDOH) Air Guidance Values (AGV) in SV-10. TCE exceeded its NYSDOH (AGV of 5 µg/m³) at a concentration of 338 micrograms per cubic (µg/m³) at SV-11.

1.7 Summary of Supplemental Remedial Investigations

Langan implemented a supplemental parcel-specific RI for Parcel G1 to satisfy the OER requirements in accordance with Langan's *Supplemental Remedial Investigation Work Plan for Parcel G1*, dated August 13, 2014, which was approved by the OER on August 13, 2014. Concurrently, Langan implemented a supplemental parcel-specific RI for the former area described as Parcel F1 (together with Parcel F2) to satisfy the OER requirements in accordance with Langan's *Supplemental Remedial Investigation Work Plan for Parcels F1 and F2* dated August 13, 2014, which was also approved by the OER on August 13, 2014. The supplemental

parcel-specific remedial investigation for Parcel F1 was used to develop this RAP because the construction activity planned for Parcel G1 will also disturb soil/fill material on Parcel F1.¹⁷

Langan's supplemental remedial investigations consisted of the following scope of work in areas addressed by this RAP:

- Installation of 4 soil borings (SB-34, SB-36, SB-37, and SB-44), and collection of 8 soil samples, and associated QA/QC samples for laboratory analysis;
- Installation of one monitoring wells (MW-34) and collection of a groundwater sample, as well as the collection of one groundwater sample from one existing monitoring well (MW-23), and associated QA/QC samples for laboratory analysis; and
- Installation of 6 soil vapor sampling points (SV-19 to SV-23, and SV-32) and collection of 6 soil vapor samples.

The supplemental RI results are presented in Figures 9, 10, and 11. The sampling methodology, field observations and results of Langan's supplemental RI for Parcel G1 are documented in the "*Supplemental Remedial Investigation Report for Parcels G1, Brooklyn, New York,*" dated December 5, 2015. Additionally, the sampling methodology, field observations and results of Langan's supplemental RI for Parcels F1 and F2 are documented in the "*Supplemental Remedial Investigation Report for Parcels F1 and F2, Brooklyn, New York,*" dated January 9, 2015. The following section summarizes the results of the supplemental RI.

1.7.1 Summary of Supplemental RI Results

The environmental findings presented below were derived from Langan's supplemental remedial investigations and are specific to Parcel G1:

1. The soil vapor sampling points and soil borings were completed at a depth of 5 feet bgs within the surficial layer of historic fill. The historic fill is composed of varying amounts of sand, gravel, brick, coal, wood, ash, and brick, ceramic, and asphalt fragments.

¹⁷ The Department of Buildings filing for Parcel G1 includes a portion of the area formerly described as Parcel F1. Parcel G1 as described in the Supplemental RIR for Parcel G1, included a portion of Lot 90 which is described in the RAP for Parcel F1 as area F1B. Parcel F1 as described in the Supplemental RIR for Parcel F1 included portions of Lots 50 and Lot 80, which are described in the RAP for Parcel G1.

2. At soil boring SB-34, no PCBs and herbicides were detected and no VOCs and pesticides exceeded their Unrestricted Use SCOs. Five VOCs, including acetone, m/p-xylene, toluene, trichloroethene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Five VOCs, including ethylbenzene, m/p-xylene, toluene, trichloroethene, total xylenes, were detected at concentrations below their Unrestricted Use SCOs in subsurface soil. Five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) exceeded their Unrestricted Use SCOs in both surface and subsurface samples. Four of these compounds (all except chrysene) also exceeded their Restricted-Residential Use SCOs in both sample intervals. Total SVOCs were detected in surface soil at a concentration of 20.95 mg/kg and at a concentration of 22.86 mg/kg in subsurface soil. Five metals (copper, lead, mercury, nickel, and zinc) exceeded above their Unrestricted Use SCOs in surface soil. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) in surface soil at a concentration of 600 mg/kg. Three metals (lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in subsurface soil.
3. At soil boring SB-36, no herbicides were detected and no VOCs, PCBs, or pesticides exceeded their Unrestricted Use SCOs. Six VOCs, including 1,2-dichloroethane, acetone, methylcyclohexane, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Six VOCs, including acetone, ethylbenzene, o-xylene, m/p-xylene, toluene, total xylenes, were detected at concentrations below their Unrestricted Use SCOs in subsurface soil. One SVOC (indeno(1,2,3-cd)pyrene) exceeded its Restricted-Residential Use SCO in surface and subsurface soil. Total SVOCs were detected in surface soil at a concentration of 9.124 mg/kg and at a concentration of 8.91 mg/kg in subsurface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Three metals (lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in surface or subsurface soil.
4. At soil boring SB-37, no PCBs, pesticides and herbicides were detected and no VOCs exceeded their Unrestricted Use SCOs. Six VOCs, including 2-butanone, acetone, methyl cyclohexane, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Five VOCs, including 2-butanone, acetone, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted

Use SCOs in subsurface soil. Seven SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) exceeded their Unrestricted Use SCOs in both surface and subsurface samples. Six of these compounds (all except benzo(k)fluoranthene) also exceeded their Restricted-Residential Use SCOs in both samples. Total SVOCs were detected in surface soil at a concentration of 61.444 mg/kg and at a concentration of 134.71 mg/kg in subsurface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Lead exceeded its Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in surface or subsurface soil.

5. At soil boring SB-44, no PCBs and herbicides exceeded their Unrestricted Use SCOs. TCE exceeded its Unrestricted Use SCO (0.47 mg/kg) at a concentration of 1.1 mg/kg in surface soil (0-2 feet bgs) only. No SVOCs exceeded their Unrestricted Use SCOs in surface soil. Six SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene, exceeded their Unrestricted Use SCOs in subsurface soil (3-5 feet bgs). Four SVOCs (all except benzo(k)fluoranthene and chrysene) also exceeded their Restricted-Residential Use SCOs in subsurface soil. Total SVOCs were detected in surface soil at a concentration of 7.63 mg/kg and at a concentration of 21.24 mg/kg in subsurface soil. One pesticide (4,4'-DDE) slightly exceeded its Unrestricted Use SCO in surface soil. Two metals (lead and zinc) exceeded their Unrestricted Use SCOs in surface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. Lead and mercury also exceeded their Restricted-Residential Use SCOs (400 mg/kg and 0.81 mg/kg, respectively) in subsurface soil at concentrations of 1,000 mg/kg and 1.6 mg/kg, respectively.
6. At monitoring well MW-23, no PCBs, pesticides, or herbicides were detected. The VOC trans-1,2-dichloroethene (trans-1,2-DCE) exceeded its TOGS SGV (5 micrograms per liter [$\mu\text{g/L}$]) at a concentration of 7.4 $\mu\text{g/L}$. Three PAHs (benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) exceeded their TOGS SGVs. Benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their TOGS SVG (0.002 $\mu\text{g/L}$) at concentrations of 0.09 $\mu\text{g/L}$, 0.06 $\mu\text{g/L}$, and 0.15 $\mu\text{g/L}$, respectively. Five metals (iron, lead, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.
 - Iron exceeded its TOGS SGV (300 $\mu\text{g/L}$) at a total concentration of 25,400 $\mu\text{g/L}$.
 - Lead exceeded its TOGS SGV (25 $\mu\text{g/L}$) at a total concentration of 69.01 $\mu\text{g/L}$.

- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 134,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 979.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 312,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs.

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 16,200 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 118,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 818.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 31,300 µg/L.

7. At MW-34, no SVOCs, PCBs, pesticides, or herbicides were detected. The VOC trans-1,2-DCE exceeded its TOGS SGV (5 µg/L) at a concentration of 16 µg/L. Five metals (arsenic, iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.

- Arsenic exceeded its TOGS SGV (25 µg/L) at a total concentration of 58.5 µg/L.
- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 15,100 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 48,900 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,637 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 357,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs in the parent sample.

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 2,030 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 46,800 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,613 µg/L.

- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 318,000 µg/L.
 - Arsenic was detected at a dissolved concentration in the parent sample (17.35 µg/L), but not at a concentration above its TOGS SGV; arsenic was, however, detected above its TOGS AGV in the duplicate sample. Arsenic exceeded its TOGS SGV (25 µg/L) at a dissolved concentration of 28.15 µg/L.
8. No VOCs exceeded their NYSDOH AGVs at SV-19 and SV-20. TCE exceeded its AGV of 5 micrograms per cubic meter (µg/m³) at four soil vapor points (SV-21, SV-22, SV-23, and SV-32) at concentrations of: 109 µg/m³ at sampling location SV-21, 207 µg/m³ at sampling location SV-22, 118 µg/m³ at sampling location SV-23, and 19.6 µg/m³ at sampling location SV-32. No other detected soil vapor concentrations exceeded established AGVs.

1.8 Summary of Waste Characterization Investigation

A waste characterization investigation was completed for the area of the proposed building footprint of Parcel G1 in September 2013. The waste characterization investigation included soil and groundwater sampling. The purpose of the waste characterization investigation was:

- To perform in-situ characterization to avoid characterizing stockpiles of excavated soil;
- To provide sufficient information to help evaluate construction costs related to management and re-use or disposal of excess soil and groundwater during the planned redevelopment of a sub-area of Parcel G1; and
- To evaluate potential dewatering options (e.g. discharge to a NYCDEP sewer or the East River).

The proposed building footprint of Parcel G1 was divided into 10 approximately 2,700-square-foot waste characterization cells. About 10,000 cubic yards of soil/fill material within the proposed excavation area (about 26,000 square feet) was characterized in-situ at a frequency of one sample for every 500 CY. Waste characterization cells were composed of shallow intervals representing approximately 0 to 5 feet bgs and approximately 500 CY of subsurface material, and one deep interval (in the southern portion of the proposed excavation) representing approximately 5 to 10 feet bgs and approximately 500 CY of subsurface material. Twenty soil borings were completed within the proposed excavation area, with two soil borings within each cell. A sample set was collected from each shallow and deep grid cell, consisting of one grab sample and one composite sample. 20 sample sets and one duplicate sample were collected

and submitted for analysis and associated QA/QC samples. Grab soil samples were analyzed for VOCs only, by United States Environmental Protection Agency (USEPA) Method 8260C. Composite soil samples were analyzed for the following parameters:

- Semi-volatile organic compounds (SVOCs) (USEPA Method 8270D)
- Polychlorinated biphenyls (PCBs) (USEPA Method 8082A)
- Organochlorine pesticides (USEPA Method 8081B)
- Herbicides (USEPA Method 8151A)
- Target analyte list [TAL] metals (USEPA Method 6010C/7471B)
- Hexavalent chromium (USEPA Method 7196A)
- Cyanide (USEPA Method 9010C/9012A)
- Toxicity characteristic leaching procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals (USEPA Method 1311)
- Ignitability (USEPA Method 1030)
- Corrosivity (USEPA Method 9045D)
- Cyanide Reactivity (SW846 Chapter 7.3)
- Sulfide Reactivity (SW846 Chapter 7.3)
- Total petroleum hydrocarbons gasoline-range organics (TPH-GRO) (USEPA Method 8015C)
- Total petroleum hydrocarbons diesel-range organics (TPH-DRO) (USEPA Method 8015C)
- Paint filter (USEPA Method 9095A)

One groundwater sample was collected and analyzed for New York City Department of Environmental Protection (NYCDEP) sewer discharge parameters¹⁸ and NYSDEC State Pollutant Discharge Elimination System (SPDES) parameters¹⁹ to evaluate potential dewatering options (e.g. discharge to a NYCDEP sewer or Newtown Creek/East River).

¹⁸ NYCDEP sewer discharge parameters include non-polar material, pH, temperature, flash point, cadmium, hexavalent chromium, copper, lead, mercury, nickel, zinc, benzene, carbon tetrachloride, chloroform, 1,4-dichlorobenzene, ethylbenzene, MTBE, naphthalene, phenol, tetrachloroethylene, toluene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, total xylenes, total PCBs, total suspended solids, carbonaceous biochemical oxygen demand (CBOD), chloride, total nitrogen, and total solids.

¹⁹ NYSDEC SPDES parameters include pH, temperature, oil and grease, total suspended solids, settleable solids, BTEX, MTBE, halogenated VOCs, aromatic VOCs, nitrate and nitrite, and metals.

The waste characterization analytical soil results are presented in Figures 12 and 13. The sampling methodology, field observations and results of the waste characterization investigation are presented in the *Waste Characterization Technical Letter Report for Building G1 and Proposed CSO*, dated November 11, 2013.

1.8.1 Summary of Waste Characterization Results

The environmental findings presented below were derived from Langan's waste characterization only and are specific to Parcel G1. A review of the analytical soil and groundwater results indicated:

- Seven VOCs, including 1,2-dichloroethane, acetone, benzene, methylene chloride, naphthalene, toluene, and total xylenes, were detected above their Unrestricted Use SCOs in one or more grab soil samples. The VOCs 1,2-dichloroethane and acetone exceeded their Unrestricted Use SCOs in sample G1_SB-03B_4-4.5. Methylene chloride exceeded its Unrestricted Use SCO in sample G1_SB-04A_2-2.5. Benzene and total xylenes exceeded their Unrestricted Use SCOs in sample G1_SB-05B_3-3.5. Naphthalene exceeded its Unrestricted Use SCO in sample G1_SB-06A_3-3.5. Toluene exceeded its Unrestricted Use SCO in sample G1_SB-06A_7-7.5. None of the VOCs detected in the soil samples exceeded their Restricted-Residential Use SCOs.
- Fourteen SVOCs, including 3-methylphenol, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-10D_5-10. Ten SVOCs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene also exceeded their Restricted-Residential Use SCOs in composite soil sample, G1_COMP-10D_5-10.
- Seven SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in sixteen composite soil samples (G1_COMP-01S_0-5, G1_COMP-01D_5-10, G1_COMP-02S_0-5, G1_COMP-02D_5-10, G1_COMP-03S_0-5, G1_COMP-03D_5-10, G1_COMP-04S_0-5, G1_COMP-04D_5-10, G1_COMP-05S_0-5, G1_COMP-05D_5-10, G1_COMP-06D_5-10, G1_COMP-07S_0-5, G1_COMP-07D_5-10, G1_COMP-08S_0-5, G1_COMP-09S_0-5, and

G1_COMP-09D_5-10). Seven PAHs also exceeded their Restricted-Residential Use SCOs in G1_COMP-08S_0-5 and G1_COMP-09D_5-10. Six PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs in seven composite soil samples (G1_COMP-01D_5-10, G1_COMP-02S_0-5, G1_COMP-03S_0-5, G1_COMP-04D_5-10, G1_COMP-05S_0-5, G1_COMP-06D_5-10, and G1_COMP-09S_0-5). Five PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential Use SCOs in six composite soil samples (G1_COMP-01S_0-5, G1_COMP-02D_5-10, G1_COMP-03D_5-10, G1_COMP-04S_0-5, G1_COMP-05D_5-10, and G1_COMP-07S_0-5)

- Six SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-06S_0-5. Four PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs.
- Five SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-10S_0-5. Four PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs.
- Two SVOCs, both PAHs, including benzo(b)fluoranthene and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use and Restricted-Residential Use SCOs in one composite soil sample, G1_COMP-08D_5-10.
- Total SVOC concentrations ranged from 12.265 mg/kg (G1_COMP-08D_5-10) to 134.71 mg/kg (G1_COMP-10D_5-10).
- No PCBs were detected above their Unrestricted Use SCOs.
- No herbicides were detected.
- One pesticide (4,4-DDT) was detected above its Unrestricted Use SCO, but below its Restricted-Residential Use SCO, in four composite soil samples (G1_COMP-02S_0-5, G1_COMP-07D_5-10, G1_COMP-09S_0-5, and G1_COMP-10S_0-5).
- Ten metals (arsenic, barium, beryllium, trivalent chromium, copper, lead, mercury, nickel, selenium and zinc) exceeded their Unrestricted Use SCOs in one or more composite soil samples. Four metals (arsenic, barium, copper, and lead) also exceeded their Restricted-Residential Use SCOs in one or more composite samples. Arsenic concentrations above its Restricted-Residential Use SCO ranged from 17 mg/kg

(G1_COMP-04S_0-5) to 54 mg/kg (G1_COMP-01D_5-10). Barium exceeded its Restricted-Residential Use SCO at 420 mg/kg in one composite soil sample, G1_COMP-09D_5-10. Copper concentrations above its Restricted-Residential Use SCO ranged from 300 mg/kg (G1_COMP-04S_0-5) to 2,900 mg/kg (G1_COMP-09D_5-10). Lead concentrations above its Restricted-Residential Use SCO ranged from 410 mg/kg (G1_COMP-03S_0-5) to 1,600 mg/kg (G1_COMP-02S_5-10).

- Based on the TCLP analytical results, lead was found to exceed its maximum concentration for the toxicity characteristic (5.0 mg/L) at a concentration of 5.4 mg/L in one composite soil sample, G1_COMP-05S_0-5.
- A review of the groundwater analytical results indicated no parameters exceeded their NYCDEP limitations for effluent to sanitary or combined sewers and no parameters exceeded their TOGS SGVs for Class I waters with the exception of total lead. Total lead exceeded its TOGS Class I SGV (8 µg/L) at a concentration of 18 µg/L.

1.9 Summary of Areas of Concern

The environmental data generated by previous environmental investigations, including Langan's *Area-Wide RI*, *Parcel-Specific Supplemental RI*, and *Waste Characterization*, are sufficient to delineate the distribution of contaminants in soil, groundwater, and soil vapor. Based on the environmental data and information presented in these studies, 18 areas with elevated concentrations of total metals (e.g., arsenic, cadmium, copper, lead, mercury, and zinc) and total SVOCs (see following table) were identified in historical fill material. One area, represented by two of these boring locations also exhibited characteristic hazardous lead waste.

Areas of Concern			
Boring Location(s)	Contaminant	Depth (feet bgs)	Concentration (mg/kg)
SB-1A / SB-1B	Arsenic	5-10	54
	Copper	0-5	810
SB-2A / SB-2B	Arsenic	5-10	46
	Copper	0-5	480
	Lead	0-5	1,600
SB-3A / SB-3B	Arsenic	5-10	34
	Copper	0-5	500
SB-5A / SB-5B*	Copper	0-5	620
	Lead	0-5	5.4 mg/L by TCLP lead
SB-7A / SB-7B	Copper	0-5	920
SB-8A / SB-8B	Arsenic	5-10	30
	Copper	0-5	440
SB-9A / SB-9B	Copper	0-5	680
		5-10	2,900
SB-10A / SB-10B	Total SVOCs	5-10	1,246.17
SB-22	Arsenic	3.5-5.5	33
	Cadmium	3.5-5.5	22
	Copper	0-2	2,500
	Lead	0-2	3,300
	Zinc	0-2	19,000
B14	Lead	2-3.5	1,870
* - Area with characteristic hazardous lead waste			

2.0 DESCRIPTION OF REMEDIATION

The remedial action objectives (RAOs) described herein were developed in accordance with applicable federal, state, and local regulations and the Site-specific CHASP and on the data and analysis presented in the following reports prepared by AKRF and Langan:

- October 2001 *Phase II Site Investigation Report* (AKRF);
- April 2004 *Supplemental Subsurface (Phase II) Investigation Report* (AKRF);
- November 2013 *Waste Characterization Technical Letter Report for Building G1 and Proposed CSO* (Langan);
- May 2014 *Area-Wide RIR* (Langan);
- December 2014 parcel-specific *Supplemental RIR for Parcel G1* (Langan); and
- January 2015 parcel-specific *Supplemental RIR for Parcels F1 and F2* (Langan).

2.1 Objectives

The remediation and mitigation objectives for the Site are:

Soil

- Prevent direct contact with contaminated soil.
- Prevent migration of contaminated soil that may result in groundwater contamination.

Groundwater

- Prevent direct exposure to contaminants in groundwater.
- Remove contaminant sources causing impact to groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into occupied structures.

Remedial and mitigation measures described herein will be performed in accordance with applicable laws and regulations, with the Site-specific CHASP and with any special conditions established by the NYSDEC. This remedy is protective of public health and/or the environment for the intended use.

2.2 Summary of Remedial Action

The proposed plan achieves all of the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry. The proposed remedy will achieve the RAOs established for the Site. The remedy is protective of public health and/or the environment for the intended use of the property.

The proposed remedial action will consist of:

1. Performance of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds;
2. Establishment of Site-specific soil cleanup objectives (SCOs) for contaminants of concern;
3. Site mobilization involving security setup, equipment mobilization, utility mark outs and marking excavation areas;
4. Implementation of stormwater and soil erosion and control measures in compliance with applicable laws and regulations;
5. Excavation to the following development elevations/depths:
 - In the area of the proposed building:
 - Approximately el. 2.95 feet (Approximately 8 to 10 feet bgs) to accommodate the foundation slab;
 - Approximately el. -2.5 feet (Approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
 - Approximately el. -4 feet (Approximately 14 feet bgs) to accommodate the elevator pits;

- Approximately el. 2 feet (Approximately 10 feet bgs) to accommodate the parking lift pits; and
 - In the area of the proposed private streets:
 - Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways; and
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3).
 - In the area of the proposed esplanade:
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual and olfactory observation and monitoring with a photoionization detector (PID);
7. Excavation and off-Site disposal of soil identified as hazardous waste. Post-excavation endpoint samples will be collected for laboratory analysis to confirm that the hazardous waste was removed. Depending on the results of post-excavation endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER;
8. Excavation and off-Site disposal of soil/fill material (both hotspot²⁰ and non-hotspot material) removed for construction purposes;
9. No hotspot endpoint samples will be collected around areas within the mass excavation where soil exceeds Site-specific SCOs, unless required for petroleum spills or other circumstances under the authority of NYS DEC, as these areas will be over-excavated to reach development depth. Post-excavation confirmation endpoint samples will be collected, consistent with DER-10, at development subgrade to determine the performance of the remedy with respect to attainment of the Site-specific SCOs. At

²⁰ A hotspot is defined as a previous soil boring location from either AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental parcel-specific remedial investigations of Parcels G1 and F1, or Langan's waste characterization investigation of Parcel G1 where sampled soil exceeded the site-specific SCOs defined in this RAP. A hotspot is also defined as a new area at which soil exceeding the Site-specific SCOs defined in this RAP is identified during construction.

locations outside of the mass excavation where soil exceeds Site-specific SCOs, hotspot endpoint confirmation samples will be collected, consistent with DER-10, to document performance of the remedy with respect to attainment of the Site-specific SCOs. Depending on the results of hotspot endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The OER may approve a proposal for management in-place of soil that exceeds Site-specific SCOs based upon a proposal demonstrating that management in-place is protective of public health and the environment.

10. Management of excavated materials, including screening of construction and demolition (C&D) debris, as defined by 6 NYCRR Part 360-1.2(b)(38), temporary stockpiling and segregation of materials to prevent commingling of contaminated materials and non-contaminated materials, in compliance with applicable laws and regulations and with any special conditions established by the NYSDEC. Prior to performing screening/segregation activities on-Site, the means and methods will be presented to the OER, whose approval will be obtained;
11. Transportation and off-Site disposal of excavated soil and fill material at permitted facilities in accordance with this plan and applicable laws and regulations for handling, transport, and disposal. Sampling and analysis of soil and fill material designated for off-Site disposal will be conducted, as required by disposal facilities. Excavated materials will be segregated based on the characterization results;
12. Off-Site recycling or disposal of other uncontaminated construction and demolition (C&D) debris at a registered Part 360-16 C&D debris processing facility or permitted C&D landfill in accordance with applicable laws and regulations for handling, transport, and disposal, this plan, and with any special conditions established by the NYSDEC;
13. Dewatering and disposal of water through one or more of the following methods: containerization and off-Site disposal, discharge to the East River, discharge to the NYCDEP municipal sewer system, and/or discharge to groundwater, in accordance with applicable laws and regulations, including any permits and pretreatment requirements;
14. Removal of underground storage tanks (if encountered), and closure of petroleum spills, in compliance with applicable local, state and federal laws and regulations;

15. Import of materials for backfilling excavations and raising land elevations and for clean cover material in compliance with this RAP and in accordance with applicable laws and regulations;
16. Residual (existing) soil and fill material outside of the proposed building footprint will be demarcated in accordance with the SMMP;
17. Construction and maintenance of an engineered composite cover system consisting of concrete or asphalt pavement²¹, a 18-inch-thick concrete building slab, or 2 feet of certified clean soil²² imported from an OER-approved source to prevent human exposure to residual (existing) soil/fill material;
18. Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20 mils) as per manufacturer's specifications under the new building slab (including elevator pits), grade beams, and pile caps, extending along all subsurface walls of the foundation from the base of excavation to the surface grade level;
19. Submission of a Remedial Closure Report (RCR) that describes the remedial activities, certifies that the remedial requirements have been achieved, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAP;
20. Submission for the OER approval of a Site Management Plan (SMP) in the RCR for the inspection and certification of engineering controls and reporting at a specified frequency; and
21. Continuation of the E-Designation requiring ongoing site management, establishment of engineering controls and institutional controls, including a requirement that management of engineering and institutional controls must be in compliance with the approved SMP.

²¹ The private roadways, sidewalks, and primary and secondary walkways on Parcel G1 will be comprised of impervious surfaces (concrete and/or asphalt). See Figures 4A – 4E for detail.

²² The landscaped areas, including planted terraces, planted areas in the picnic area, and tree beds in the sidewalks of the private roadways, will be capped with 2 feet of certified clean soil.

2.3 Soil Cleanup Objectives and Soil/Fill Management

The Site-specific soil cleanup objectives (SCOs) will be 6 NYCRR Part 375-6.8(b) Restricted Use Restricted-Residential SCOs with Site-specific SCOs for the following constituents (also see Table 1):

Constituent	Site-Specific SCO (mg/kg)
Total SVOCs	250
Total PCBs	1
Arsenic	23
Barium	750
Cadmium	9.3
Chromium, Total (Cr)	200
Chromium, Trivalent (Cr III)	200
Chromium, Hexavalent (Cr VI)	200
Copper	300
Lead	1,000
Mercury	2.8
Nickel	500
Zinc	10,000
<i>Notes:</i> 1. For the purposes of this RAP, consistent with CP-51, subsurface soil shall mean soil beneath permanent structures, impervious pavement, or similar cover systems or soil beneath 2 feet of soil cover for residential and restricted-residential uses.	

The Site will be excavated to the following development elevations/depths:

- In the area of the proposed building:
 - Approximately el. 2.95 feet (Approximately 8 to 10 feet bgs) to accommodate the foundation slab;
 - Approximately el. -2.5 feet (Approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
 - Approximately el. -4 feet (Approximately 14 feet bgs) to accommodate the elevator pits;
 - Approximately el. 2 feet (Approximately 10 feet bgs) to accommodate the

parking lift pits; and

- In the area of the proposed private roadways:
 - Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways; and
 - Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3).
- In the area of the proposed esplanade:
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities.

The development plan will require importing soil/fill material to raise the grade of the upland connections, private driveways, and waterfront park/esplanade to achieve final development grades consistent with the OER-approved SMMP (Appendix C), NYSDEC applicable laws and regulations and with any special conditions established by the NYSDEC, and those of any other agency with jurisdiction over the Site and/or project. The proposed development for Parcel G1 requires placement of approximately 9,200 cubic yards of soil/fill material (about 7,500 cubic yards in the private roadways (Bell Slip and Blue Slip) and about 1,700 cubic yards in the waterfront esplanade (Lot 80) to achieve final development grades. The proposed excavation and fill areas are presented on Figure 14.

If post-excavation confirmation or pre-cap soil sample results identify soil that exceeds Site-specific SCOs or if grossly contaminated soil is identified at or beyond the proposed development cut during construction, the soil will be treated as hotspots and removed to the extent practical. If encountered, the extents of grossly contaminated soil will be delineated horizontally and vertically by visual observations, field instrumentation, and mapped by GPS or on a site survey. Additional delineation may be required depending on the nature of the contamination identified. The OER will be consulted in the event that confirmation or pre-cap soil sample results exceed site specific SCOs or if gross contamination is encountered during RAP implementation. Sources of groundwater impacts, if encountered, will be remediated. If conditions indicative of a petroleum discharge are encountered, the NYSDEC will be notified, as required by law.

Clean top soil/fill material will be imported for use as fill and cover material in accordance with the SMMP. Imported soil and fill material shall meet geotechnical requirements and comply with the requirements of 6 NYCRR Part 360, and with any special conditions established by the

NYSDEC, and those of any other agency with jurisdiction over the Site and/or project. In addition, imported soil and fill material shall not contain any C&D debris, other than recognizable concrete aggregate as described herein, or exhibit any observable indicators that it was in contact with a spill of petroleum, hazardous waste or industrial waste (i.e., staining and odors). Imported fill used below the new building slab and waterproofing/vapor barrier membrane, below the clean soil cap, or below other impervious surfaces (e.g., roadways, sidewalks, and walkways) shall meet the NYSDEC 6 NYCRR Part 375-6.8(b) Restricted Use Restricted-Residential SCOs. Landscaped and planted areas will be covered with a minimum of 2 feet of certified clean soil meeting the lower of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Use Restricted-Residential and Protection of Groundwater SCOs. In accordance with the SMMP, documentation showing the material meets these SCOs will be provided to the OER prior to import of the material for review and written approval. Residual soil and fill material outside of the new building footprint will be demarcated. In non-landscaped areas, residual soil and fill material will be covered with an engineered composite cover system consisting of impervious material (e.g., concrete or asphalt).

Management of soil and fill material on-site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the SMMP. Sample non-hazardous and hazardous waste manifests for soil tracking purposes are provided as Appendix D. The Remedial Engineer will oversee, document and verify performance of the remedial actions presented in this approved RAP.

Waste Characterization

The waste characterization of the building footprint area of Parcel G1 was completed in September 2013. Soil/fill material within the proposed building excavation area was characterized in-situ at a frequency of one sample per 500 cubic yards. The results of the waste characterization investigation are presented in Figures 12 and 13 in Langan's *Waste Characterization Technical Letter Report for Building G1*, dated November 11, 2013. A copy of this technical letter report will be provided to the Contractor to assist in obtaining pre-approvals from receiving facilities. Additional waste characterization sampling will be required for excavations outside of the building footprint. Prior to conducting the additional waste characterization sampling, the sampling methodology, location, and cell size will be presented to the OER for review.

Soil/fill material will be sampled and analyzed for waste characterization parameters per disposal facility requirements at a frequency²³ specified by the receiving facility. EnCore™ sampling kits (5-gram) will be used to collect soil samples for VOC analysis. Waste characterization samples will be analyzed for one or more of the following parameters as required by the disposal facility:

- Volatile Organic Compounds (VOCs) by USEPA Method 8260C
- Semi-volatile Organic Compounds (SVOCs) by USEPA Method 8270D
- Metals by USEPA Method 6010C/7471B
- Polychlorinated Biphenyls (PCBs) by USEPA Method 8082A
- Organochlorine pesticides by USEPA Method 8081B
- Herbicides by USEPA Method 8151A
- Hexavalent Chromium by USEPA Method 7196A
- Total Cyanide by USEPA Method 9010C/9012A
- Ignitability by USEPA Method 1030
- Corrosivity (pH) by USEPA Method 9045D
- Sulfide Reactivity by SW846 Chapter 7.3
- Cyanide Reactivity by SW846 Chapter 7.3
- Toxicity Characteristic Leaching Procedure (TCLP) VOCs, SVOCs, Pesticides, Herbicides and Metals by USEPA Method 1311
- Total petroleum hydrocarbons gasoline-range organics (TPH-GRO) (USEPA Method 8015C)
- Total petroleum hydrocarbons diesel-range organics (TPH-DRO) (USEPA Method 8015C)
- Paint Filter by USEPA Method 9095A

Waste characterization samples will be analyzed by a laboratory certified in the states where the soil may be transported for disposal. Request letters to, and pre-approval letters from, disposal facilities will be forwarded to the OER upon receipt and prior to the start of load-out of excavated material. The waste characterization sampling methodology and laboratory analytical results will be reported to the OER when available and in the Remedial Closure Report (RCR).

²³ Sampling frequency is subject to change based on disposal facility requirements.

Estimated Soil/Fill Removal Quantities

The development cut for the proposed building will encompass approximately 26,000 square feet to varying depths below grade (see Section 2.3). About 11,250 tons (7,500 cubic yards) of soil/fill material will be excavated to accommodate the proposed building. Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways.

The proposed utility excavations, extents and volumes are shown on Figure 14. About 2,500 tons (1,650 cubic yards) of soil/fill material will be excavated to accommodate the proposed utilities and associated structures. The remainder of the proposed utilities will be constructed above the current Site grades in the imported fill layer.

About 9,200 cubic yards of soil/fill material will be imported to raise the grade of the private roadways (about 7,500 cubic yards) and the waterfront esplanade (about 1,700 cubic yards) to achieve final development grades consistent with the OER-approved SMMP and NYSDEC laws and regulations.

Excavated soil/fill material will be disposed off-Site in accordance with local, state, and federal laws and regulations. The proposed disposal facility(ies), waste type(s), and quantities of soil/fill material designed for each disposal facility are not known at this time. This information will be reported to the OER once identified. The information will also be included in the remedial closure report. Proposed excavation areas are presented on Figure 14.

Disposal Facility	Waste Type	Estimated Quantities
TBD	Non-Hazardous Soil/Fill Material	TBD
TBD	Hazardous Soil/Fill Material	TBD

Hazardous Waste Removal

Previous waste characterization sampling identified two areas with soil/fill material exhibiting characteristic hazardous lead soil and total copper above its Site-specific SCO (SB-5A and SB-5B). Hazardous waste locations are indicated on Figure 15. Hazardous waste will be removed prior to mass excavation. In an effort to minimize the amount of hazardous waste presently associated with the sample locations named above, a work plan to delineate the extent of the hazardous waste will be presented to the OER for review and approval; the analytical results and findings and strategy for disposal will also be presented to the OER for review and

approval. The work plan will incorporate the collection of endpoint samples at a frequency and at locations as defined in DER-10 for laboratory analysis to confirm that the hazardous waste is fully delineated. The endpoint samples will be analyzed for total and TCLP lead and total copper. Depending on the results of endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The extent of the hazardous waste excavation areas will be mapped horizontally and vertically by GPS or in a site survey.

Hotspot Removal

Previous environmental investigations identified 18 hotspot areas with total metals (arsenic, cadmium, copper, lead, mercury, and zinc) and total SVOCs concentrations that exceed Site-specific SCOs (see Section 1.9). The hotspots are summarized in the table below:

Hotspot Summary				
Boring Location(s)	Contaminant	Depth (feet bgs)	Concentration (mg/kg)	Classification
SB-1A / SB-1B	Arsenic	5-10	54	Hotspot
	Copper	0-5	810	
SB-2A / SB-2B	Arsenic	5-10	46	Hotspot
	Copper	0-5	480	
	Lead	0-5	1,600	
SB-3A / SB-3B	Arsenic	5-10	34	Hotspot
	Copper	0-5	500	
SB-5A / SB-5B	Copper Lead	0-5	620 5.4 mg/L	Hotspot Hazardous Waste
SB-7A / SB-7B	Copper	0-5	920	Hotspot
SB-8A / SB-8B	Arsenic	5-10	30	Hotspot
	Copper	0-5	440	
SB-9A / SB-9B	Copper	0-5	680	Hotspot
		5-10	2,900	
SB-10A / SB-10B	Total SVOCs	5-10	1,246.17	Hotspot
SB-22	Arsenic	3.5-5.5	33	Hotspot
	Cadmium	3.5-5.5	22	
	Copper	0-2	2,500	

Hotspot Summary				
Boring Location(s)	Contaminant	Depth (feet bgs)	Concentration (mg/kg)	Classification
	Lead	0-2	3,300	
	Zinc	0-2	19,000	
B14	Lead	2-3.5	1,870	Hotspot

The proposed hotspot removal plan is included as Figure 15. All hotspot areas, with the exception of SB-22, will be removed as part of the mass excavation for the new building’s foundation. For the area of the building foundation mass excavation, post-excavation confirmation endpoint samples will be collected at development grade to determine the performance of the remedy with respect to attainment of the Site-specific SCOs.

SB-22 is located outside of the new building footprint in the proposed waterfront park/esplanade. The initial excavation area for SB-22 will be 10-feet by 10-feet to 10 feet bgs, or to native soil. Hotspot confirmation endpoint grab samples will be collected and analyzed for total arsenic, cadmium, copper, lead and zinc. Additional excavation will be completed, if required by the OER or any other agency with jurisdiction over the Site and/or project, based on the hotspot confirmation endpoint sample results and to the extent practical in accordance with the criteria for confirmation samples described in NYCDEC DER-10, modified to substitute the OER Project Manager’s determination for that of DER project manager. The extent of the hotspot excavation areas will be mapped horizontally and vertically by GPS or in a site survey.

If areas of grossly-contaminated soil are identified during construction, they will be treated as hotspots and removed to the extent practical. If encountered, the extent of grossly-contaminated soil will be delineated horizontally and vertically by visual observations, field instrumentation, and mapped by GPS or on a site survey. The OER will be consulted in the event that end point sample results exceed Site-specific SCOs or if gross contamination is encountered during RAP implementation. Sources of groundwater impacts, if encountered, will be remediated. If conditions indicative of a petroleum discharge are encountered, the NYSDEC will be notified, as required by law.

Hazardous Waste, Post-Excavation and Hotspot Confirmation Endpoint and Pre-Cap Sampling

To evaluate attainment of the Site-specific SCOs, the following samples will be collected/evaluated:

- Ten post-excavation confirmation endpoint soil samples will be collected promptly after reaching development grade from the top of foundation subgrade within the footprint of Building G1.
- Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Depending on the amount of excavation required, up to two post-excavation confirmation endpoint samples will be collected promptly after reaching subgrade.
- Two post-excavation confirmation endpoint soil samples will be collected promptly after reaching subgrade within the footprint of utility cut/excavations.
- Shallow soil samples associated with seven soil borings (B5, SB-21, SB-23, SB-34, SB-36, SB-37, and SB-44) completed by previous investigations comply with Site-specific SCOs and shall serve as pre-cap data points in the waterfront park/esplanade and roadway. Two additional pre-cap samples will be collected before these areas are filled with imported material and capped.
- No excavation is anticipated to accommodate the 2-feet of clean cover soil in landscaped areas. However, if development plans change and excavation is required, post-excavation confirmation endpoint samples will be collected promptly after reaching subgrade. The endpoint sampling frequency in these areas will be determined in coordination with the OER.

The post-excavation confirmation and pre-cap soil samples will be analyzed for VOCs, SVOCs, PCBs, pesticides, herbicides, metals (including hexavalent and trivalent chromium), and cyanide. The proposed post-excavation confirmation endpoint and pre-cap sampling plan is presented as Figure 16.

At SB-5A, SB-5B and SB-22 and in any areas where grossly-contaminated soil is identified and removed during construction, sidewall and bottom endpoint samples, will be collected per the frequencies described in DER-10 and analyzed for the contaminants of concern, consistent with

the nature of the identified contamination. The endpoint sampling plan will be determined in coordination with the OER, as necessary.

In general, endpoint sampling frequency may consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
 - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
 - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. Excavation bottom samples should be collected within 24 hours of excavation when sampling for VOCs, and should be taken from the 0- to 6-inch interval below the excavation bottom. Samples taken after 24 hours should be taken at 6 to 12 inches.
4. For contaminated soil removal, post-remediation soil samples for laboratory analysis should be taken immediately after removal of grossly-contaminated soil. If the excavation is enlarged horizontally and/or vertically, additional soil samples will be taken pursuant to bullets 1-3 above.

An NYSDOH-ELAP-certified laboratory will be used for all endpoint sample analyses. The RCR will provide tabulated analytical data tables with comparison to the Site-specific SCOs, endpoint sampling location maps with summaries of endpoint analytical data, and copies of the analytical laboratory certifications.

EnCore™ sampling kits (5-gram) will be used to collect soil samples for VOC analysis. Analytical methods²⁴ used for soil analysis may include the following:

- USEPA Method 8260C for VOCs;
- USEPA Method 8270D 8270C for SVOCs;
- USEPA Method 8082A for PCBs
- USEPA Method 8081B for organochlorine pesticides
- USEPA Method 8151A for herbicides;
- USEPA Method 6010C/7471B for metals;
- USEPA Method 7196A for hexavalent chromium;
- USEPA Method 9010C/9012A for total cyanide

If either light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) are detected, appropriate samples will be collected for characterization and a “finger print analysis.” If conditions indicative of a petroleum discharge are encountered, the NYSDEC will be notified via the NYS Spill Hotline (1-800-457-7362), as required by law.

Quality Assurance / Quality Control

Quality Assurance/Quality Control (QA/QC) samples will include one duplicate soil sample and one field blank per 20 soil samples. QA/QC samples will be collected during the hazardous waste, post-excavation confirmation and hotspot endpoint sampling programs.

Import and Reuse of Soils

Import of soil will be performed in accordance with the SMMP. The foundation for the new building will cover about 31 percent (26,000 square feet) of the Site, the private roadway Bell Slip will cover about 32 percent (26,600 square feet) of the Site, the private roadway Blue Slip will cover about 21 percent (17,400 square feet) of the Site, and the waterfront park/esplanade will cover about 16 percent (14,300square feet) of the Site.

About 9,200 cubic yards of soil/fill material will be imported to raise the grade of private roadways (about 7,500 cubic yards) and the waterfront esplanade (about 1,700 cubic yards) to

²⁴ Analytical methods specified are based on most recent versions of USEPA-published SW-846 methods.

achieve final development grades. Excavated soil/fill material from within Parcel G1 and/or other areas within the development property will not be used to meet this fill requirement. Proposals for re-use of Site soils, where appropriate, may be submitted at a later date.

Sampling frequencies for importing soil and fill material shall be in accordance with the OER-approved SMMP.

2.4 Engineering Controls

The following engineering controls (ECs) will be employed as part of the remedial action to address potential residual soil contamination at the Site:

1. A composite-cover-system, including concrete building slabs, impervious surfaces (private roadways, sidewalks of the private roadways, and primary and secondary walkways), and 2 feet of certified clean soil in landscaped and planted areas, will be constructed; and
2. A certified waterproofing/vapor barrier system with a minimum thickness of 20 mils (Grace Preprufe® 300R, Bituthene® 4000 or approved equivalent) will be installed as per manufacturer's specifications under new building slab (including elevator pits), grade beams, and pile caps, extending along all subsurface walls of the foundation from the base of excavation to the surface grade level.

Composite Cover System

The Site will be capped with an engineered, composite cover system consisting of building foundation or other impervious material (e.g., concrete and asphalt), or 2 feet of certified clean soil in landscaped areas. The proposed building's concrete foundation slab will be 18 inches thick. The private roadways,²⁵ sidewalks²⁶ of the private roadways, and the primary waterfront

²⁵ Concrete pavers underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

²⁶ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

walkway²⁷ and secondary walkways will consist of impervious surfaces (concrete and/or asphalt). The landscaped areas,²⁸ including planted terraces, planted areas in the picnic area, and tree beds in the sidewalks of the private roadways, will be constructed above imported soil/fill material and will be capped with a minimum of 2 feet of the OER-approved certified clean soil imported from an approved source, in accordance with the SMMP. See Figures 4A through 4E for detail on construction of the various components of the composite cover system. Figure 4A illustrates the extent and location of each cover type across Parcel G1.

Residual soil and fill material will be demarcated in accordance with the SMMP. Imported clean soil or top soil will be segregated at the source or facility prior to sampling and analysis.

2.5 Waterproofing/Vapor Barrier Membrane System

A waterproofing/vapor barrier membrane system will be installed under the proposed building slab (including elevator pits), grade beams, and pile caps, extending along all subsurface walls of the foundation from the base of excavation to surface grade level, to mitigate migration of soil vapors into the new building. The waterproofing/vapor barrier system will be a minimum of 20 mils thick and will be installed according to the manufacturer's specifications. Grace Preprufe® 300R (or approved equivalent) will be installed under horizontal slabs and Grace Bituthene® 4000 (or approved equivalent) will be installed along vertical walls (i.e. elevator pit walls). Proposed vapor barrier design plans and specifications for the proposed waterproofing/vapor barrier product are included in Appendix E. If an alternate product is selected after approval of this RAP, the specifications for the alternate product will be provided to the OER for review and approval. A plan showing the extent of the proposed waterproofing/vapor barrier system is provided as Figure 17. Waterproofing/vapor barrier system details are presented on Figure 18. As-built waterproofing/vapor barrier plans prepared by the Contractor responsible for installing and inspecting the waterproofing/vapor barrier system will be submitted with the RCR. The RCR will include photographs of the installation process, a copy of a PE/RA-certified letter (on company letterhead) from the Contractor responsible for installation and field inspections. The PE will certify that the vapor barrier membrane system was properly installed per manufacturer's instructions, that the vapor barrier membrane system will mitigate the potential for soil vapor intrusion into the building, and that

²⁷ In all walkway areas, concrete pavers underlain in descending order by about 8 inches of binding course, a 2-foot thick concrete slab, about 2 feet 8 inches of compacted aggregate base.

²⁸ Top soil and mulch underlain by a minimum 2 feet of certified clean soil.

the engineering control will render the Site protective for occupancy by mitigating the potential soil vapor intrusion exposure pathway.

2.6 Contingency for Petroleum or Solvent-Impacted Material

In addition to an on-Site presence during all invasive and excavation activities, and during any soil management work, the Remedial Engineer will monitor any necessary additional waste characterization and endpoint sampling activities and earthwork. Soil and fill material will be monitored using a PID and visual and olfactory field screening techniques to identify soil and fill material containing petroleum, solvents or other indicators of contamination that may otherwise exclude material from being accepted at the selected disposal facility. If petroleum- or solvent-impacted material is identified, samples will be collected and analyzed for one or more analytical parameters listed in Section 2.3 based on the nature of the identified contamination. Analytical data will be compared to the Site-specific SCOs. If the petroleum- or solvent-impacted material is present at concentrations that exceed the Site-specific SCOs, the material will be treated as a hotspot and excavated to the extent practical and transported off-Site for disposal. Hotspot confirmation endpoint samples will be collected to document removal of the petroleum- or solvent-impacted material at a frequency of one sample per 900 square feet of excavation bottom and one sample per 30 linear feet of sidewall.

2.7 Contingency for Hazardous Waste

One area of characteristic hazardous lead waste was identified at the Site. If additional hazardous waste is identified by sampling or other remedial activities, a work plan to delineate the extent of the hazardous waste will be presented to the OER for review and approval; the analytical results and findings and strategy for disposal will also be presented to the OER for review and approval. The work plan will incorporate the collection of endpoint samples at a frequency and at locations as defined in DER-10 for laboratory analysis to confirm that the hazardous waste is fully delineated. Depending on the results of endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The extent of the hazardous waste excavation areas will be mapped horizontally and vertically by GPS or in a site. Hazardous waste will not be reused on-Site and will be transported off-Site for disposal at a facility permitted to accept hazardous waste. Post-excavation hazardous waste confirmation endpoint samples will be collected to document removal of the hazardous waste at a frequency of one sample per 900 square feet of excavation bottom and one sample per 30 linear feet of sidewall.

2.8 Contingency for Potential USTs

The presence of a UST is unlikely based on a review of previous environmental studies. However, if a UST is encountered during earthwork, the tank will be decommissioned in accordance with applicable NYSDEC UST closure requirements. A FDNY-licensed tank contractor will oversee the cleaning and removal of the tank, concrete encasements, piping and appurtenances in accordance with applicable laws and regulations. The tank will be exposed, excavated, cut open and cleaned on polyethylene sheeting, as necessary. Waste characterization samples of the tank contents (including oil, sludge, and wastewater) will be collected and analyzed, as necessary, in accordance with the permit requirements of the proposed disposal facility(ies) and in accordance with 6 NYCRR Part 372.2(a)(2). Tank contents will be disposed of off-Site in accordance with applicable laws and regulations. The cleaned tank, piping and appurtenances will be transported off-Site to a scrap metal facility for recycling.

Post-excavation soil samples will be collected as per the NYSDEC DER-10: *Technical Guidance for Site Remediation and Investigation* (May 2010). Petroleum-contaminated soils will be removed in accordance with Section 2.5, the SMMP, and other applicable procedures described in this RAP. The UST will be registered and closed with the NYSDEC Petroleum Bulk Storage unit, as necessary. UST closure documentation will be provided in the RCR. The RCR will include the following information, as necessary:

- A description of the completed scope of work;
- Data tables and figures;
- Photographs of spill response, dewatering, housekeeping and tank removal activities;
- Waste characterization analytical reports;
- Soil sampling analytical reports (if required);
- Copies of completed waste profiles, forms and/or applications;
- Copies of disposal facility approval letters;
- Waste transporter and disposal facility permits;
- Copies of waste disposal documentation (i.e. manifests, chains of custody, and/or receipts);
- A copy of the NYSDEC PBS application and facility information report;
- A copy of the notarized FDNY affidavit of tank removal and closure signed by a FDNY certificate/license holder; and
- Other applicable correspondence and documentation.

3.0 REMEDIAL ACTION MANAGEMENT

3.1 Project Organization and Oversight

The New York State Professional Engineer responsible for overseeing the implementation of this RAP is Jason J. Hayes, P.E. with Langan.

3.2 Site Security

Site access will be controlled by gated entrances to the fenced property.

3.3 Work Hours

The hours for operation of remedial construction will be in accordance with the New York City Department of Buildings construction code requirements.

3.4 Construction Health and Safety Plan

The Site-specific CHASP is included in Appendix B. The Site-specific CHASP is specific to Langan's employees and its subcontractors only. The developer will require the Contractor and their subcontractors to develop and implement their own Site-specific CHASPs. Langan's Health and Safety Officer (HSO) will be reported to the OER prior to the start of remediation. Remedial work performed under this RAP will be in full compliance with applicable health and safety laws and regulations, including Site and standard OSHA worker safety requirements and HAZWOPER requirements (as necessary). Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that the work is performed in compliance with their own Site-specific CHASP and applicable laws and regulations. The Site-specific CHASP pertains to work completed by Langan in accordance with the RAP.

All Langan field personnel involved in remedial activities involving hazardous material (as defined by the Resource Conservation and Recovery Act [RCRA]) and as required by OSHA will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. The HSO will be responsible for maintaining workers training records.

Langan personnel entering any exclusion zone will be trained in the provisions of the Site-specific CHASP and be required to sign a CHASP acknowledgment. If necessary, Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

3.5 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the upwind and downwind Site perimeter and between the ground intrusive work on a continuous basis during intrusive soil disturbance activities. Upwind concentrations will be used to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment 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 activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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 Site perimeter, activities will be shutdown.

All fifteen-minute readings will be recorded and be available for OER personnel to review. Instantaneous readings, if any, will also be recorded and used for decision-making purposes.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind Site perimeters and between the ground intrusive work 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 (PM10) 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 exceedance of

the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM10 particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) 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 will continue with dust suppression techniques, provided that downwind PM10 particulate levels do not exceed $150 \mu\text{g}/\text{m}^3$ above the upwind concentration and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 particulate levels are greater than $150 \mu\text{g}/\text{m}^3$ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume, provided that dust suppression measures and other controls are successful in reducing the downwind PM10 particulate concentration to within $150 \mu\text{g}/\text{m}^3$ of the upwind concentration and in preventing visible dust migration.

All readings will be recorded, downloaded at the end of the day and be available for OER personnel to review.

3.6 Agency Approvals

All permits or government approvals required for remediation and construction have been or will be obtained by the Contractor prior to the start of remediation and construction. Acceptance of this RAP by the OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

3.7 Site Preparation

3.7.1 Pre-Construction Meeting

The OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities. The Contractor shall organize and accommodate this meeting in the Site trailer. During this meeting, the Contractor will identify a secure area that they will provide to the Remedial Engineer to store CAMP monitoring equipment.

3.7.2 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each Langan field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

3.7.3 Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated by the Contractor prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the mark-out ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAP.

3.7.4 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed by the Contractor in accordance with applicable laws and regulations. The methods of dewatering shall be at the option of the Contractor, provided that dewatering is accomplished in a manner that shall preserve the strength of foundation strata; shall not cause instability of the excavation sides; shall not result in loss of ground from beyond the property lines; shall not cause damage to existing structures, streets, pavements, and utilities; and complies with all applicable regulations.

Dewatering fluids from temporary construction dewatering will be managed through one or more of the following methods:

- Discharge to the surface waters of the East River / Newtown Creek;
- Discharge to the NYCDEP municipal sewer system;
- Discharge to groundwater; and/or
- Containerization and off-Site disposal at permitted or licenses treatment, storage or disposal facility.

A brief description of each option and regulatory requirements is provided in the sections below.

Discharges to Surface Waters of the East River / Newtown Creek

Dewatering fluids discharged to the surface waters of the East River / Newtown Creek would be authorized upon receipt of a State Pollutant Discharge Elimination System (SPDES) permit or a SPDES Non-Jurisdictional Determination (NJD) from the NYSDEC. The dewatering fluids would be pretreated as necessary to meet the requirements of the SPDES permit. Discharges to the surface waters of the East River / Newtown Creek under a SPDES permit or a SPDES NJD may also require a Long Island Well Permit from the NYSDEC depending on the design of the dewatering system. Copies of all NYSDEC permits and supporting documentation would be included in the closure report.

Discharges to the NYCDEP Municipal Sewer System

Dewatering fluids discharged to the municipal sewer system would be authorized upon receipt of a sewer discharge permit from the NYCDEP. The NYCDEP regulates discharges to the New York City municipal sewer system pursuant to Title 15 Rules of the City of New York Chapter 19. Receiving a sewer discharge permit from the NYCDEP would require completing a Wastewater Quality Control Application, submitting laboratory analytical data, and paying payment of fees upfront. The dewatering fluid would be pretreated as necessary to meet the NYCDEP limitations for effluent to sewer system. Discharges to the NYCDEP municipal sewer system may also require a Long Island Well Permit from the NYSDEC depending on the design of the dewatering system. Copies of all NYCDEP and NYSDEC permits and supporting documentation would be included in the closure report.

Discharges to Groundwater

Discharges to groundwater would be authorized upon receipt of a SPDES permit or a SPDES NJD from the NYSDEC. The dewatering fluids would be pretreated as necessary to meet the requirements of the SPDES permit and the groundwater effluent limitations as set forth in Technical Operation and Guidance Series (TOGS) 1.1.1 Table 5 – New York State Groundwater Effluent Limitations (Class GA) and 6 NYCRR Part 703.6. Discharges to groundwater under a SPDES permit or a SPDES NJD may also require a Long Island Well Permit from the NYSDEC depending on the design of the dewatering system. Copies of all NYDEC permits and supporting documentation would be included in the closure report.

Containerization and Off-Site Disposal

The dewatering fluids would be containerized in appropriate vessels (e.g., frac tanks, vacuum trucks, or equivalent) and transported off-Site for disposal at a permitted treatment, storage or disposal facility. Dewatering fluids would be characterized before transport off-Site for disposal purposes in a manner consistent with the requirements of the receiving facility and in compliance with applicable laws and regulations. Waste characterization samples would be analyzed by a laboratory that is certified by the state in which the receiving facility is located and shall be collected at a frequency specified by the selected disposal facility. Dewatering fluids would be transported off-Site in accordance the requirements of Section 2.7 and in compliance with applicable laws and regulations.

The following documentation would be established and reported by the Remedial Engineer or QEP for each disposal destination used during the construction project to document that the disposal of dewatering fluids complies with applicable laws and regulations:

- A signed letter from the owner or generator to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at a site in New York. The letter will provide the project identity and the name and phone number of the owner or generator. The letter will include as an attachment a summary of all analytical data for the material being transported; and

- A letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the regulated material.

Dewatering fluids transported off-Site for disposal would be managed as regulated material and will be managed in accordance with applicable laws and regulations. A strict chain of custody or manifest system for exported dewatering fluids would be employed. The Contractor shall provide the Remedial Engineer or QEP the facility-signed manifest for each load of leaving the Site within one week of disposal.

The closure report would include an itemized account of the destination of dewatering fluids exported from the Site during the construction project. Documentation associated with disposal of dewatered groundwater would include the following:

- Facility-signed manifests;
- Facility pre-approval letters; and
- Copies of valid, current, operating permits for each receiving facility.

3.7.5 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations and in accordance with the SMMP. The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will be recorded in daily or weekly field reports.

3.7.6 Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the Site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

3.7.7 Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit by the Contractor. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be

examined by the Remedial Engineer and the Contractor for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be used by the Contractor for removing soil from vehicles and equipment, as necessary.

3.8 Traffic Control

Drivers of trucks leaving the Site with soil/fill material will operate in a manner that is preventative of neighborhood impacts and follow designated NYC truck and commercial vehicle routes (see Figure 19).

3.9 Spill Prevention

To prevent spills from occurring at the Site, the following inspections will be performed by the Contractor:

- Weekly Equipment Inspections – Used to account for fluids carried on and used to operate equipment and ensure that they are not leaking. Also account for overall function of equipment to protect against malfunction during operation or handling of excavated materials.
- On-Site Materials Handling – used to account for material quantity and proper methods of storage to help reduce the chance of a spill or release.
- Safety Equipment Inspections – Used to account for the quantity, location, and working condition of safety equipment on-Site. Safety equipment and supplies will be kept accessible and in good working order.

Any discrepancies or inadequacies discovered as a result of these inspections will be corrected immediately.

The following is a list of actions that should be taken by the Contractor in the event of a spill:

- Account for Site personnel and make proper notifications.
- Evaluate the hazard(s), identify the source of the discharge, and stop the spill or leak.
- Exclude any source of ignition from the spilled material if flammable.
- Isolate and contain the spill in the smallest area possible.

- Keep personnel upwind of the spill area. Evaluate potential vapor and dust hazards, and implement appropriate suppression operations.
- At no time will personnel be allowed to come in contact with unidentified spilled materials.
- Notify the Owner.

3.10 Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of Site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and the downing of power lines creating dangerous Site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for Site preparedness prior to the event and response after the event.

3.10.1 Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the Site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay-bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

3.10.2 Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A Site inspection report will be submitted to the OER at the completion of Site inspection and after the site security is

assessed. Site conditions will be compared to the inventory of Site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYSDEC within 2 hours of identification and consistent with state regulations. Emergency conditions and petroleum spills will also be reported to the OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Storm-water control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off-Site to adjacent properties, property owners and the OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to the OER and implemented following approval by the OER and granting of Site access by the property owner. Impacted off-Site areas may require characterization based on-Site conditions, at the discretion of the OER. If conditions indicative of a petroleum discharge are encountered, the NYSDEC will be notified via the NYS Spill Hotline (1-800-457-7362), as necessary, by a qualified environmental professional. If the source of the spill is ongoing and can be identified, the source should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by the NYSDEC.

3.10.3 Storm Response Reporting

A Site inspection report will be submitted to the OER at the completion of Site inspection. An inspection report established by the OER is available on the OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of Site conditions and material performed prior to the storm event and significant differences will be noted. The Site inspection report will be sent to the OER project manager and will include the Site name, address, tax block and lot, Site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the Site was dislocated and whether any of the soil left the Site; estimates

of the volume of soil that left the Site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of on-Site or off-Site exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to the OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

3.11 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

3.12 Reporting and Record Keeping

3.12.1 Daily Reports

Daily reports, providing a general summary of activities for each day of active soil disturbance work, will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;

- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP exceedances, if any;
- Photographs of Site conditions and activities; and
- An alpha-numeric Site map will be used to identify locations described in reports submitted to the OER.

The frequency of the reporting period may be revised in consultation with the OER project manager based on planned project tasks. Email reports are not intended to be the primary mode of communication for notification to the OER of emergencies (i.e., accidents, spills), requests for changes to the RAP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an appendix in the RCR.

3.12.2 Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

3.13 Complaint Management

Complaints from citizens will be promptly reported to the OER. Complaints will be addressed and outcomes will also be reported to the OER in daily reports. Notices to the OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

3.14 Deviations from the Remedial Action Plan

Changes to the RAP will be reported to the OER Project Manager and will be documented in daily reports and reported in the RCR. The process to be followed if there are any deviations from the RAP will include a request for approval for the change from the OER noting the following:

- Reasons for deviating from the approved RAP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

4.0 REMEDIAL CLOSURE REPORT

An RCR to document implementation of the remedial action defined in this RAP will be prepared by the Remedial Engineer and submitted to the OER. The RCR will include:

- Information required by this RAP.
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy.
- Site Management Plan.
- Description of any changes in the remedial action from the elements provided in this RAP and associated design documents.
- Tabular summary of endpoint sampling results and material characterization results, QA/QC results for endpoint sampling, and other sampling and chemical analysis performed as part of the remedial action.
- Test results or other evidence demonstrating remedial systems are functioning properly.
- Account of the source area locations and characteristics of contaminated material removed from the Site including a map showing source areas.
- Account of the disposal destination of contaminated material removed from the Site. Documentation associated with disposal of material will include transportation and disposal records and letters approving receipt of the material.
- Account of the origin and analytical testing for material imported to the Site.
- PE/RA-certified as-built plans (prepared by others) depicting the extent of the waterproofing/vapor barrier membrane and the installation details (penetrations, joints, etc.) with respect to the building foundation, footings, slab, and sidewalls.
- Product specification sheets for the installed waterproofing/vapor barrier membrane.
- Photographs of the installation of the waterproofing/vapor barrier membrane as well as a deviations narrative (as necessary).
- PE/RA certified letter (on company letterhead) from the contractor responsible for installation and field inspections of the waterproofing/vapor barrier membrane system.
- A copy of the waterproofing/vapor barrier membrane manufacturer's and a copy of the installer's certificate of warranty.
- Reports and supporting material will be submitted in digital format.
- The following certification language in front of the Executive Summary of the RCR:

I, [name], am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for the [site name (address)] site, site number [site number]. I certify to the following:

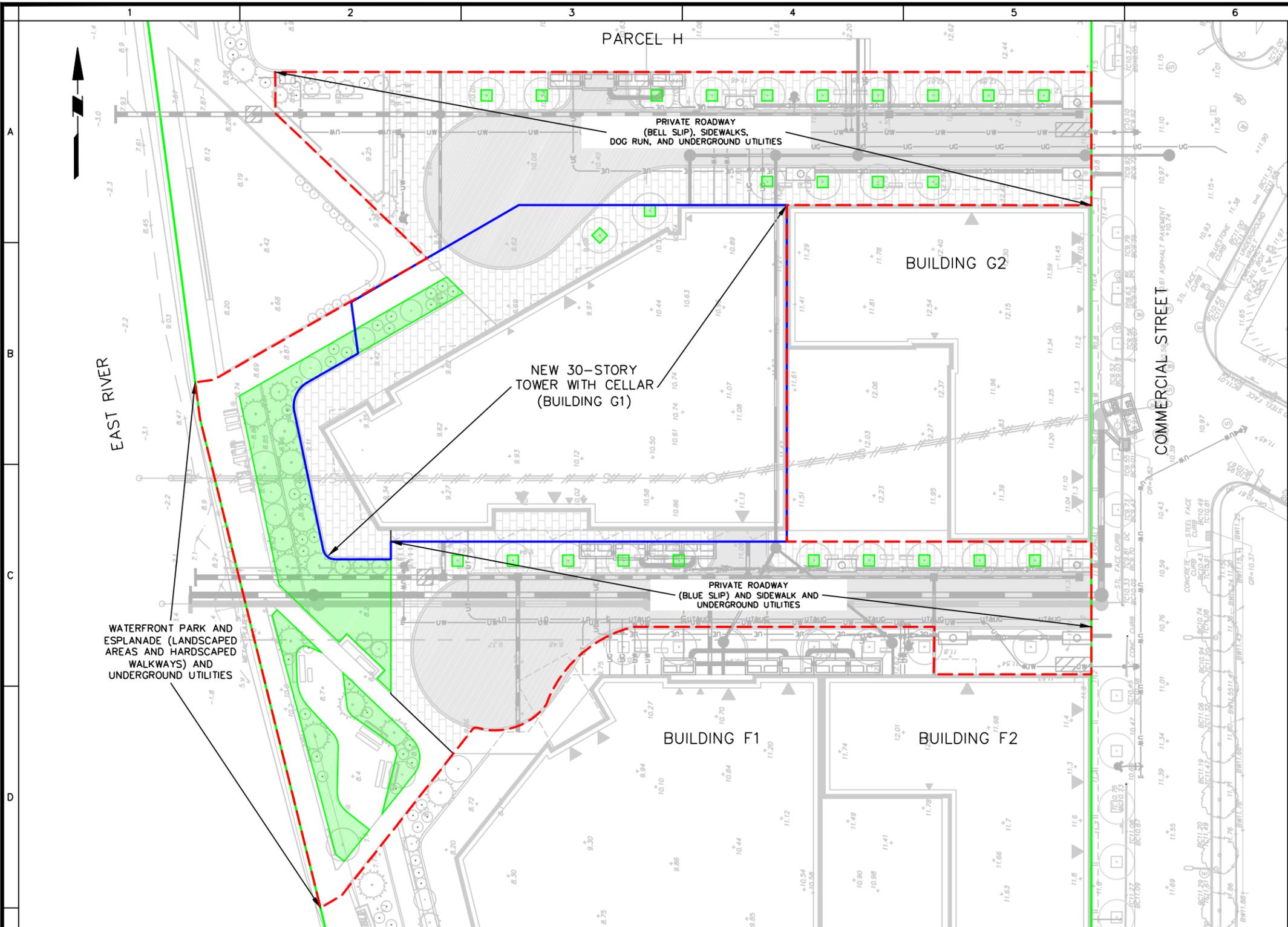
- I have reviewed this document, to which my signature and seal are affixed.*
- Engineering Controls implemented during this remedial action were designed by me or a person under my direct supervision and achieve the goals established in the Remedial Action Plan for this site.*
- The Engineering Controls constructed during this remedial action were professionally observed by me or by a person under my direct supervision and (1) are consistent with the Engineering Control design established in the Remedial Action Plan and (2) are accurately reflected in the text and drawings for as-built design reported in this Remedial Closure Report.*
- The OER-approved Remedial Action Plan dated [date] and Stipulations in a letter dated [date] were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.*

5.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, the schedule will be updated and submitted to the OER. An approximately twelve-month-long remediation period is currently anticipated.

Schedule Milestone	Duration (weeks)	Weeks from Remedial Action Start
OER Approval of RAP	4	4
Mobilization	2	6
Remedial Construction	48	54
Demobilization	2	56
Submit Remedial Closure Report	6	62

FIGURES



LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY (BLOCK 2472, LOT 80, p/o LOT 50 and p/o Lot 100)
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- PROPOSED LANDSCAPED AREA

- GENERAL NOTES**
1. BASE MAP SOURCE: LANGAN DRAWINGS "170229002-COMBINED-SURVEY-BLOCK 2472" AND "170229001-C-UI0101-FG BLOCKS."
 2. NORTH ARROW SHOWS PROJECT NORTH.
 3. LANDSCAPED AREAS ARE ILLUSTRATED IN FIGURE. THE REMAINDER OF PARCEL G1 WILL BE IMPROVED WITH IMPERVIOUS SURFACES (E.G. CONCRETE OR ASPHALT).
 4. ELEVATIONS SHOWN IN DRAWING ARE BASED ON NATIONAL VERTICAL DATUM OF 1988. DATUM REFERS TO THE NATIONAL VERTICAL DATUM OF 1988 (NAVD88) WHICH IS APPROXIMATELY 1.1 FEET ABOVE MEAN SEA LEVEL DATUM AT SANDY HOOK, NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGIC SURVEY (USGS NGVD 1929).

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Project

GREENPOINT LANDING

Block 2472, Lot 80,
p/o Lot 50, and p/o Lot 100
BROOKLYN

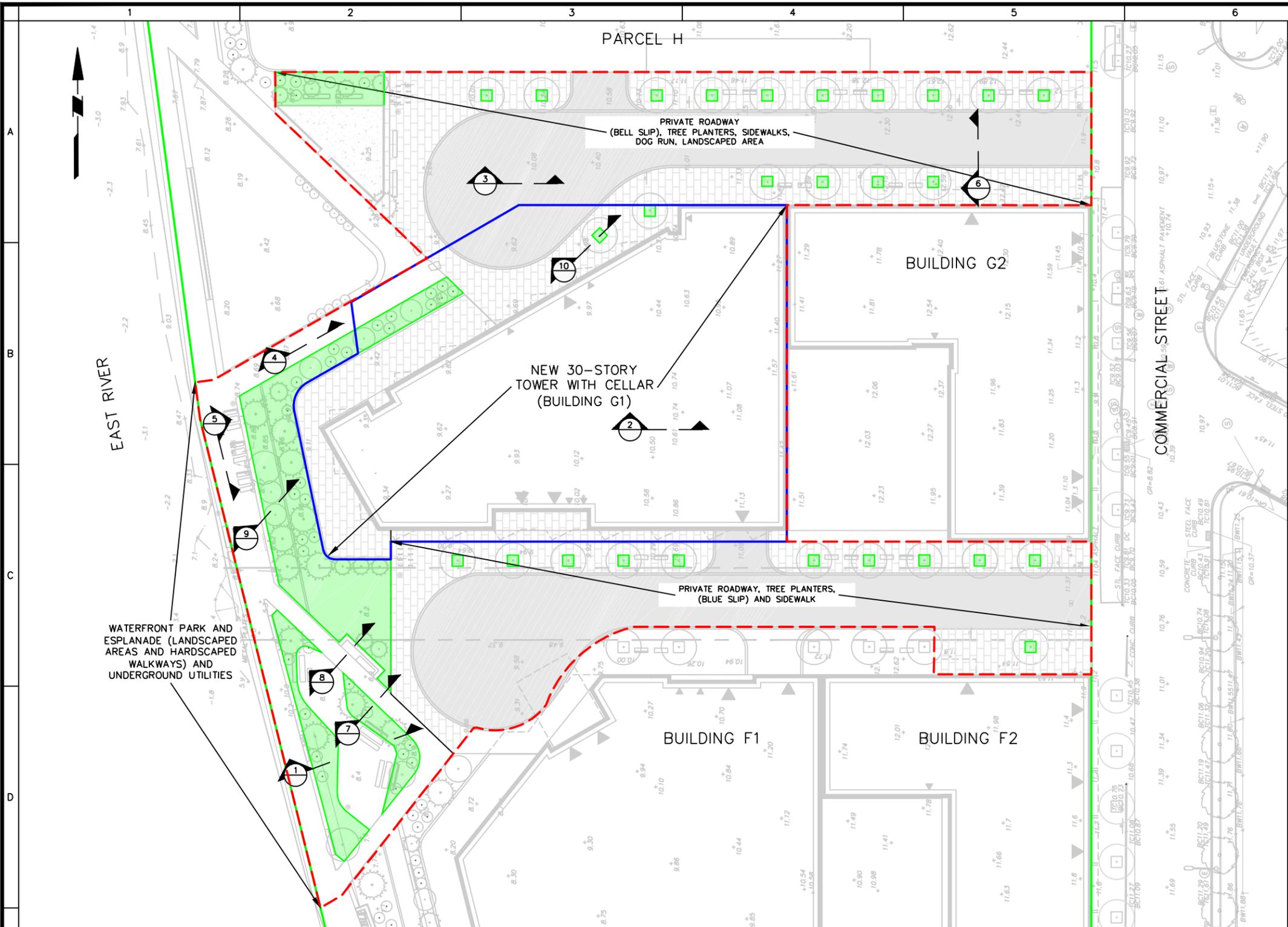
KINGS NEW YORK

Drawing Title

PROPOSED DEVELOPMENT PLAN

PARCEL G1

Project No. 170229002	Drawing No.
Date 2/25/2015	3
Scale 1' = 50'	
Drawn By GCW	Checked By MSR
Submission Date	Sheet 3 of 19

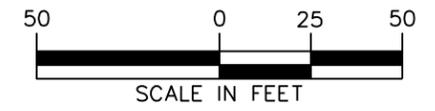


LEGEND

	APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
	APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
	APPROXIMATE PARCEL G1 BOUNDARY (BLOCK 2472, LOT 80, p/o LOT 50 and p/o Lot 100)
	APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
	PROPOSED LANDSCAPED AREA

- GENERAL NOTES**
1. BASE MAP SOURCE: LANGAN DRAWINGS "170229002-COMBINED-SURVEY-BLOCK 2472" AND "170229001-C-UI0101-FG BLOCKS."
 2. NORTH ARROW SHOWS PROJECT NORTH.
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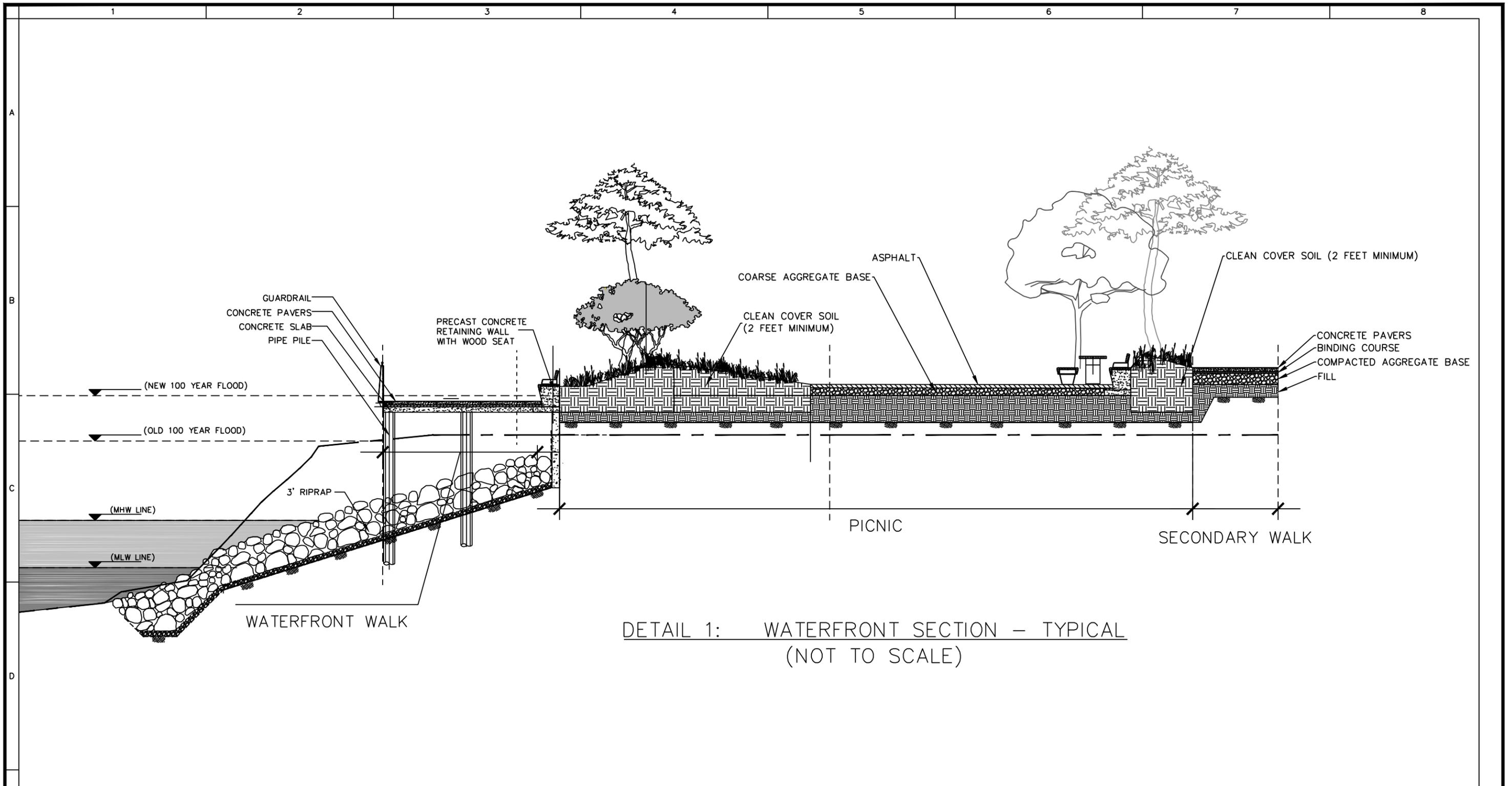


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GREENPOINT LANDING
 Block 2472, Lot 80, p/o Lot 50, and p/o Lot 100
 BROOKLYN
KINGS NEW YORK

Drawing Title
PROPOSED SITE COVER SYSTEM PLAN
PARCEL G1

Project No. 170229002	Drawing No.
Date 3/23/2015	4A
Scale 1' = 50'	
Drawn By GCW	Checked By MSR
Submission Date	Sheet 4 of 19



DETAIL 1: WATERFRONT SECTION – TYPICAL
(NOT TO SCALE)

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LANDING**

Block 2472, Lot 80,
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Drawing Title

**PROPOSED SITE
COVER SYSTEM DETAILS**

PARCEL G1

Project No.
170229002

Date
3/23/2015

Scale
NTS

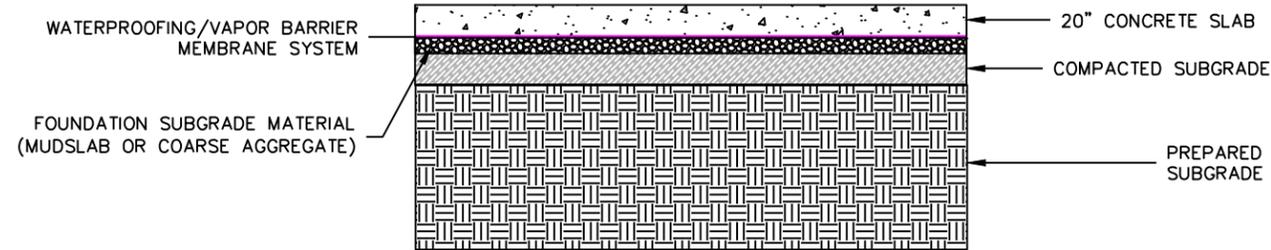
Drawn By
GCW

Checked By
MSR

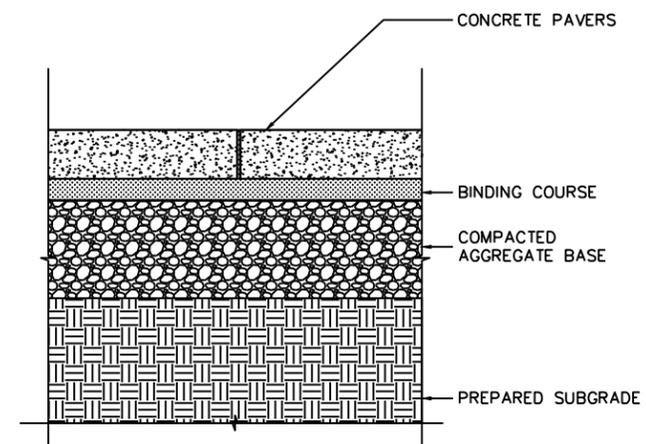
Submission Date

4B

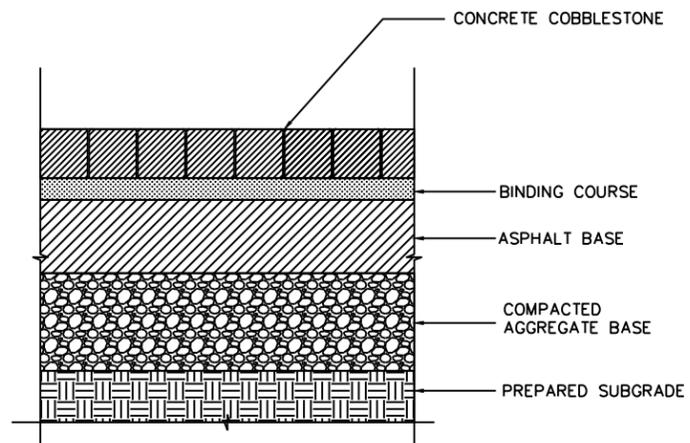
Sheet 4 of 19



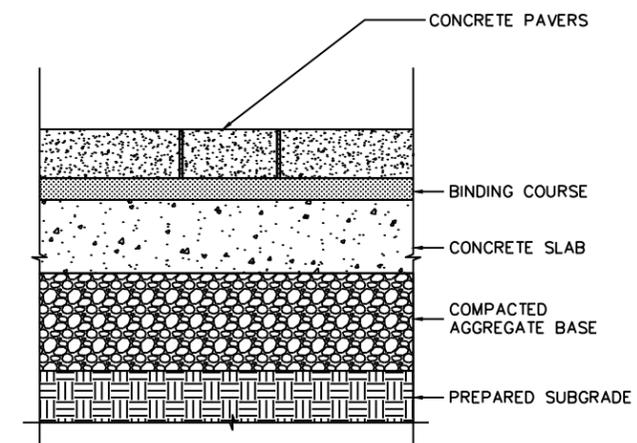
DETAIL 2: TYPICAL BUILDING FOUNDATION SLAB DETAIL
(NOT TO SCALE)



DETAIL 4: TYPICAL SECONDARY WALK
(NOT TO SCALE)



DETAIL 3: TYPICAL COBBLESTONE ROADWAY
(NOT TO SCALE)



DETAIL 5: TYPICAL WATERFRONT WALK
(NOT TO SCALE)

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Block 2472, Lot 80,
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Drawing Title

**PROPOSED SITE
COVER SYSTEM DETAILS**

PARCEL G1

Project No.
170229002

Date
3/23/2015

Scale
NTS

Drawn By
GCW

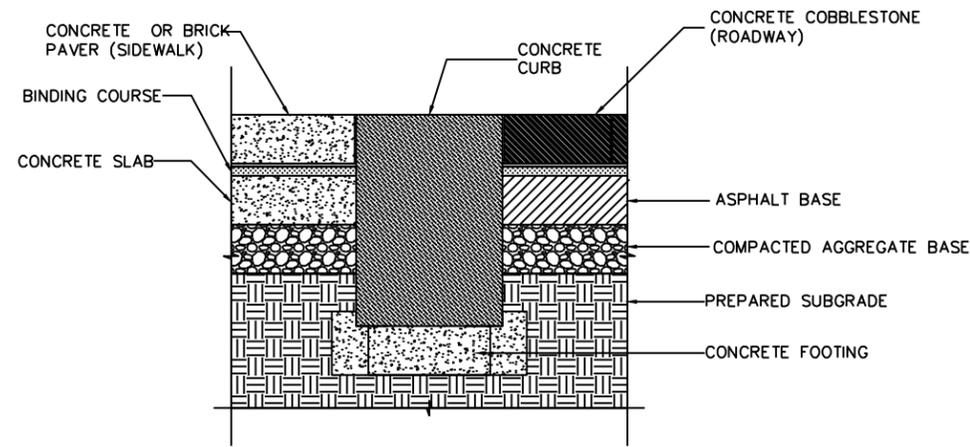
Checked By
MSR

Submission Date

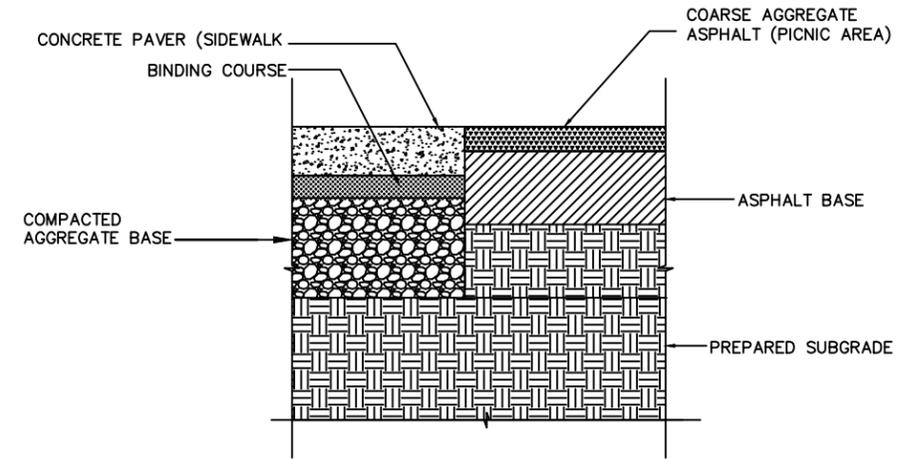
Drawing No.

4C

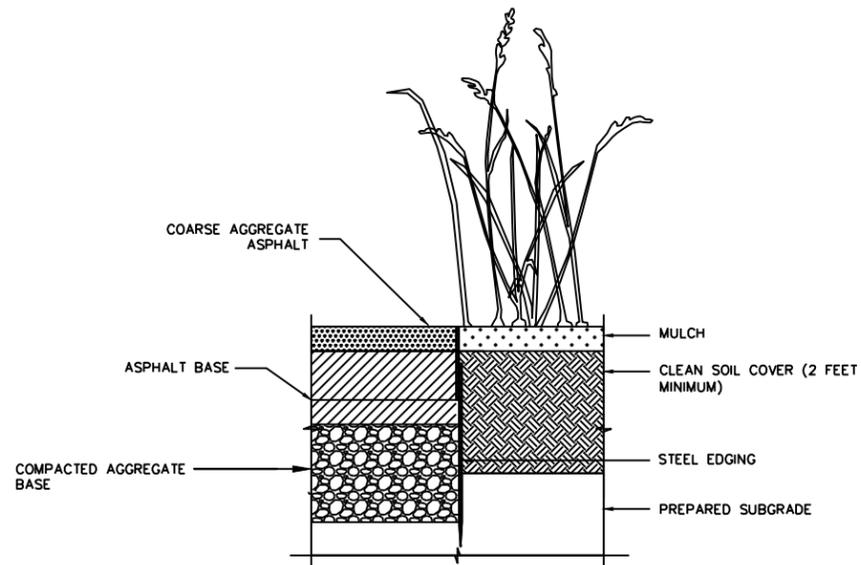
Sheet 4 of 19



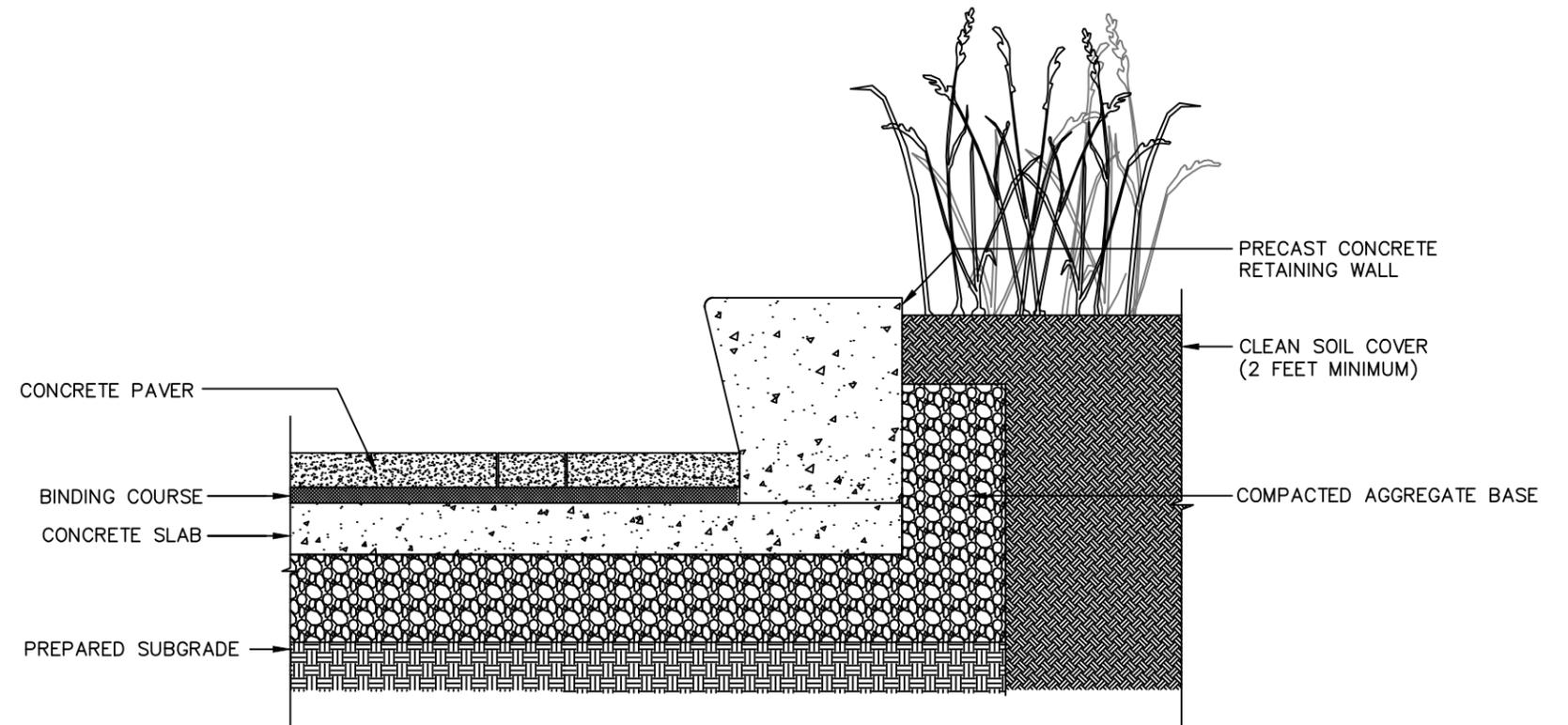
DETAIL 6: TYPICAL ROADWAY AND SIDEWALK
(NOT TO SCALE)



DETAIL 8: TYPICAL PICNIC AREA AT SECONDARY WALK
(NOT TO SCALE)



DETAIL 7: TYPICAL PICNIC AREA AND PLANTED AREA
(NOT TO SCALE)



DETAIL 9: TYPICAL TERRACE WALL
(NOT TO SCALE)

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LANDING**

Block 2472, Lot 80,
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Drawing Title

**PROPOSED SITE
COVER SYSTEM DETAILS**

PARCEL G1

NEW YORK

Project No.
170229002

Date
3/23/2015

Scale
NTS

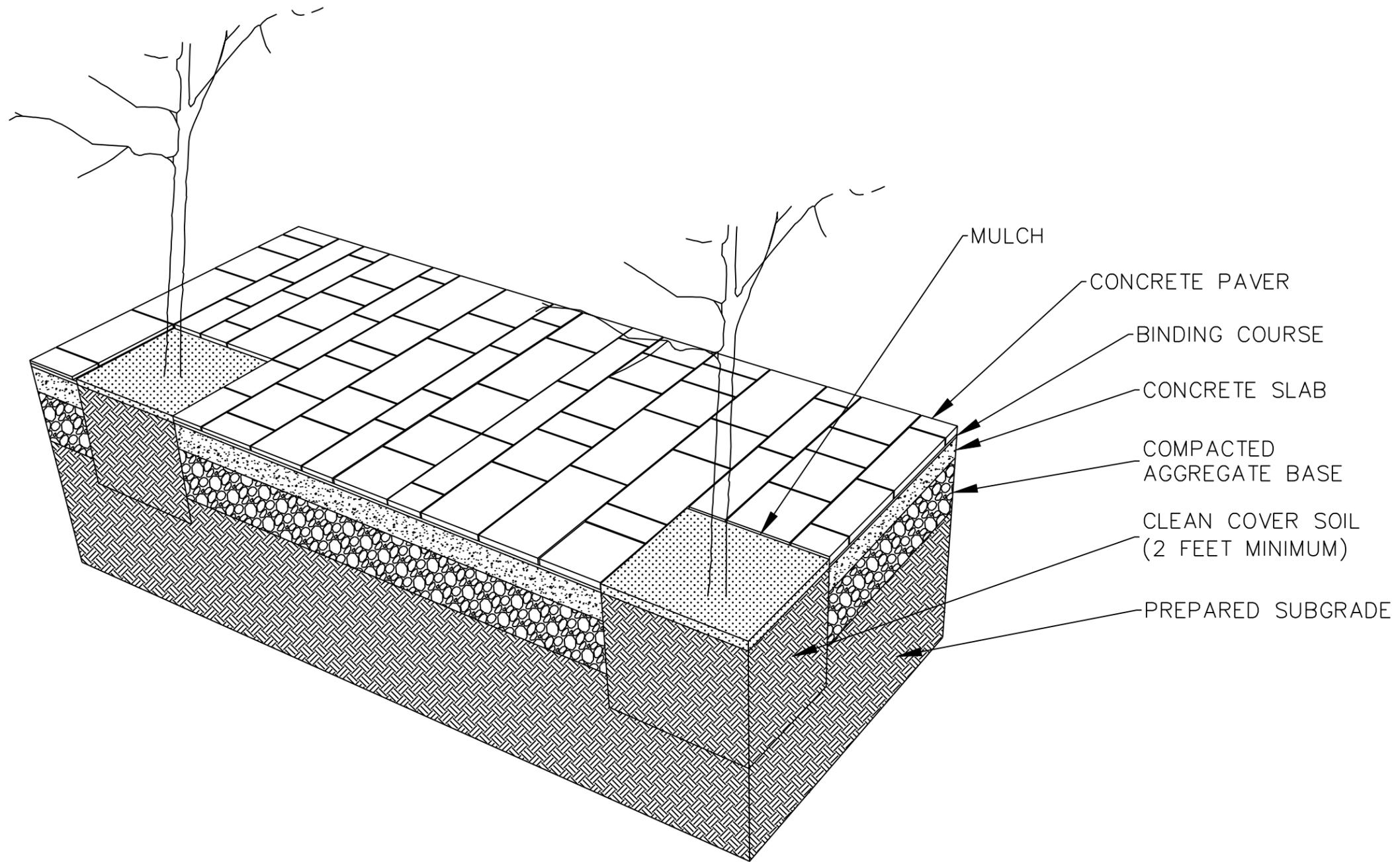
Drawn By
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Submission Date

4D

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DETAIL 10: TYPICAL SIDEWALK ALONG ROADWAY WITH TREE PLANTERS
(NOT TO SCALE)

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**GREENPOINT
LANDING**

Block 2472, Lot 80,
p/o Lot 50, and p/o Lot 100
BROOKLYN

KINGS

NEW YORK

Drawing Title

**PROPOSED SITE
COVER SYSTEM DETAILS**

PARCEL G1

Project No.
170229002

Date
3/23/2015

Scale
NTS

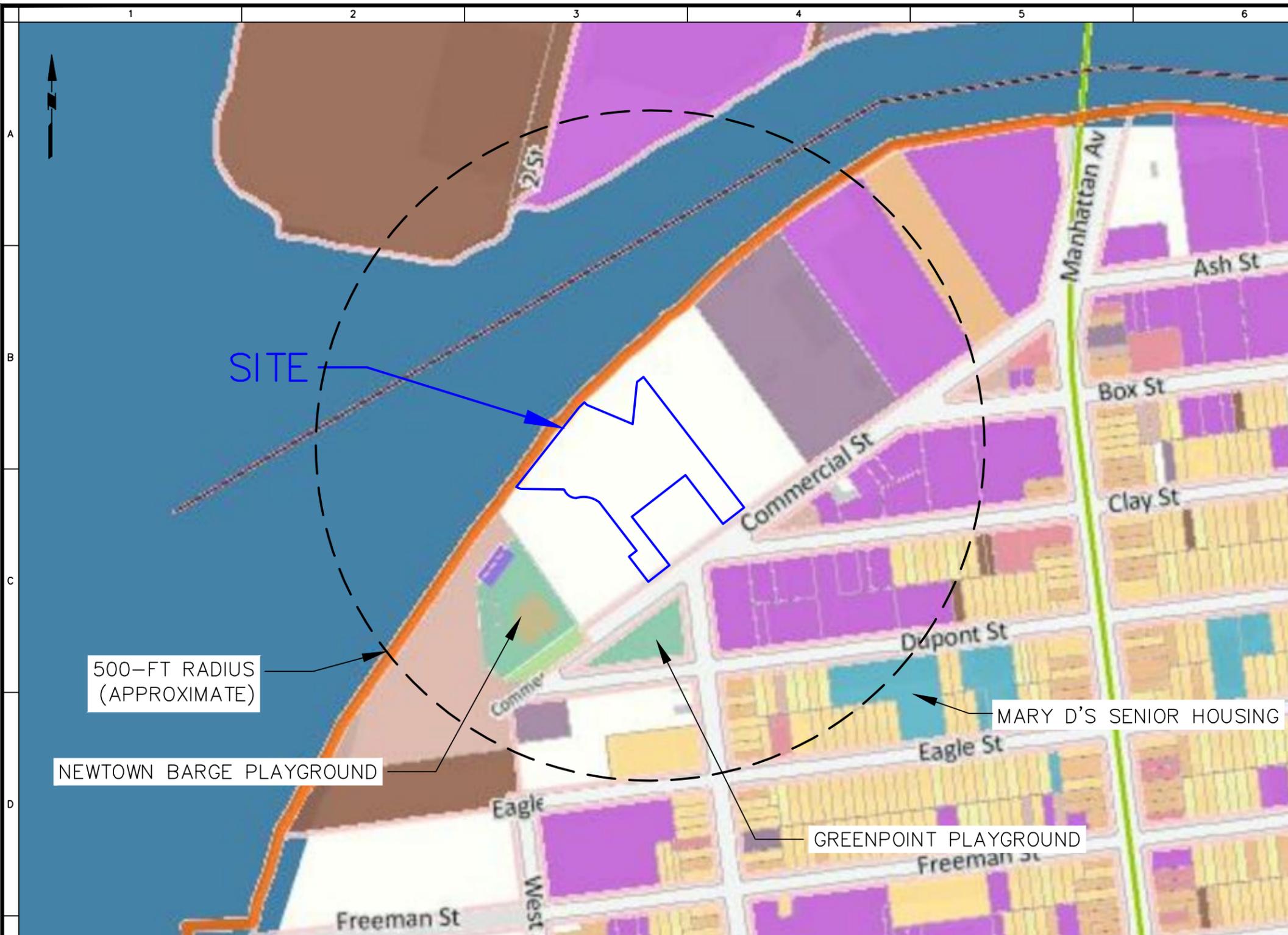
Drawn By
GCW

Checked By
MSR

Submission Date

4E

Sheet 4 of 19



LEGEND

APPROXIMATE SITE BOUNDARY

TEXT

SENSITIVE RECEPTORS

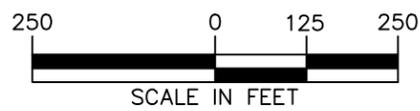
LAND USE CATEGORIES

- 1&2 FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- MIXED-USE
- OPEN SPACE & OUTDOOR RECREATION
- COMMERCIAL
- INSTITUTIONS
- INDUSTRIAL
- PARKING
- TRANSPORTATION & UTILITIES
- VACANT LOTS

GENERAL NOTES

1. BASE MAP SOURCE: NYC OASIS MAPS.

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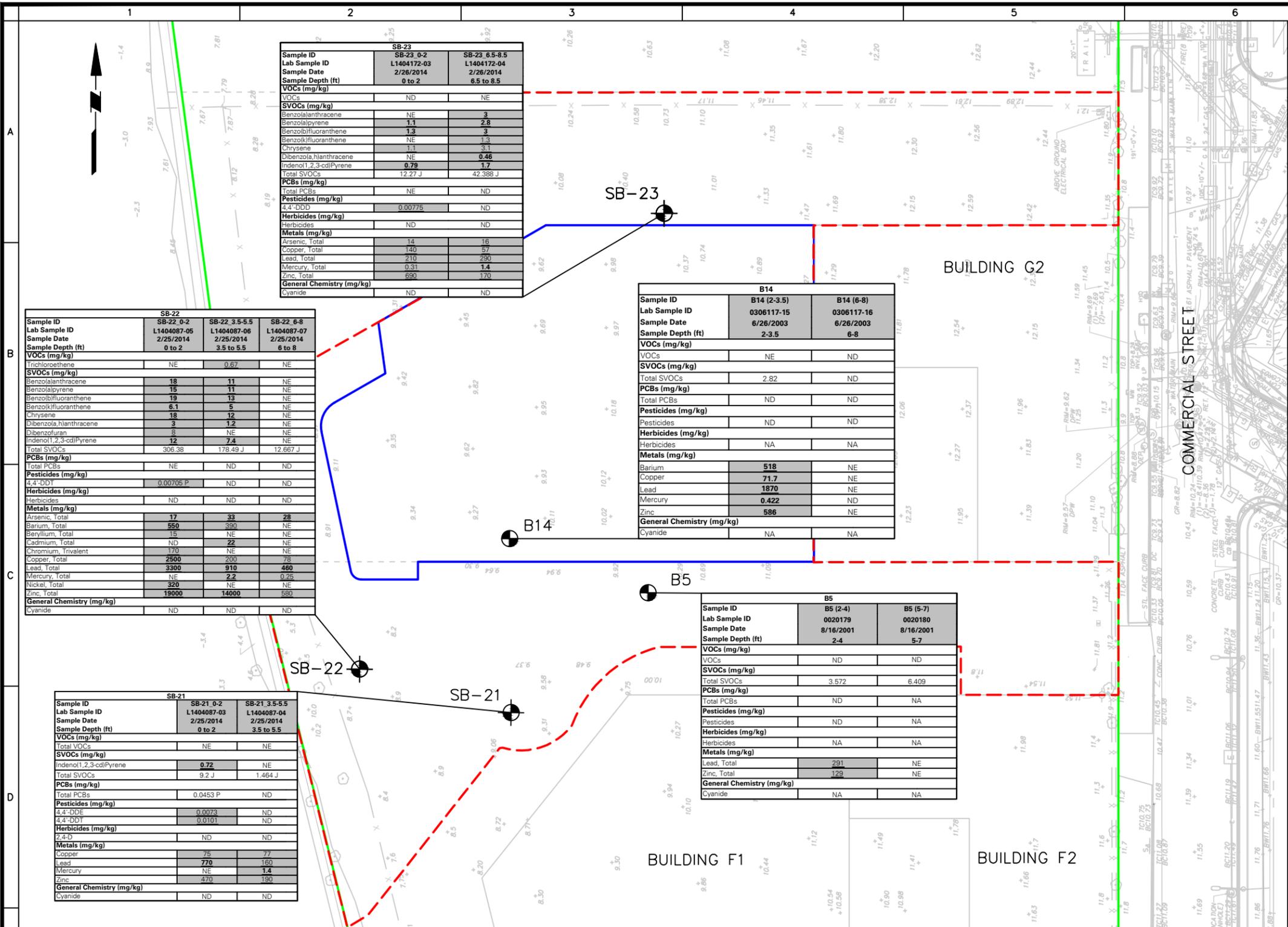
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Drawing Title
LAND USE AND SENSITIVE RECEPTORS
PARCEL G1

Project No. 170229002	Drawing No.
Date 11/20/2014	5
Scale 1" = 250'	
Drawn By GCW	
Submission Date	Sheet 5 of 19



Sample ID	SB-23 0-2	SB-23 6.5-8.5
Lab Sample ID	L1404172-03	L1404172-04
Sample Date	2/26/2014	2/26/2014
Sample Depth (ft)	0 to 2	6.5 to 8.5
VOCs (mg/kg)	NE	NE
SVOCs (mg/kg)		
Benzo(a)anthracene	NE	3
Benzo(a)pyrene	1.1	2.8
Benzo(b)fluoranthene	1.3	3
Benzo(k)fluoranthene	NE	1.3
Chrysene	1.1	3.1
Dibenz(a,h)anthracene	NE	0.46
Indeno(1,2,3-cd)Pyrene	0.79	1.7
Total SVOCs	12.27 J	42.388 J
PCBs (mg/kg)		
Total PCBs	NE	ND
Pesticides (mg/kg)		
4,4'-DDT	0.00775	ND
Herbicides (mg/kg)		
Herbicides	ND	ND
Metals (mg/kg)		
Arsenic, Total	14	16
Copper, Total	140	57
Lead, Total	210	290
Mercury, Total	0.31	1.4
Zinc, Total	690	170
General Chemistry (mg/kg)		
Cyanide	ND	ND

Sample ID	B14 (2-3.5)	B14 (6-8)
Lab Sample ID	0306117-15	0306117-16
Sample Date	6/26/2003	6/26/2003
Sample Depth (ft)	2-3.5	6-8
VOCs (mg/kg)		
SVOCs (mg/kg)		
Total SVOCs	2.82	ND
PCBs (mg/kg)		
Total PCBs	ND	ND
Pesticides (mg/kg)		
Pesticides	ND	ND
Herbicides (mg/kg)		
Herbicides	NA	NA
Metals (mg/kg)		
Barium	518	NE
Copper	71.7	NE
Lead	1870	NE
Mercury	0.422	ND
Zinc	586	NE
General Chemistry (mg/kg)		
Cyanide	NA	NA

Sample ID	B5 (2-4)	B5 (5-7)
Lab Sample ID	0020179	0020180
Sample Date	8/16/2001	8/16/2001
Sample Depth (ft)	2-4	5-7
VOCs (mg/kg)		
SVOCs (mg/kg)		
Total SVOCs	3.572	6.409
PCBs (mg/kg)		
Total PCBs	ND	NA
Pesticides (mg/kg)		
Pesticides	ND	NA
Herbicides (mg/kg)		
Herbicides	NA	NA
Metals (mg/kg)		
Lead, Total	291	NE
Zinc, Total	129	NE
General Chemistry (mg/kg)		
Cyanide	NA	NA

Sample ID	SB-22 0-2	SB-22 3.5-5.5	SB-22 6-8
Lab Sample ID	L1404087-05	L1404087-06	L1404087-07
Sample Date	2/25/2014	2/25/2014	2/25/2014
Sample Depth (ft)	0 to 2	3.5 to 5.5	6 to 8
VOCs (mg/kg)			
Trichloroethene	NE	0.67	NE
SVOCs (mg/kg)			
Benzo(a)anthracene	18	11	NE
Benzo(a)pyrene	15	11	NE
Benzo(b)fluoranthene	19	13	NE
Benzo(k)fluoranthene	8.1	5	NE
Chrysene	18	12	NE
Dibenz(a,h)anthracene	3	1.2	NE
Dibenzofuran	8	NE	NE
Indeno(1,2,3-cd)Pyrene	12	7.4	NE
Total SVOCs	306.38	178.49 J	12.667 J
PCBs (mg/kg)			
Total PCBs	NE	ND	ND
Pesticides (mg/kg)			
4,4'-DDT	0.00705 P	ND	ND
Herbicides (mg/kg)			
Herbicides	ND	ND	ND
Metals (mg/kg)			
Arsenic, Total	17	33	28
Barium, Total	550	390	NE
Beryllium, Total	18	NE	NE
Cadmium, Total	ND	22	NE
Chromium, Trivalent	170	NE	NE
Copper, Total	2500	200	78
Lead, Total	3300	910	460
Mercury, Total	NE	2.2	0.25
Nickel, Total	320	NE	NE
Zinc, Total	19000	14000	580
General Chemistry (mg/kg)			
Cyanide	ND	ND	ND

Sample ID	SB-21 0-2	SB-21 3.5-5.5
Lab Sample ID	L1404087-03	L1404087-04
Sample Date	2/25/2014	2/25/2014
Sample Depth (ft)	0 to 2	3.5 to 5.5
VOCs (mg/kg)		
Total VOCs	NE	NE
SVOCs (mg/kg)		
Indeno(1,2,3-cd)Pyrene	0.72	NE
Total SVOCs	9.2 J	1.464 J
PCBs (mg/kg)		
Total PCBs	0.0453 P	ND
Pesticides (mg/kg)		
4,4'-DDE	0.0073	ND
4,4'-DDT	0.0101	ND
Herbicides (mg/kg)		
2,4-D	ND	ND
Metals (mg/kg)		
Copper	75	77
Lead	770	180
Mercury	NE	1.4
Zinc	470	190
General Chemistry (mg/kg)		
Cyanide	ND	ND

LEGEND

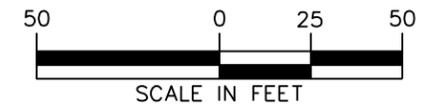
- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- PREVIOUS SOIL BORING LOCATION AND ID (AKRF 2003)
- PREVIOUS SOIL BORING LOCATION AND ID (PHASE 2 RI, LANGAN 2014)

GENERAL NOTES

- BASE MAP SOURCE: LANGAN DRAWING "170229001-V-EX0101 AND 170229001-C-UI0101."
- SOIL BORINGS WERE LOCATED BY GPS.
- NORTH ARROW SHOWS PROJECT NORTH.
- SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NYSDEC 6 NYCRR PART 375-6.8(A,B) AND CP-51 UNRESTRICTED USE AND RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCO) (TABLE 1).
- ONLY ANALYTES WITH DETECTIONS ARE PRESENTED.
- CONCENTRATIONS EXCEEDING NYSDEC PART 375-6.8(A) AND CP-51 UNRESTRICTED USE SCOS ARE SHADED AND UNDERLINED.
- CONCENTRATIONS EXCEEDING NYSDEC PART 375-6.8(B) AND CP-51 RESTRICTED-RESIDENTIAL SCOS ARE SHADED, UNDERLINED, AND BOLDED.
- VOC - VOLATILE ORGANIC COMPOUND
- SVOC - SEMIVOLATILE ORGANIC COMPOUND
- PCB - POLYCHLORINATED BIPHENYL
- mg/kg - MILLIGRAM PER KILOGRAM
- NA - NOT ANALYZED
- NE - RESULTS DO NOT EXCEED CRITERIA
- ND - NOT DETECTED
- "~" - CRITERIA DOES NOT EXIST
- J - THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT BUT BELOW THE REPORTING LIMIT; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

TABLE 1	NYSDEC PART 375 AND CP-51 UNRESTRICTED USE SCO	NYSDEC PART 375 AND CP-51 RESTRICTED RESIDENTIAL USE SCO
VOCs (mg/kg)		
Trichloroethene	0.47	21
SVOCs (mg/kg)		
Benzo(a)anthracene	1	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1	1
Benzo(k)fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz(a,h)anthracene	0.33	0.33
Dibenzofuran	7	59
Indeno(1,2,3-cd)Pyrene	0.5	0.5
Total SVOCs	-	-
Pesticides (mg/kg)		
4,4'-DDT	0.0033	13
4,4'-DDE	0.0033	8.9
4,4'-DDT	0.0033	7.9
Metals (mg/kg)		
Arsenic, Total	13	16
Barium, Total	350	400
Beryllium, Total	7.2	7.2
Cadmium, Total	2.5	4.3
Chromium, Trivalent	30	180
Copper, Total	50	270
Lead, Total	63	400
Mercury, Total	0.18	0.81
Nickel, Total	30	310
Zinc, Total	109	10000

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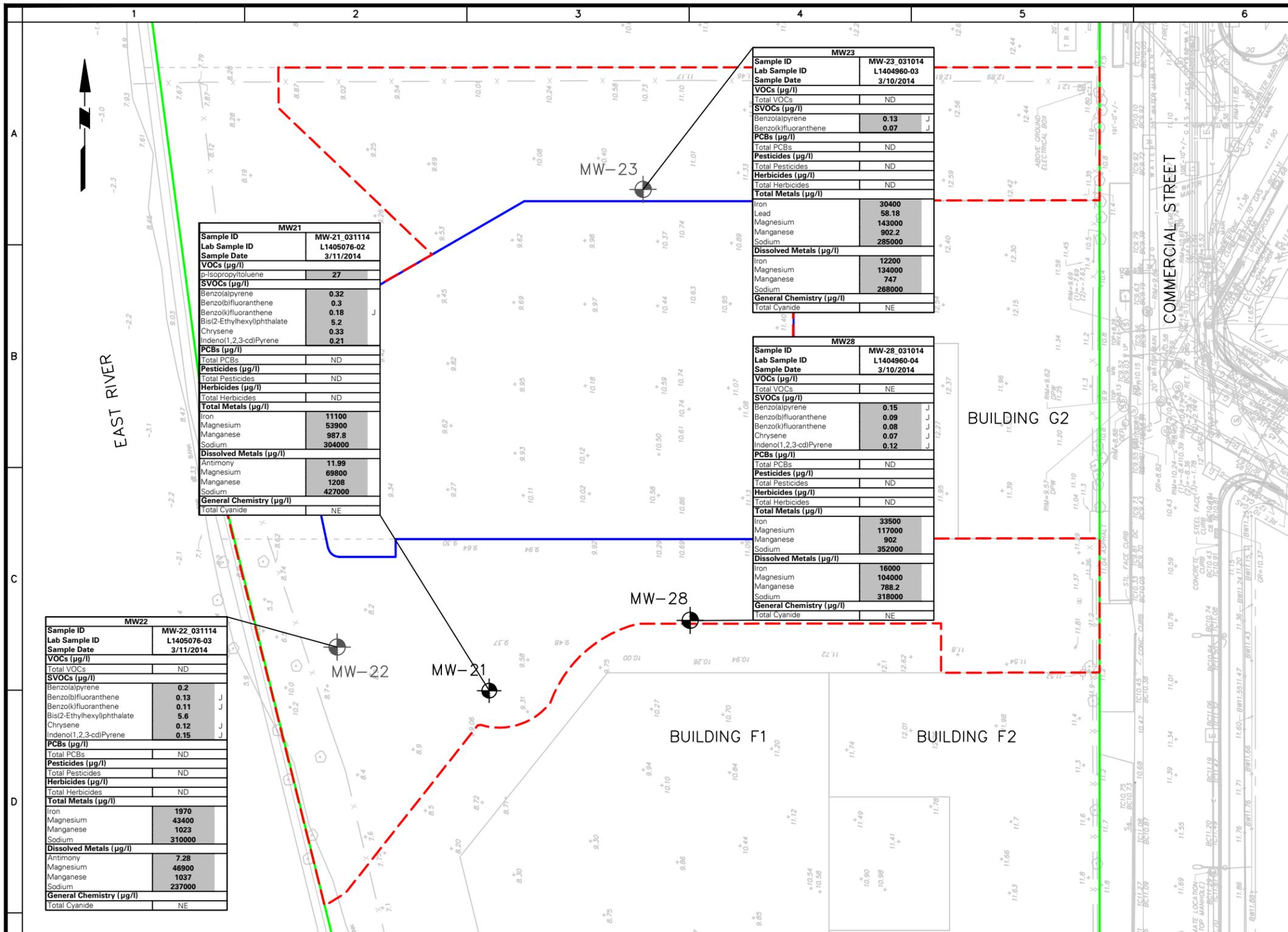


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GREENPOINT LANDING
 Block 2472, Lot 80,
 p/o Lot 50, and p/o Lot 100
 BROOKLYN
 KINGS NEW YORK

Drawing Title
PREVIOUS SOIL ANALYTICAL RESULTS - REMEDIAL INVESTIGATION
 PARCEL G1

Project No.
 170229002
 Date
 11/20/2014
 Scale
 1' = 50'
 Drawn By/Checked By
 SRD/MSR
 Submission Date
 Drawing No.
6
 Sheet 6 of 19



MW21	
Sample ID	MW-21_031114
Lab Sample ID	L1405076-02
Sample Date	3/11/2014
VOCs (µg/l)	
p-Isopropyltoluene	27
SVOCs (µg/l)	
Benzo(a)pyrene	0.32
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.18
Bis(2-Ethylhexyl)phthalate	5.2
Chrysene	0.33
Indeno(1,2,3-cd)Pyrene	0.21
PCBs (µg/l)	
Total PCBs	ND
Pesticides (µg/l)	
Total Pesticides	ND
Herbicides (µg/l)	
Total Herbicides	ND
Total Metals (µg/l)	
Iron	11100
Magnesium	53900
Manganese	987.8
Sodium	304000
Dissolved Metals (µg/l)	
Antimony	11.99
Magnesium	69800
Manganese	1208
Sodium	427000
General Chemistry (µg/l)	
Total Cyanide	NE

MW23	
Sample ID	MW-23_031014
Lab Sample ID	L1404960-03
Sample Date	3/10/2014
VOCs (µg/l)	
Total VOCs	ND
SVOCs (µg/l)	
Benzo(a)pyrene	0.13
Benzo(k)fluoranthene	0.07
PCBs (µg/l)	
Total PCBs	ND
Pesticides (µg/l)	
Total Pesticides	ND
Herbicides (µg/l)	
Total Herbicides	ND
Total Metals (µg/l)	
Iron	30400
Lead	58.18
Magnesium	143000
Manganese	902.2
Sodium	285000
Dissolved Metals (µg/l)	
Iron	12200
Magnesium	134000
Manganese	747
Sodium	268000
General Chemistry (µg/l)	
Total Cyanide	NE

MW28	
Sample ID	MW-28_031014
Lab Sample ID	L1404960-04
Sample Date	3/10/2014
VOCs (µg/l)	
Total VOCs	NE
SVOCs (µg/l)	
Benzo(a)pyrene	0.15
Benzo(b)fluoranthene	0.09
Benzo(k)fluoranthene	0.08
Chrysene	0.07
Indeno(1,2,3-cd)Pyrene	0.12
PCBs (µg/l)	
Total PCBs	ND
Pesticides (µg/l)	
Total Pesticides	ND
Herbicides (µg/l)	
Total Herbicides	ND
Total Metals (µg/l)	
Iron	33500
Magnesium	117000
Manganese	902
Sodium	352000
Dissolved Metals (µg/l)	
Iron	16000
Magnesium	104000
Manganese	788.2
Sodium	318000
General Chemistry (µg/l)	
Total Cyanide	NE

MW22	
Sample ID	MW-22_031114
Lab Sample ID	L1405076-03
Sample Date	3/11/2014
VOCs (µg/l)	
Total VOCs	ND
SVOCs (µg/l)	
Benzo(a)pyrene	0.2
Benzo(b)fluoranthene	0.13
Benzo(k)fluoranthene	0.11
Bis(2-Ethylhexyl)phthalate	5.6
Chrysene	0.12
Indeno(1,2,3-cd)Pyrene	0.15
PCBs (µg/l)	
Total PCBs	ND
Pesticides (µg/l)	
Total Pesticides	ND
Herbicides (µg/l)	
Total Herbicides	ND
Total Metals (µg/l)	
Iron	1970
Magnesium	43400
Manganese	1023
Sodium	310000
Dissolved Metals (µg/l)	
Antimony	7.28
Magnesium	46900
Manganese	1037
Sodium	237000
General Chemistry (µg/l)	
Total Cyanide	NE

LEGEND

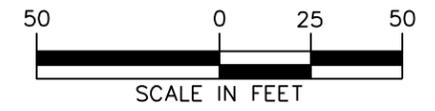
- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT BOUNDARY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- MW-23 PREVIOUS MONITORING WELL LOCATION AND ID (PHASE 2 RI, LANGAN 2014)

GENERAL NOTES

1. BASE MAP SOURCE: LANGAN DRAWING "170229001-V-EX0101 AND 170229001-C-UI0101."
1. MONITORING WELLS WERE SURVEYED BY LANGAN
2. NORTH ARROW SHOWS PROJECT NORTH.
3. GROUNDWATER SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (SGV) FOR CLASS GA WATER (TABLE 1). ONLY ANALYTES WITH DETECTIONS ARE PRESENTED.
5. CONCENTRATIONS EXCEEDING THE NYSDEC TOGS 1.1.1 SGVS ARE SHADED AND BOLDED.
5. VOC - VOLATILE ORGANIC COMPOUND
6. SVOC - SEMIVOLATILE ORGANIC COMPOUND
7. PCB - POLYCHLORINATED BIPHENYL
8. µg/L - MICROGRAM PER LITER
9. NE - NO EXCEEDANCE
10. ND - NOT DETECTED
11. "~" - CRITERIA DOES NOT EXIST
14. J - THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT BUT BELOW THE REPORTING LIMIT; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

Table 1	NYSDEC TOGS Standards and Guidance Values - GA
VOCs (µg/l)	
p-Isopropyltoluene	5
SVOCs (µg/l)	
Benzo(a)pyrene	0
Benzo(b)fluoranthene	0.002
Benzo(k)fluoranthene	0.002
Bis(2-Ethylhexyl)phthalate	5
Chrysene	0.002
Indeno(1,2,3-cd)Pyrene	0.002
Total Metals (µg/l)	
Iron	300
Lead	25
Magnesium	35000
Manganese	300
Selenium	10
Sodium	20000
Dissolved Metals (µg/l)	
Antimony	3
Iron	300
Magnesium	35000
Manganese	300
Selenium	10
Sodium	20000
Thallium	0.5

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Collectively known as Langan

Project

GREENPOINT LANDING

Block 2472, Lot 80,
p/o Lot 50, and p/o Lot 100
BROOKLYN

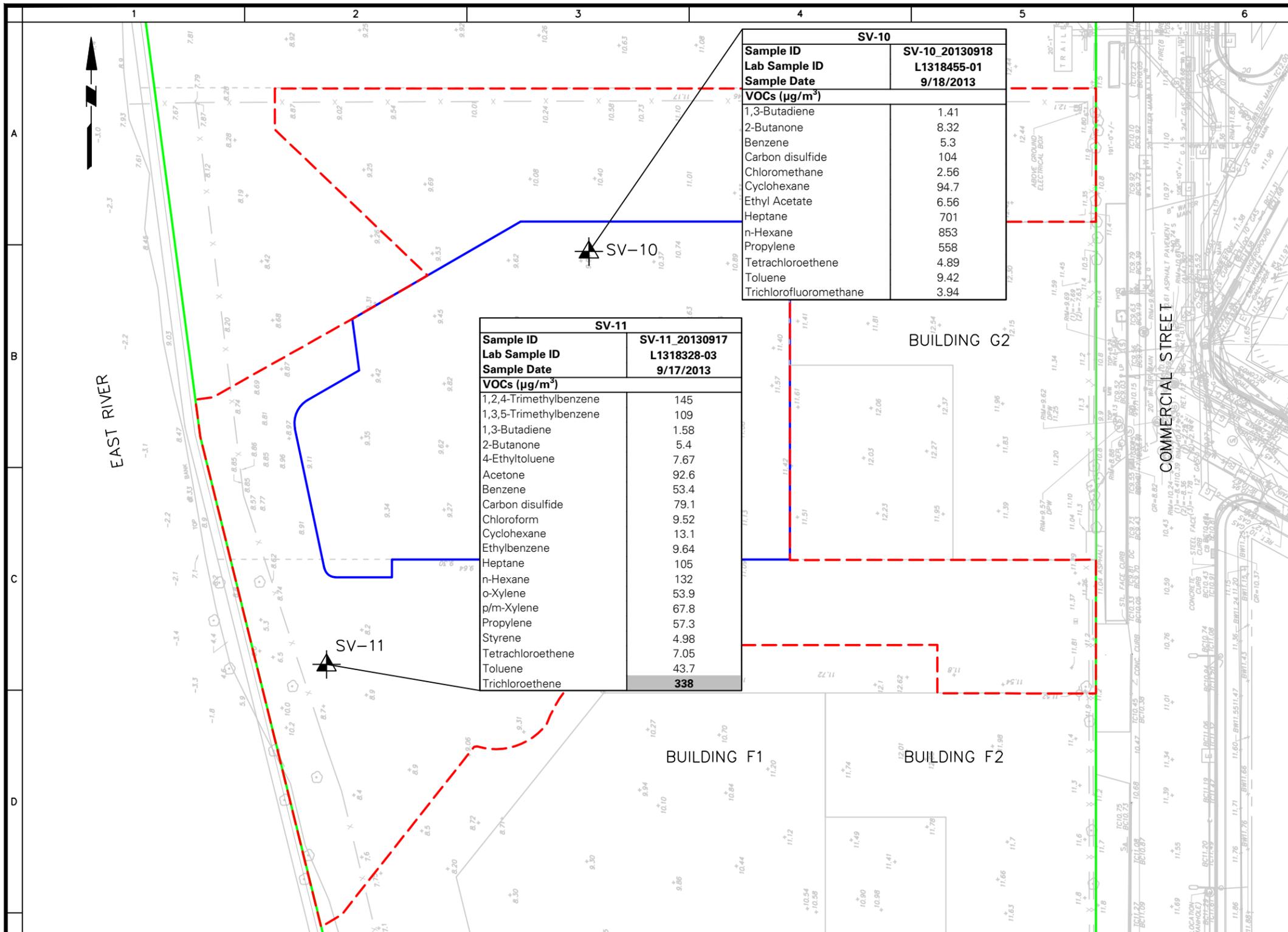
KINGS NEW YORK

Drawing Title

PREVIOUS GROUNDWATER ANALYTICAL RESULTS - REMEDIAL INVESTIGATION

PARCEL G1

Project No.	170229002	7	
Date	11/20/2014		
Scale	1' = 50'		
Drawn By	SRD	Checked By	MSR
Submission Date		Sheet 7 of 19	



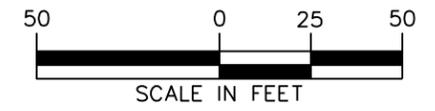
LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- SV-10 PREVIOUS SOIL VAPOR SAMPLING LOCATION AND ID (PHASE 1 RI, LANGAN 2013)

- GENERAL NOTES**
- BASE MAP SOURCE: LANGAN DRAWING "170229001-V-EX0101-L&M" AND "170229001-C-UI0101."
 - PREVIOUS SOIL VAPOR POINTS WERE SURVEYED BY LANGAN.
 - NORTH ARROW SHOWS PROJECT NORTH.
 - SOIL VAPOR ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) AIR GUIDELINE VALUE (AGV) (TABLE 1).
 - ONLY ANALYTES WITH DETECTIONS ARE PRESENTED.
 - VOC - VOLATILE ORGANIC COMPOUND
 - $\mu\text{g}/\text{m}^3$ - MICROGRAMS PER CUBIC METER

TABLE 1	NYSDOH AGV
VOCs ($\mu\text{g}/\text{m}^3$)	
Methylene chloride	60
Tetrachloroethene	30
Trichloroethene	5

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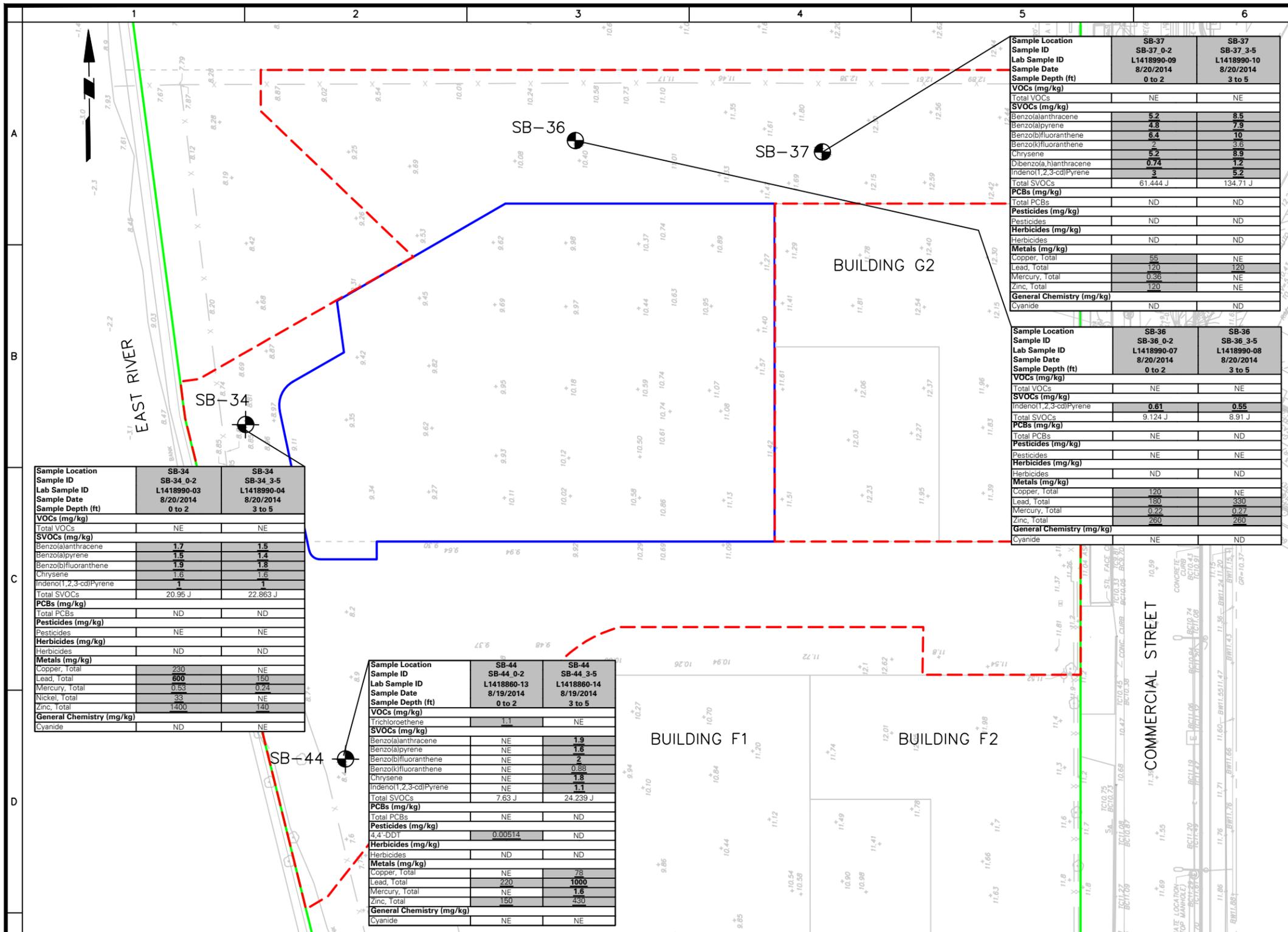


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KINGS NEW YORK

Drawing Title
PREVIOUS SOIL VAPOR ANALYTICAL RESULTS - REMEDIAL INVESTIGATION
PARCEL G1

Project No. 170229002	Drawing No. 8
Date 11/20/2014	
Scale 1' = 50'	Sheet 8 of 19
Drawn By/Checked By SRD/MSR	
Submission Date	



Sample Location	SB-34	SB-34
Sample ID	SB-34_0-2	SB-34_3-5
Lab Sample ID	L1418990-03	L1418990-04
Sample Date	8/20/2014	8/20/2014
Sample Depth (ft)	0 to 2	3 to 5
VOCs (mg/kg)	NE	NE
SVOCs (mg/kg)		
Benzolanthracene	1.7	1.5
Benzopyrene	1.5	1.4
Benzofluoranthene	1.9	1.8
Chrysene	1.6	1.6
Indeno(1,2,3-cd)Pyrene	1	1
Total SVOCs	20.95 J	22.863 J
PCBs (mg/kg)		
Total PCBs	ND	ND
Pesticides (mg/kg)		
Pesticides	NE	NE
Herbicides (mg/kg)		
Herbicides	ND	ND
Metals (mg/kg)		
Copper, Total	230	NE
Lead, Total	600	150
Mercury, Total	0.53	0.24
Nickel, Total	33	NE
Zinc, Total	1400	140
General Chemistry (mg/kg)		
Cyanide	ND	NE

Sample Location	SB-44	SB-44
Sample ID	SB-44_0-2	SB-44_3-5
Lab Sample ID	L1418860-13	L1418860-14
Sample Date	8/19/2014	8/19/2014
Sample Depth (ft)	0 to 2	3 to 5
VOCs (mg/kg)	1.1	NE
SVOCs (mg/kg)		
Benzolanthracene	NE	1.9
Benzopyrene	NE	1.6
Benzofluoranthene	NE	2
Benzokfluoranthene	NE	0.88
Chrysene	NE	1.8
Indeno(1,2,3-cd)Pyrene	NE	1.1
Total SVOCs	7.63 J	24.239 J
PCBs (mg/kg)		
Total PCBs	NE	ND
Pesticides (mg/kg)		
4,4'-DDT	0.00514	ND
Herbicides (mg/kg)		
Herbicides	ND	ND
Metals (mg/kg)		
Copper, Total	NE	78
Lead, Total	220	1000
Mercury, Total	NE	1.6
Zinc, Total	150	430
General Chemistry (mg/kg)		
Cyanide	NE	NE

Sample Location	SB-37	SB-37
Sample ID	SB-37_0-2	SB-37_3-5
Lab Sample ID	L1418990-09	L1418990-10
Sample Date	8/20/2014	8/20/2014
Sample Depth (ft)	0 to 2	3 to 5
VOCs (mg/kg)		
Total VOCs	NE	NE
SVOCs (mg/kg)		
Benzolanthracene	5.2	8.5
Benzopyrene	4.8	7.9
Benzofluoranthene	6.4	10
Benzokfluoranthene	2	3.6
Chrysene	5.2	8.9
Dibenzolanthracene	0.74	1.2
Indeno(1,2,3-cd)Pyrene	3	5.2
Total SVOCs	61.444 J	134.71 J
PCBs (mg/kg)		
Total PCBs	ND	ND
Pesticides (mg/kg)		
Pesticides	ND	ND
Herbicides (mg/kg)		
Herbicides	ND	ND
Metals (mg/kg)		
Copper, Total	55	NE
Lead, Total	120	120
Mercury, Total	0.36	NE
Zinc, Total	120	NE
General Chemistry (mg/kg)		
Cyanide	ND	ND

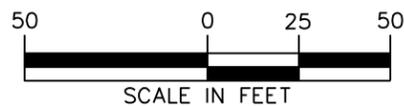
Sample Location	SB-36	SB-36
Sample ID	SB-36_0-2	SB-36_3-5
Lab Sample ID	L1418990-07	L1418990-08
Sample Date	8/20/2014	8/20/2014
Sample Depth (ft)	0 to 2	3 to 5
VOCs (mg/kg)		
Total VOCs	NE	NE
Indeno(1,2,3-cd)Pyrene	0.61	0.55
Total SVOCs	9.124 J	8.91 J
PCBs (mg/kg)		
Total PCBs	NE	ND
Pesticides (mg/kg)		
Pesticides	NE	NE
Herbicides (mg/kg)		
Herbicides	ND	ND
Metals (mg/kg)		
Copper, Total	120	NE
Lead, Total	180	330
Mercury, Total	0.22	0.27
Zinc, Total	260	260
General Chemistry (mg/kg)		
Cyanide	NE	ND

- LEGEND**
- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
 - APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
 - APPROXIMATE PARCEL G1 BOUNDARY
 - APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
 - SOIL BORING LOCATION AND ID (SUPPLEMENTAL RI, LANGAN 2014)

- GENERAL NOTES**
1. BASE MAP SOURCE: LANGAN DRAWINGS "170229001-V-EX0101 AND "170229001-C-UI0101."
 2. NORTH ARROW SHOWS PROJECT NORTH.
 3. SOIL BORING LOCATIONS WERE LOCATED BY GPS.
 4. SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NYSDEC 6 NYCRR PART 375-6.8(A,B) AND CP-51 UNRESTRICTED AND RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCOS) (SEE TABLE 1)
 5. ONLY SOIL ANALYTES WITH DETECTIONS ARE PRESENTED.
 6. CONCENTRATIONS EXCEEDING THE NYSDEC PART 375-6.8(A) AND CP-51 UNRESTRICTED USE SCOS ARE SHADED AND UNDERLINED.
 7. CONCENTRATIONS EXCEEDING THE NYSDEC PART 375-6.8(B) AND CP-51 RESTRICTED-RESIDENTIAL USE SCOS ARE SHADED, UNDERLINED, AND BOLDED.
 8. VOC - VOLATILE ORGANIC COMPOUND
 9. SVOC - SEMIVOLATILE ORGANIC COMPOUND
 10. PCB - POLYCHLORINATED BIPHENYL
 11. mg/kg - MILLIGRAMS PER KILOGRAM
 12. NA - NOT ANALYZED
 13. NE - RESULTS DO NOT EXCEED CRITERIA
 14. ND - NOT DETECTED
 15. "~" - CRITERIA DOES NOT EXIST
 16. J - THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT BUT BELOW THE REPORTING LIMIT; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

TABLE 1	NYSDEC PART 375 AND CP-51 UNRESTRICTED USE SCO	NYSDEC PART 375 AND CP-51 RESTRICTED-RESIDENTIAL USE SCO
VOCs (mg/kg)		
Benzene	0.06	4.8
Toluene	0.7	100
Trichloroethene	0.47	21
SVOCs (mg/kg)		
Benzolanthracene	1	1
Benzopyrene	1	1
Benzofluoranthene	1	1
Benzokfluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenzolanthracene	0.33	0.33
Dibenzofuran	7	59
Indeno(1,2,3-cd)Pyrene	0.5	0.5
Total SVOCs	-	-
PCBs (mg/kg)		
Aroclor 1260	0.1	1
Total PCBs	0.1	1
Pesticides (mg/kg)		
4,4'-DDT	0.0033	7.9
Metals (mg/kg)		
Arsenic	13	16
Barium, Total	350	400
Cadmium, Total	2.5	4.3
Chromium, Trivalent	30	180
Copper, Total	50	270
Lead, Total	63	400
Mercury, Total	0.18	0.81
Nickel, Total	30	310
Zinc, Total	109	10000
General Chemistry (mg/kg)		
Cyanide	27	40

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BROOKLYN

KINGS

NEW YORK

Drawing Title

SUPPLEMENTAL RI
SOIL ANALYTICAL RESULTS -
PARCEL G1

Project No.
170229002

Date
11/20/2014

Scale
1' = 50'

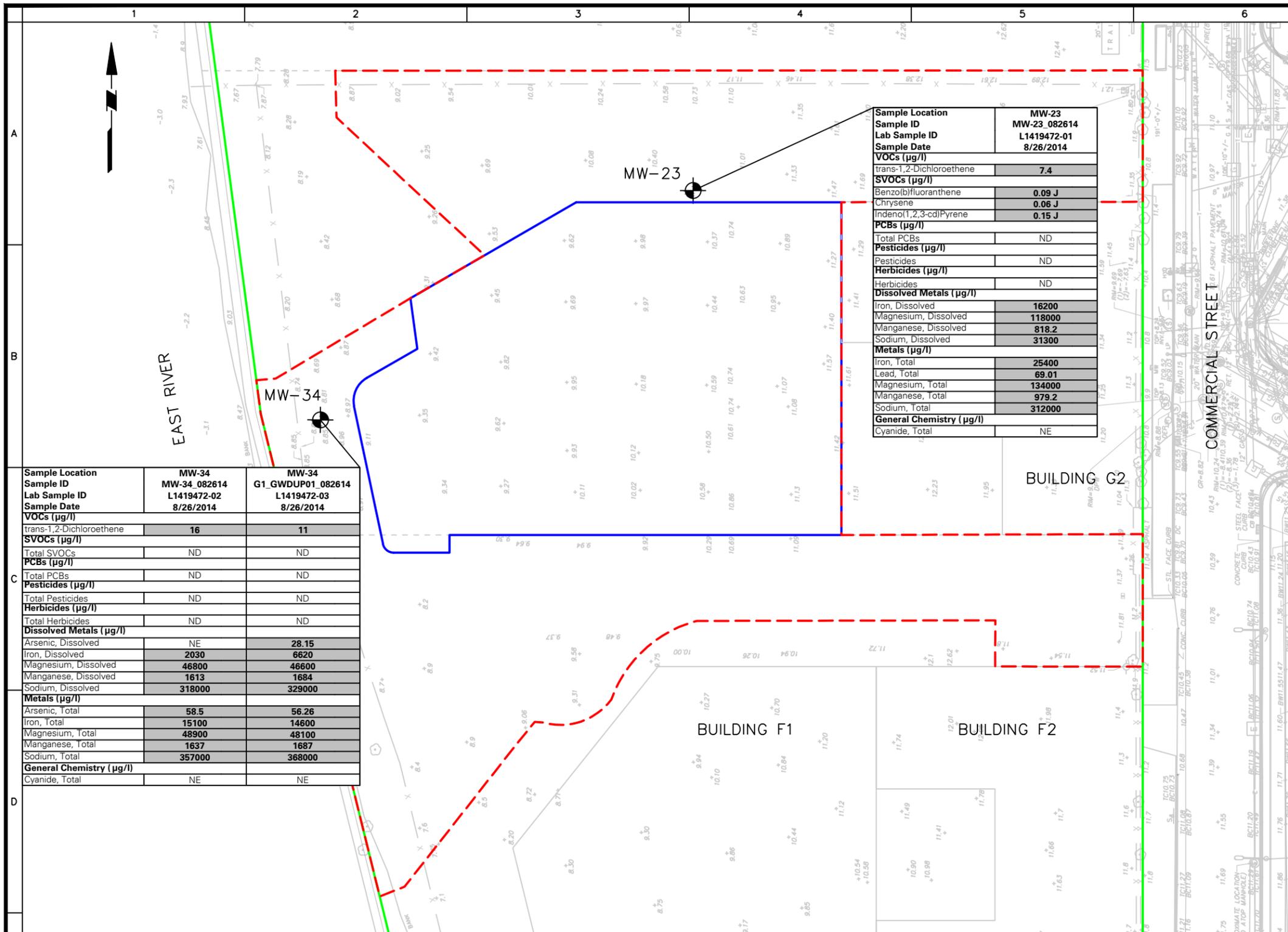
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SRD/MSR

Submission Date

Drawing No.

9

Sheet 9 of 19



LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- MONITORING WELL LOCATION AND ID (SUPPLEMENTAL RI, LANGAN 2014)

GENERAL NOTES

- BASE MAP SOURCE: LANGAN DRAWING "170229001-V-EX010-L&M" AND "170229001-C-UI0101"
- MONITORING WELLS WERE SURVEYED BY LANGAN.
- NORTH ARROW SHOWS PROJECT NORTH.
- GROUNDWATER SAMPLE RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (SGV) FOR CLASS GA WATERS.
- ONLY ANALYTES WITH DETECTIONS ARE SHOWN.
- CONCENTRATIONS EXCEEDING THE NYSDEC TOGS 1.1.1 SGV EXCEEDANCES ARE HIGHLIGHTED AND BOLDED.
- VOC-VOLATILE ORGANIC COMPOUND
- SVOC-SEMIVOLATILE ORGANIC COMPOUND
- PCB-POLYCHLORINATED BIPHENYL
- µg/L - MICROGRAM PER LITER
- NE - RESULTS DO NOT EXCEED CRITERIA
- ND - NOT DETECTED
- "~" - CRITERIA DOES NOT EXIST
- J - THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT BUT BELOW THE REPORTING LIMIT; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

TABLE 1	NYSDEC TOGS SGVs - Class GA
VOCs (µg/l)	
trans-1,2-Dichloroethene	5
SVOCs (µg/l)	
Benzo(b)fluoranthene	0.002
Chrysene	0.002
Indeno(1,2,3-cd)Pyrene	0.002
Total SVOCs	-
PCBs (µg/l)	
Total PCBs	0.09
Pesticides (µg/l)	
Total Pesticides	ND
Herbicides (µg/l)	
Total Herbicides	ND
Metals (µg/l)	
Arsenic, Total	25
Iron, Total	300
Lead, Total	25
Magnesium, Total	35000
Manganese, Total	300
Sodium, Total	20000
Dissolved Metals (µg/l)	
Arsenic, Dissolved	25
Antimony, Dissolved	3
Iron, Dissolved	300
Magnesium, Dissolved	35000
Manganese, Dissolved	300
Sodium, Dissolved	20000
General Chemistry (mg/kg)	
Cyanide, Total	200

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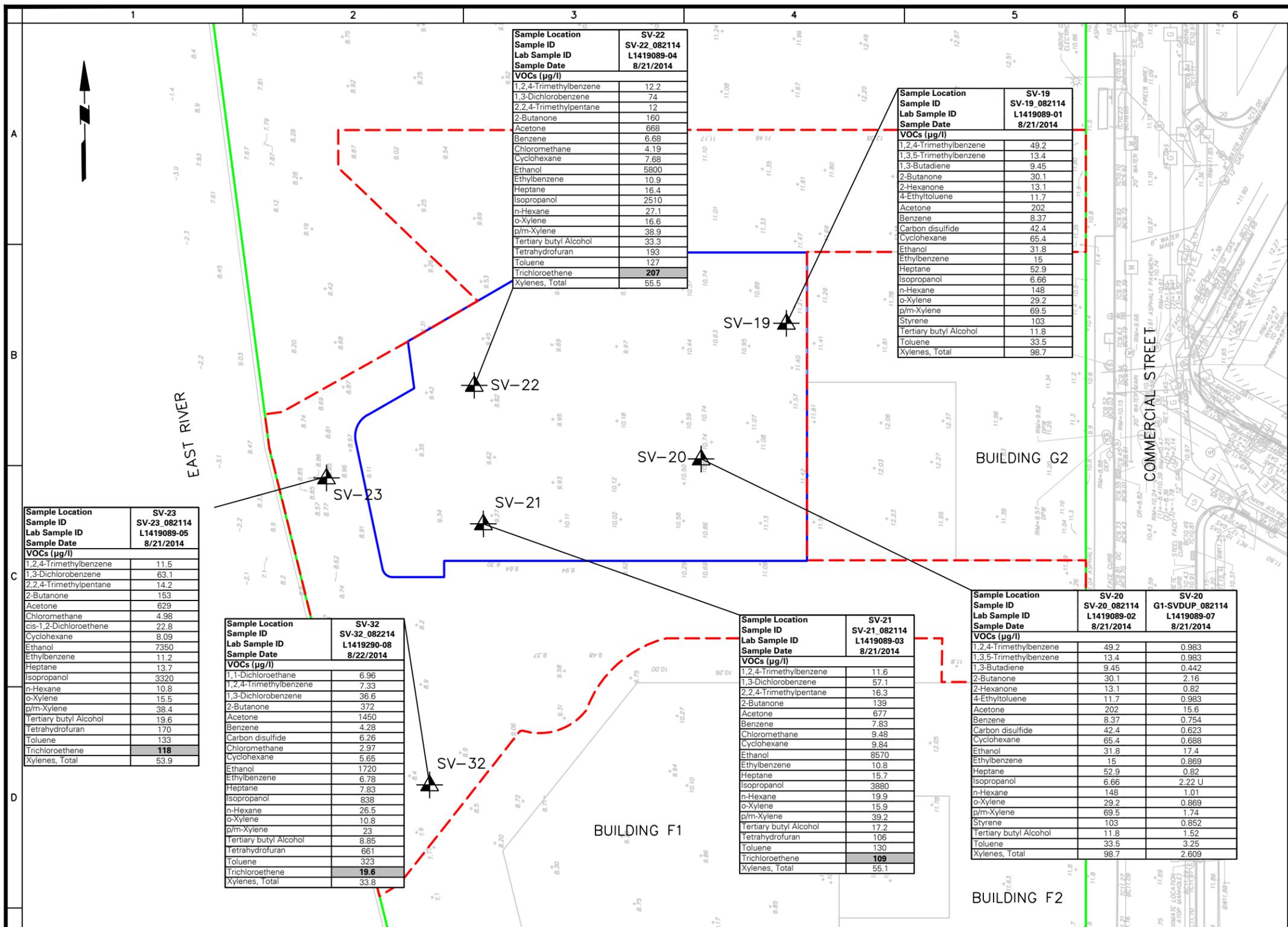
SCALE IN FEET

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 Block 2472, Lot 80,
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 BROOKLYN
 KINGS NEW YORK

Drawing Title
SUPPLEMENTAL RI
GROUNDWATER ANALYTICAL RESULTS - PARCEL G1

Project No.
170229002
 Date
11/24/2014
 Scale
1' = 50'
 Drawn By/Checked By
SRD/MSR
 Submission Date
 Drawing No.
10
 Sheet 10 of 19



LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- SOIL VAPOR SAMPLING LOCATION AND ID (SUPPLEMENTAL RI, LANGAN 2014)

- GENERAL NOTES**
- BASE MAP SOURCE: LANGAN DRAWINGS "170229001-V-EX0101-L+M" AND "170229001-C-UI0101"
 - NORTH ARROW SHOWS PROJECT NORTH
 - LOCATIONS OF SOIL VAPOR SAMPLING POINTS ARE APPROXIMATE.
 - SOIL VAPOR ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) AIR GUIDELINE VALUES (AGV).
 - ONLY SOIL VAPOR DETECTIONS ARE PRESENTED.
 - CONCENTRATIONS EXCEEDING THE NYSDOH AGVS ARE SHADED AND BOLDED.
 - VOCS - VOLATILE ORGANIC COMPOUNDS
 - $\mu\text{g}/\text{m}^3$ - MICROGRAMS PER CUBIC METER
 - ONE AMBIENT AIR SAMPLE, G1-AA01_082114, WAS COLLECTED. THE RESULTS DO NOT EXCEED THE NYSDOH AGV.

TABLE 1	NYSDOH AGV
VOCS ($\mu\text{g}/\text{m}^3$)	
Methylene chloride	60
Tetrachloroethene	30
Trichloroethene	5

Sample Location	SV-23
Sample ID	SV-23_082114
Lab Sample ID	L1419089-05
Sample Date	8/21/2014
VOCS ($\mu\text{g}/\text{l}$)	
1,2,4-Trimethylbenzene	11.5
1,3-Dichlorobenzene	63.1
2,2,4-Trimethylpentane	14.2
2-Butanone	153
Acetone	629
Chloromethane	4.98
cis-1,2-Dichloroethene	22.8
Cyclohexane	8.09
Ethanol	7350
Ethylbenzene	11.2
Heptane	13.7
Isopropanol	3320
n-Hexane	10.8
o-Xylene	15.5
p/m-Xylene	38.4
Tertiary butyl Alcohol	19.6
Tetrahydrofuran	170
Toluene	133
Trichloroethene	118
Xylenes, Total	53.9

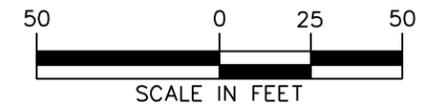
Sample Location	SV-32
Sample ID	SV-32_082214
Lab Sample ID	L1419290-08
Sample Date	8/22/2014
VOCS ($\mu\text{g}/\text{l}$)	
1,1-Dichloroethane	6.96
1,2,4-Trimethylbenzene	7.33
1,3-Dichlorobenzene	36.6
2-Butanone	372
Acetone	1450
Benzene	4.28
Carbon disulfide	6.26
Chloromethane	2.97
Cyclohexane	5.65
Ethanol	1720
Ethylbenzene	6.78
Heptane	7.83
Isopropanol	838
n-Hexane	26.5
o-Xylene	10.8
p/m-Xylene	23
Tertiary butyl Alcohol	8.85
Tetrahydrofuran	661
Toluene	323
Trichloroethene	19.6
Xylenes, Total	33.8

Sample Location	SV-22
Sample ID	SV-22_082114
Lab Sample ID	L1419089-04
Sample Date	8/21/2014
VOCS ($\mu\text{g}/\text{l}$)	
1,2,4-Trimethylbenzene	12.2
1,3-Dichlorobenzene	74
2,2,4-Trimethylpentane	12
2-Butanone	160
Acetone	668
Benzene	6.68
Chloromethane	4.19
Cyclohexane	7.68
Ethanol	5800
Ethylbenzene	10.9
Heptane	16.4
Isopropanol	2510
n-Hexane	27.1
o-Xylene	16.6
p/m-Xylene	38.9
Tertiary butyl Alcohol	33.3
Tetrahydrofuran	193
Toluene	127
Trichloroethene	207
Xylenes, Total	55.5

Sample Location	SV-19
Sample ID	SV-19_082114
Lab Sample ID	L1419089-01
Sample Date	8/21/2014
VOCS ($\mu\text{g}/\text{l}$)	
1,2,4-Trimethylbenzene	49.2
1,3,5-Trimethylbenzene	13.4
1,3-Butadiene	9.45
2-Butanone	30.1
2-Hexanone	13.1
4-Ethyltoluene	11.7
Acetone	202
Benzene	8.37
Carbon disulfide	42.4
Cyclohexane	65.4
Ethanol	31.8
Ethylbenzene	15
Heptane	52.9
Isopropanol	6.66
n-Hexane	148
o-Xylene	29.2
p/m-Xylene	69.5
Styrene	103
Tertiary butyl Alcohol	11.8
Toluene	33.5
Xylenes, Total	98.7

Sample Location	SV-20	SV-20
Sample ID	SV-20_082114	G1-SVDUP_082114
Lab Sample ID	L1419089-02	L1419089-07
Sample Date	8/21/2014	8/21/2014
VOCS ($\mu\text{g}/\text{l}$)		
1,2,4-Trimethylbenzene	49.2	0.983
1,3,5-Trimethylbenzene	13.4	0.983
1,3-Butadiene	9.45	0.442
2-Butanone	30.1	2.16
2-Hexanone	13.1	0.82
4-Ethyltoluene	11.7	0.983
Acetone	202	15.6
Benzene	8.37	0.754
Carbon disulfide	42.4	0.623
Cyclohexane	65.4	0.688
Ethanol	31.8	17.4
Ethylbenzene	15	0.869
Heptane	52.9	0.82
Isopropanol	6.66	2.22 U
n-Hexane	148	1.01
o-Xylene	29.2	0.869
p/m-Xylene	69.5	1.74
Styrene	103	0.852
Tertiary butyl Alcohol	11.8	1.52
Toluene	33.5	3.25
Xylenes, Total	98.7	2.609

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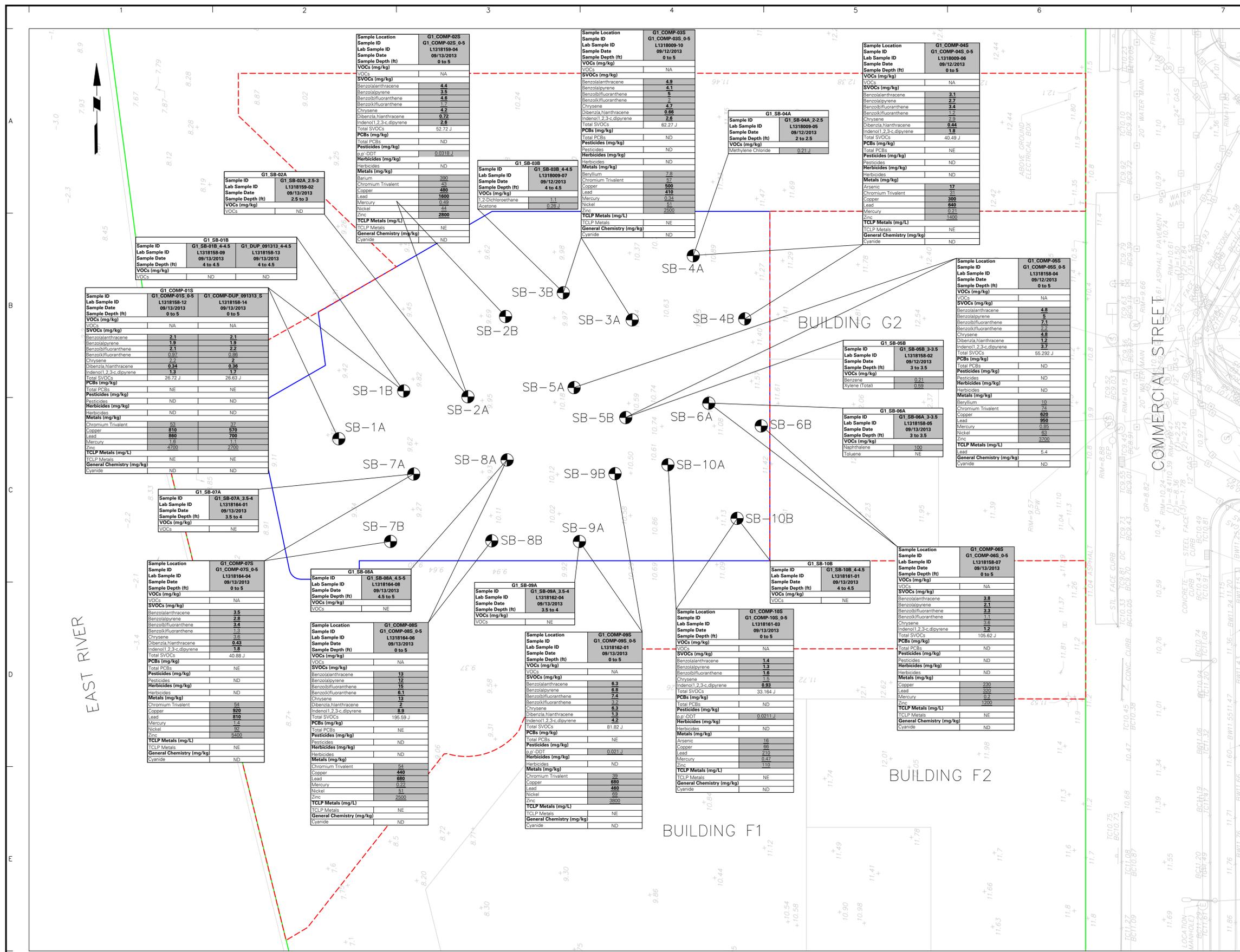


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Project
GREENPOINT LANDING
 Block 2472, Lot 80,
 p/o Lot 50, and p/o Lot 100
 BROOKLYN
 KINGS NEW YORK

Drawing Title
SUPPLEMENTAL RI
SOIL VAPOR ANALYTICAL RESULTS - PARCEL G1

Project No. 170229002
 Date 11/24/2014
 Scale 1' = 50'
 Drawn By SRD / Checked By MSR
 Submission Date
 Drawing No. **11**
 Sheet 11 of 19



LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT BOUNDARY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- PREVIOUS SOIL BORING LOCATION AND ID (LANGAN 2013)

- GENERAL NOTES**
- BASE MAP SOURCE: LANGAN DRAWINGS "170229001-V-EX0101 AND 170229001-C-UI0101."
 - SOIL BORING LOCATIONS WERE LOCATED BY GPS.
 - NORTH ARROW SHOWS PROJECT NORTH.
 - SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NYSDEC 6 NYCRR PART 375-6.8(A,B) AND CP-51 UNRESTRICTED USE AND RESTRICTED USE RESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCO) (TABLE 1).
 - ONLY ANALYTES WITH DETECTIONS ARE PRESENTED.
 - CONCENTRATIONS EXCEEDING THE NYSDEC PART 375-6.8(A) UNRESTRICTED USE SCOS ARE SHADED AND UNDERLINED.
 - CONCENTRATIONS EXCEEDING THE NYSDEC PART 375-6.8(B) RESTRICTED-RESIDENTIAL SCOS ARE SHADED, UNDERLINED, AND BOLDED.
 - VOC - VOLATILE ORGANIC COMPOUND
 - SVOC - SEMI-VOLATILE ORGANIC COMPOUND
 - PCB - POLYCHLORINATED BIPHENYL
 - mg/kg - MILLIGRAMS PER KILOGRAM
 - NA - NOT ANALYZED
 - NE - RESULTS DO NOT EXCEED CRITERIA
 - ND - NOT DETECTED
 - "~" - CRITERIA DOES NOT EXIST
 - J - THE ANALYTE WAS DETECTED ABOVE THE METHOD DETECTION LIMIT BUT BELOW THE REPORTING LIMIT; THEREFORE, THE RESULT IS AN ESTIMATED CONCENTRATION.

TABLE 1

TABLE 1	NYSDEC PART 375 AND CP-51 UNRESTRICTED USE SCO	NYSDEC PART 375 AND CP-51 RESTRICTED-RESIDENTIAL USE SCO
VOCs (mg/kg)		
1,2-Dichloroethane	0.02	3.1
Acetone	0.05	100
Benzene	0.06	4.8
Methylene Chloride	0.05	100
Naphthalene	12	100
Toluene	0.7	100
SVOCs (mg/kg)		
3-Methylphenol	0.33	100
Acephenanthrene	20	100
Benzolanthracene	1	1
Benzofluoranthene	1	1
Benzofluoranthene	1	1
Benzofluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz(a,h)anthracene	0.33	0.33
Dibenzofuran	100	100
Fluoranthene	100	100
Indeno(1,2,3-c)pyrene	0.5	0.5
Naphthalene	12	100
Phenanthrene	100	100
Pyrene	100	100
Total SVOCs	-	-
PCBs (mg/kg)		
Total PCBs	0.1	1
Pesticides (mg/kg)		
0,00033	0.00033	7.9
Metals (mg/kg)		
Arsenic	13	16
Barium	390	400
Beryllium	7.2	7.2
Chromium Trivalent	30	180
Copper	60	270
Lead	63	400
Mercury	0.18	2.8
Nickel	30	310
Selenium	3.9	180
Zinc	109	10000
General Chemistry (mg/kg)		
Cyanide	27	40

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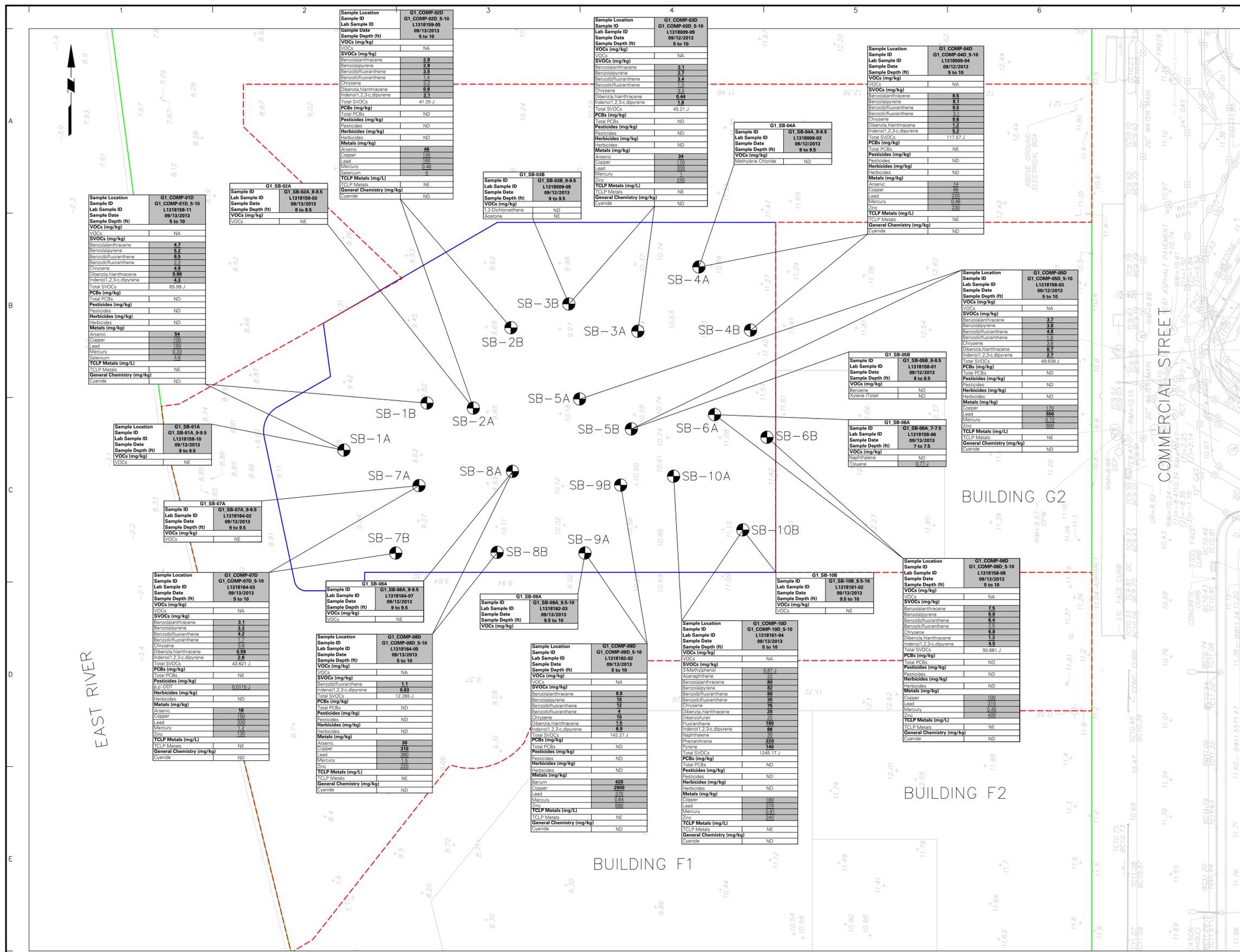


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Project
GREENPOINT LANDING
 Block 2472, Lot 80,
 p/o Lot 50, and p/o Lot 100
 BROOKLYN
 NEW YORK

Drawing Title
SOIL ANALYTICAL RESULTS - WASTE CHARACTERIZATION INVESTIGATION (SHALLOW INTERVAL 0-5')
 PARCEL G1

Project No.
170229002
 Date
11/24/2014
 Scale
1" = 20'
 Drawn By
LJM
 Submission Date
 Sheet 12 of 19



LEGEND

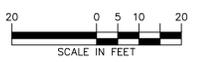
- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- PREVIOUS SOIL BORING LOCATION AND ID (LANGAN 2013)

- GENERAL NOTES**
- BASE MAP SOURCE: "170229001-V-EX0101 AND 170229001-C-U10101"
 - SOIL BORING LOCATIONS WERE LOCATED BY GPS.
 - NORTH ARROW SHOWS PROJECT NORTH.
 - SOIL SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NYSDEC 6 NYCRR PART 375-6.8(A,B) AND CP-51 UNRESTRICTED USE AND RESTRICTED USE UNRESTRICTED-RESIDENTIAL SOIL CLEANUP OBJECTIVES (SCO) (TABLE 1).
 - ONLY ANALYTES WITH DETECTIONS ARE PRESENTED.
 - CONCENTRATIONS EXCEEDING THE NYSDEC PART 375-6.8(A) UNRESTRICTED USE SCOS ARE SHADED AND UNDERLINED.
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 - VOC - VOLATILE ORGANIC COMPOUND
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 - PCB - POLYCHLORINATED BIPHENYL
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TABLE 1

TABLE 1	NYSDEC PART 375 AND CP-51 UNRESTRICTED USE SCO	NYSDEC PART 375 AND CP-51 RESTRICTED-RESIDENTIAL USE SCO
VOCs (mg/kg)		
1,2-Dichloroethane	0.02	3.1
Acetone	0.05	100
Benzene	0.06	4.8
Methylene Chloride	0.05	100
Naphthalene	12	100
Toluene	0.7	100
SVOCs (mg/kg)		
3-Methylphenol	0.33	100
Acenaphthene	20	100
Benzo[a]anthracene	1	1
Benzo[a]pyrene	1	1
Benzo[b]fluoranthene	1	1
Benzo[k]fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz[a,h]anthracene	0.33	0.33
Dibenzofuran	100	59
Fluoranthene	100	100
Indeno[1,2,3-c]dipylene	0.5	0.5
Naphthalene	12	100
Phenanthrene	100	100
Pyrene	100	100
Total SVOCs	-	-
PCBs (mg/kg)		
Total PCBs	0.1	1
Pesticides (mg/kg)		
p,p'-DDE	0.0033	7.9
Metals (mg/kg)		
Arsenic	13	16
Barium	350	400
Beryllium	7.2	72
Chromium Trivalent	30	170
Copper	60	270
Lead	63	400
Mercury	0.18	2.8
Nickel	30	310
Selenium	3.9	180
Zinc	109	10000
General Chemistry (mg/kg)		
Cyanide	27	40

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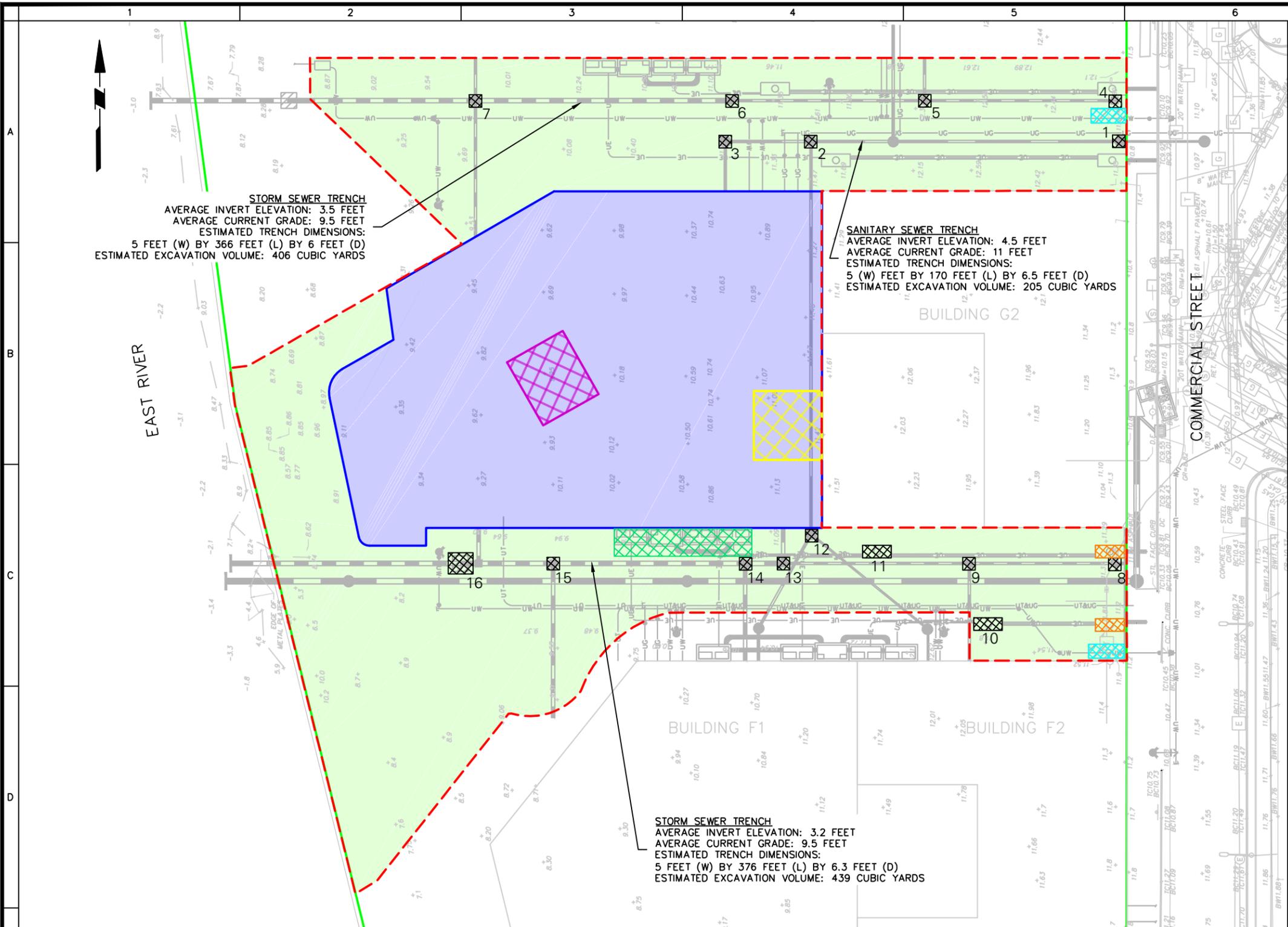


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Project
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 Block 2472, Lot 80,
 p/O Lot 50, and p/O Lot 100
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Drawing Title
SOIL ANALYTICAL RESULTS - WASTE CHARACTERIZATION INVESTIGATION (DEEP INTERVAL 5-10')
PARCEL G1

Project No.
170229002
 Date
11/24/2014
 Scale
1" = 20'
 Drawn By
LJM
 Submission Date
 Drawing No.
13
 Sheet 13 of 19



LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE BUILDING G1 FOOTPRINT
- APPROXIMATE AREA OF PROPOSED EXCAVATION IN NEW BUILDING FOOTPRINT. EXCAVATION WILL EXTEND TO ABOUT EL. 2.95 FEET (ABOUT 8 TO 10 FEET BELOW EXISTING SITE GRADE) AND TO ABOUT EL. -2.5 FEET (ABOUT 12.5 TO 14.5 FEET BELOW EXISTING SITE GRADE) TO ACCOMMODATE PILE CAPS AND GRADE BEAMS.
- APPROXIMATE AREA OF PROPOSED EXCAVATION TO ABOUT EL. -4 FEET (ABOUT 14 FEET BELOW EXISTING SITE GRADE) TO ACCOMMODATE ELEVATOR PITS.
- APPROXIMATE AREA OF PROPOSED EXCAVATION TO ABOUT EL. 2 FEET (ABOUT 10 FEET BELOW EXISTING SITE GRADE) TO ACCOMMODATE PARKING LIFT PITS.
- CON EDISON VAULT EXCAVATION AREA
 VAULT BOTTOM ELEVATION: 3 FEET
 AVERAGE CURRENT GRADE: 10.5 FEET
 ESTIMATED TRENCH DIMENSIONS: 65 FEET BY 10 FEET BY 7.5 FEET
 ESTIMATED EXCAVATION VOLUME: 181 CUBIC YARDS
- DEP WATER MAIN VAULTS (AT GRADE) EXCAVATION AREA
 ESTIMATED TRENCH DIMENSIONS: 17 FEET BY 7 FEET BY 12 FEET
 ESTIMATED EXCAVATION VOLUME: 53 CUBIC YARDS EACH
- CON EDISON MANHOLES (AT GRADE) EXCAVATION AREA
 ESTIMATED TRENCH DIMENSIONS: 13 FEET BY 6 FEET BY 9 FEET
 ESTIMATED EXCAVATION VOLUME: 26 CUBIC YARDS EACH
- LIMITED EXCAVATION AREAS FOR MANHOLES AND OTHER STRUCTURES ASSOCIATED WITH STORM AND/OR SANITARY SEWERS (SEE TABLE 1 BELOW)
- APPROXIMATE AREAS OF FILLING AND GRADING TO ACHIEVE FINAL DEVELOPMENT GRADES

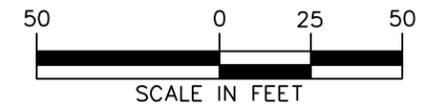
TABLE 1: MANHOLE/STRUCTURE DIMENSIONS AND VOLUMES

NUMBER ID	LENGTH (FEET)	WIDTH (FEET)	DEPTH (FEET)	APPROXIMATE VOLUME TO BE EXCAVATED (CUBIC YARDS)
1	5	5	9.5	9
2	5	5	6	6
3	5	5	5	5
4	5	5	5	5
5	5	5	7	6.5
6	5	5	6	5.5
7	5	5	5	5
8	5	5	5	5
9	5	5	6.5	6
10	13	6	7	21
11	13	6	6	17
12	5	5	4	4
13	5	5	6	5.5
14	5	5	6	5.5
15	5	5	6	5.5
16	11	11	18	83
TOTAL (ROUNDED)				195

GENERAL NOTES

- BASE MAP SOURCE: LANGAN DRAWINGS "170229002-COMBINED-SURVEY BLOCK 2472 AND 170229002-UI0101-FG-BLOCKS"
- NORTH ARROW SHOWS PROJECT NORTH.
- ELEVATIONS SHOWN IN DRAWING ARE BASED IN NATIONAL VERTICAL DATUM OF 1988 (NAVD88), WHICH IS APPROXIMATELY 1.1 FEET ABOVE MEAN SEA LEVEL DATUM AT SANDY HOOK, NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGICAL SURVEY (USGS NGVD 1929).

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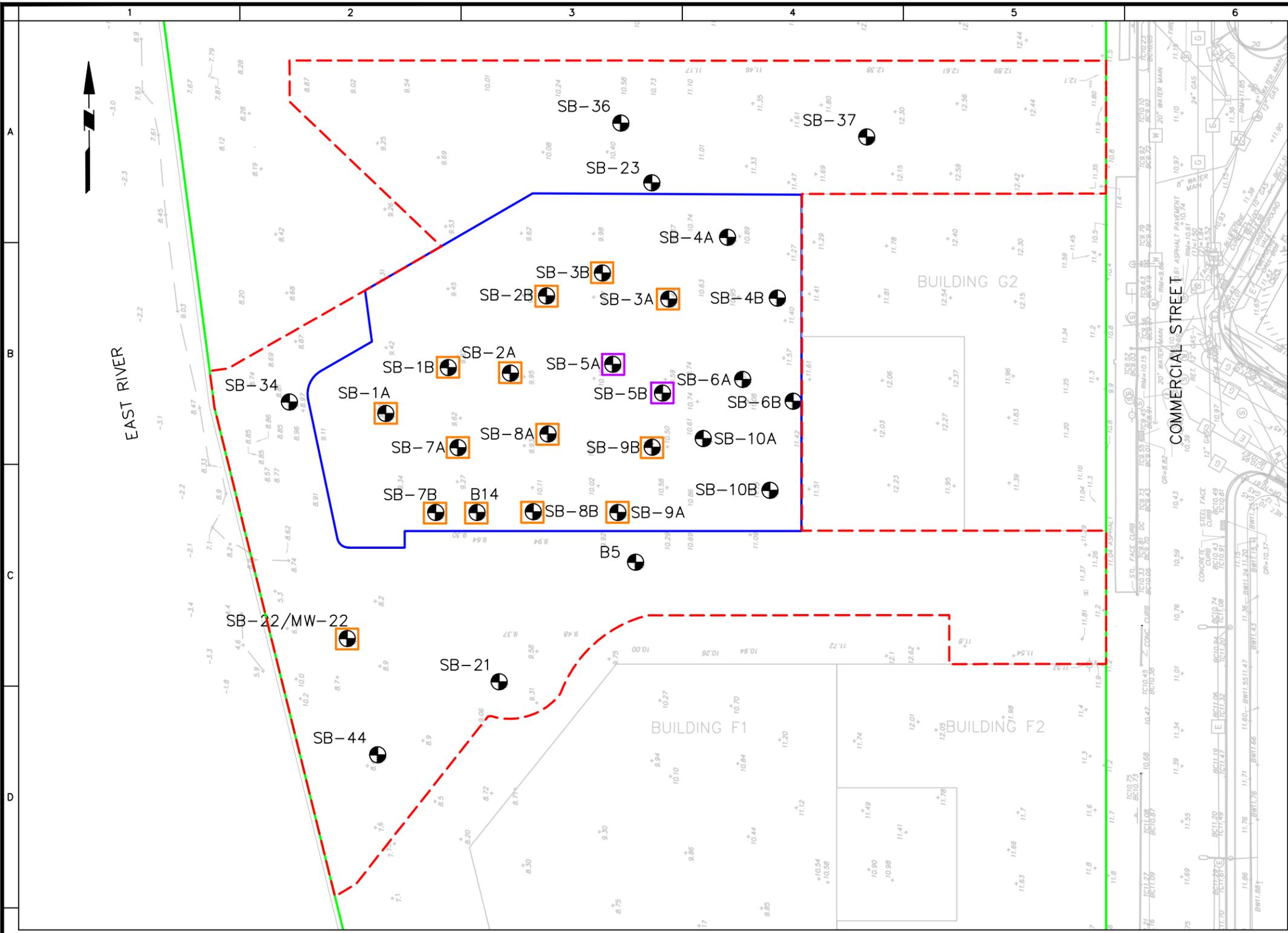


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 Block 2472, Lots 80,
 p/o Lot 50, p/o Lot 100
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Drawing Title
PROPOSED EXCAVATION AND FILL AREAS
PARCEL G1

Project No. 170229002	Drawing No.
Date 3/5/2015	14
Scale 1' = 50'	
Drawn By GCW	Checked By MSR
Submission Date	Sheet 14 of 19



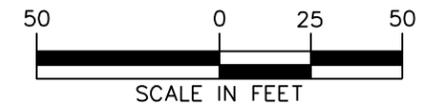
LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)
- SB-3A HOTSPOT AND SOIL BORING LOCATION AND ID
- SB-5A HAZARDOUS WASTE AREA AND SOIL BORING LOCATION AND ID
- SB-1A SOIL BORING LOCATION AND ID (NON-HOTSPOT)

GENERAL NOTES

1. BASE MAP SOURCE: LANGAN DRAWING "170229002-COMBINED-SURVEY BLOCK 2472"
2. NORTH ARROW SHOWS PROJECT NORTH.
3. A HOTSPOT IS DEFINED AS A PREVIOUS SOIL BORING LOCATION FROM EITHER AKRF'S PHASE II ENVIRONMENTAL SITE INVESTIGATION, LANGAN'S AREA-WIDE REMEDIAL INVESTIGATION, LANGAN'S SUPPLEMENTAL PARCEL-SPECIFIC REMEDIAL INVESTIGATIONS OF PARCELS G1 AND F1, OR LANGAN'S WASTE CHARACTERIZATION INVESTIGATION OF PARCEL G1 WHERE SAMPLED SOIL EXCEEDED THE SITE-SPECIFIC SCOS DEFINED IN THE RAP. A HOTSPOT IS ALSO DEFINED AS A NEW AREA AT WHICH SOIL EXCEEDING THE SITE-SPECIFIC SCOS DEFINED IN THE RAP IS IDENTIFIED DURING CONSTRUCTION.
4. SB-1A, SB-1B, SB-3A, SB-3B, SB-8A, AND SB-8B REPRESENT ARSENIC AND COPPER HOTSPOTS.
5. SB-2A AND SB-2B REPRESENT ARSENIC, COPPER AND LEAD HOTSPOTS.
6. SB-7A, SB-7B, SB-9A, AND SB-9B REPRESENT COPPER HOTSPOTS.
7. SB-10A AND SB-10B REPRESENT TOTAL SVOCs HOTSPOTS.
8. SB-22 REPRESENTS AN ARSENIC, CADMIUM, COPPER, LEAD, AND ZINC HOTSPOT.
9. B14 REPRESENTS A LEAD HOTSPOT.
6. SB-5A AND SB-5B REPRESENT COPPER HOTSPOTS. HAZARDOUS WASTE WAS ALSO IDENTIFIED AT SB-5A AND SB-5B. HAZARDOUS WASTE WILL BE REMOVED PRIOR TO MASS EXCAVATION. A WORK PLAN TO DELINEATE THE EXTENT OF THE HAZARDOUS WASTE WILL BE PRESENTED TO THE OER FOR REVIEW AND APPROVAL IN AN EFFORT TO MINIMIZE THE AMOUNT OF HAZARDOUS WASTE ASSOCIATED WITH SB-5A AND SB-5B. THE WORK PLAN WILL INCORPORATE THE COLLECTION OF ENDPOINT SAMPLES AT A FREQUENCY AND AT LOCATIONS AS DEFINED IN DER-10 FOR LABORATORY ANALYSIS TO CONFIRM THE HAZARDOUS WASTE IS FULLY DELINEATED. THE ANALYTICAL RESULTS AND FINDINGS AND STRATEGY FOR DISPOSAL WILL ALSO BE PRESENTED TO THE OER FOR REVIEW AND APPROVAL.
7. ELEVATIONS SHOWN IN FIGURE ARE BASED IN NATIONAL VERTICAL DATUM OF 1988. DATUM REFERS TO THE NATIONAL VERTICAL DATUM OF 1988 (NAVD88) WHICH IS APPROXIMATELY 1.1 FEET ABOVE MEAN SEA LEVEL DATUM AT SANDY HOOK, NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGIC SURVEY (USGS NGVD 1929).

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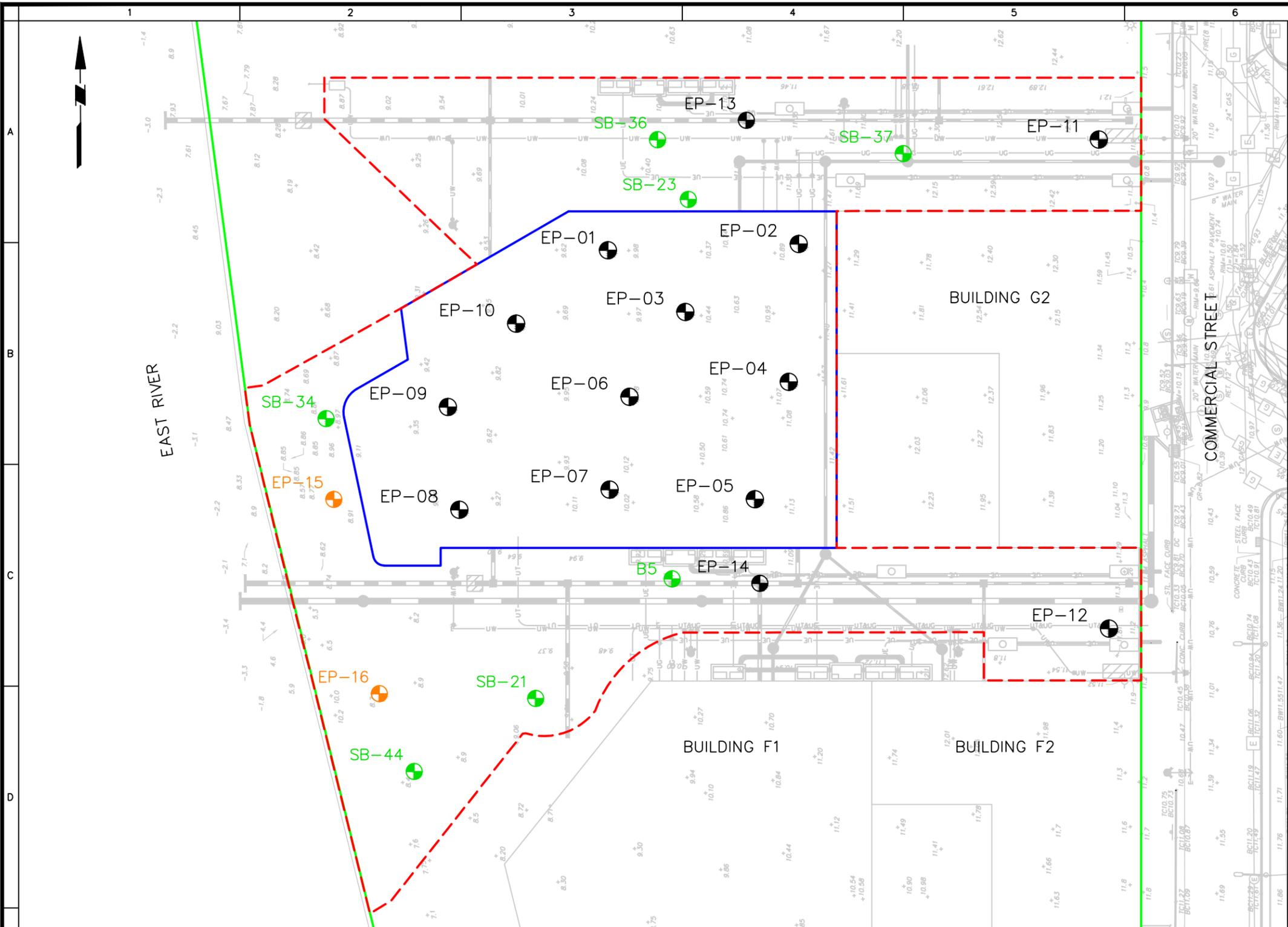


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 Block 2472, Lot 80,
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 BROOKLYN
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Drawing Title
HOTSPOT REMOVAL PLAN
PARCEL G1

Project No. 170229002	Drawing No. 15
Date 3/23/2015	
Scale 1' = 50'	
Drawn By SRD	Checked By MSR
Submission Date	Sheet 15 of 19



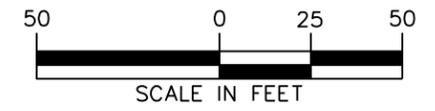
LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN THE DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY
- APPROXIMATE BUILDING G1 FOOTPRINT
- SB-23 PREVIOUS SOIL BORING WITH SHALLOW SOIL SAMPLE SERVING AS A PRE-CAP DATA POINT
- ⊙ EP-01 PROPOSED POST-EXCAVATION CONFIRMATION ENDPOINT SAMPLING LOCATION AND ID
- ⊙ EP-13 PROPOSED PRE-CAP SAMPLE LOCATION AND ID

GENERAL NOTES

1. BASE MAP SOURCE: LANGAN DRAWINGS "170229002-COMBINED SURVEY-BLOCK 2472 LOTS 50-65-AND-100-NAVD88" AND "170229001-C-UI0101-FG-BLOCKS."
2. NORTH ARROW SHOWS PROJECT NORTH.
3. POST-EXCAVATION CONFIRMATION ENDPOINT AND PRE-CAP SAMPLES WILL BE COLLECTED TO EVALUATE ATTAINMENT OF THE SITE-SPECIFIC SCOS.
4. POST-EXCAVATION CONFIRMATION ENDPOINT SOIL SAMPLES WILL BE COLLECTED AT SUBGRADE WITHIN THE NEW BUILDING FOOTPRINT (EP-01 TO EP-10), ROADWAYS (EP-11 AND EP-12) (DEPENDING ON THE AMOUNT OF EXCAVATION REQUIRED), AND UTILITY EXCAVATIONS (EP-13 AND EP-14).
5. SHALLOW SOIL SAMPLES ASSOCIATED WITH SEVEN SOIL BORINGS (B5, SB-21, SB-23, SB-34, SB-36, SB-37 AND SB-44) COMPLETED BY PREVIOUS INVESTIGATIONS COMPLY WITH SITE-SPECIFIC SCOS AND SHALL SERVE AS PRE-CAP DATA POINTS IN THE WATERFRONT PARK/ESPLANADE AND ROADWAY.
6. PRE-CAP SAMPLES (EP-15 AND EP-16) WILL BE COLLECTED WITHIN THE WATERFRONT PARK/ESPLANADE BEFORE THESE AREAS ARE FILLED WITH IMPORTED MATERIAL AND CAPPED.
7. CONFIRMATION AND DOCUMENTATION ENDPOINT SOIL SAMPLES WILL BE LOCATED BY GPS, SURVEY, OR FIELD MEASUREMENT.
8. CONFIRMATION AND DOCUMENTATION ENDPOINT SOIL SAMPLES WILL BE ANALYZED FOR VOCs, SVOCs, PCBs, PESTICIDES, HERBICIDES, METALS (INCLUDING HEXAVALENT AND TRIVALENT CHROMIUM), AND CYANIDE.
9. NAVD88 DATUM REFERS TO THE NATIONAL VERTICAL DATUM OF 1988 (NAVD88) WHICH IS APPROXIMATELY 1.1 FEET ABOVE MEAN SEA LEVEL DATUM AT SANDY HOOK, NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGIC SURVEY (USGS NGVD 1929).

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 Block 2472, Lot 80,
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 BROOKLYN
 KINGS NEW YORK

Drawing Title
POST-EXCAVATION CONFIRMATION AND PRE-CAP SAMPLING PLAN
 PARCEL G1

Project No. 170229002	Drawing No.
Date 3/24/2015	16
Scale 1' = 50'	
Drawn By GCW	Checked By MSR
Submission Date	Sheet 16 of 19

LEGEND



APPROXIMATE EXTENT OF WATERPROOFING/VAPOR BARRIER MEMBRANE

GENERAL NOTES

1. BASE MAP SOURCE: FOUNDATION AND CELLAR FLOOR BOTTOM REINFORCEMENT PLAN PREPARED BY DESIMONE, DATED MAY 17, 2013.
2. VAPOR BARRIER/WATERPROOFING MEMBRANE TO BE INSTALLED UNDER THE NEW CONCRETE SLAB (INCLUDING THE ELEVATOR PITS), GRADE BEAMS, AND PILE CAPS, EXTENDING ALONG THE SUBSURFACE WALLS OF THE FOUNDATION FROM THE BASE OF EXCAVATION TO THE SURFACE GRADE.
3. VAPOR BARRIER MEMBRANE SYSTEM SHALL INCLUDE GRACE PREPRUFE 300R (OR APPROVED EQUIVALENT) AND GRACE BITUTHENE 4000 (OR APPROVED EQUIVALENT) AND HAVE A MINIMUM THICKNESS OF 20 MILS.
4. VAPOR BARRIER/WATERPROOFING MEMBRANE IS DESIGNED BY OTHERS.

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WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

Date	Description	No.
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REVISIONS

Date	Description	No.

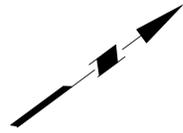
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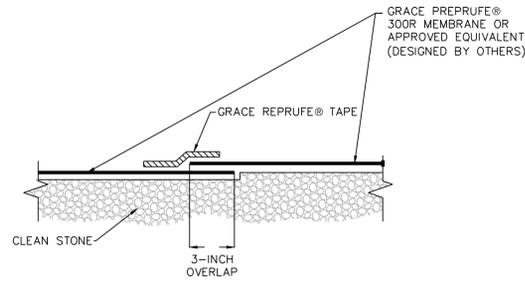
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 21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001
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 Langan Engineering, Environmental, Surveying and Landscape Architecture, P.C.
 Langan Engineering and Construction Services, Inc.
 Langan International LLC
 Collectively known as Langan

Project
GREENPOINT LANDING
PARCEL G1
 Block 2472, Lot 80,
 p/o Lot 50, and p/o Lot 100
 BROOKLYN
 KINGS NEW YORK

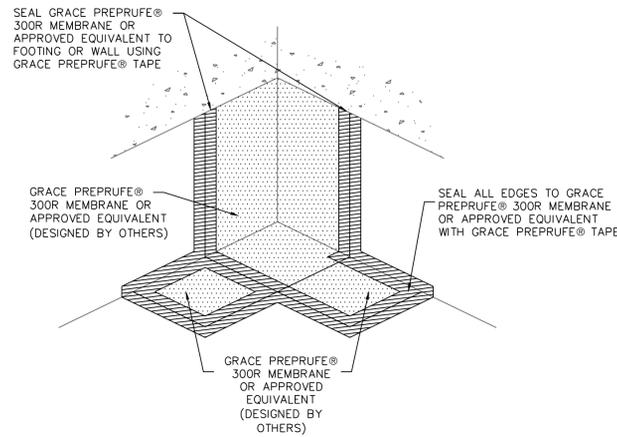
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**WATERPROOFING/VAPOR
 BARRIER MEMBRANE SYSTEM
 LAYOUT**

Project No. 170229002	Drawing No. 17
Date 11/24/2014	
Scale NTS	
Drawn By GCW	Checked By JJH
Submission Date	

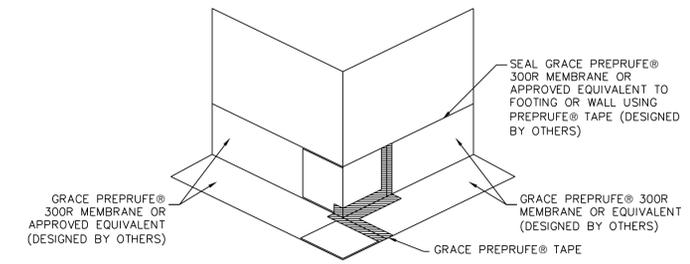




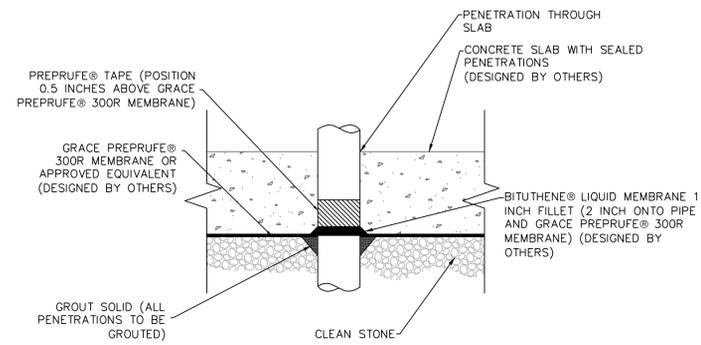
DETAIL 1: TYPICAL VAPOR BARRIER ASSEMBLY AT SEAMS (TAPE LAP METHOD)
NOT TO SCALE



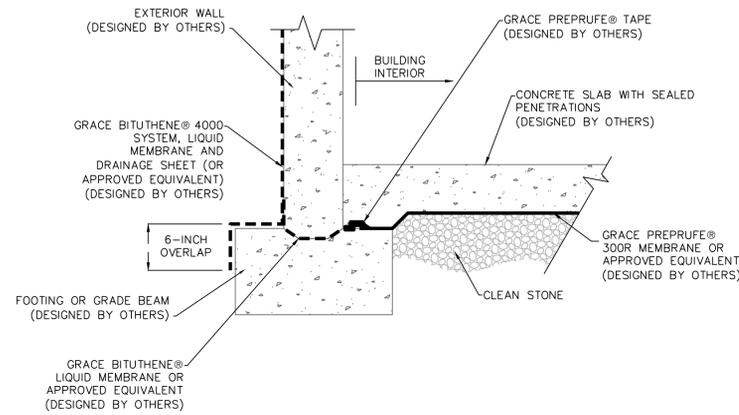
DETAIL 2: TYPICAL VAPOR BARRIER ASSEMBLY AT INSIDE CORNER
NOT TO SCALE



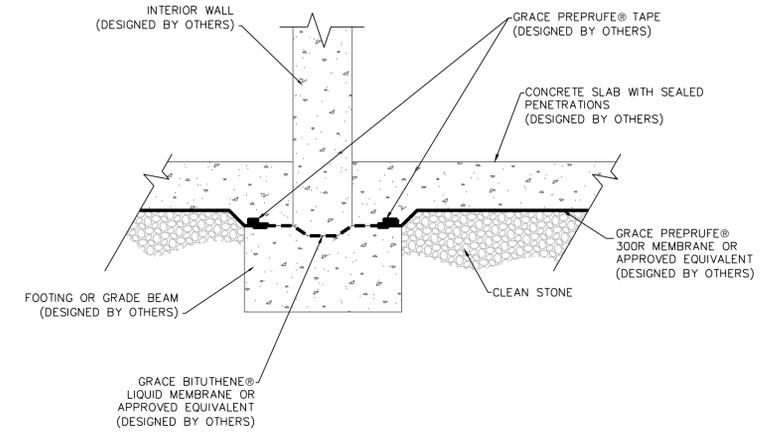
DETAIL 3: TYPICAL VAPOR BARRIER ASSEMBLY AT OUTSIDE CORNER
NOT TO SCALE



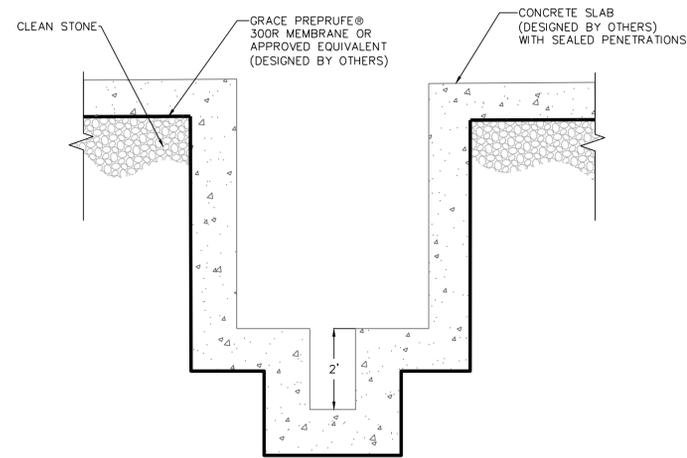
DETAIL 4: TYPICAL VAPOR BARRIER ASSEMBLY AT PENETRATION
NOT TO SCALE



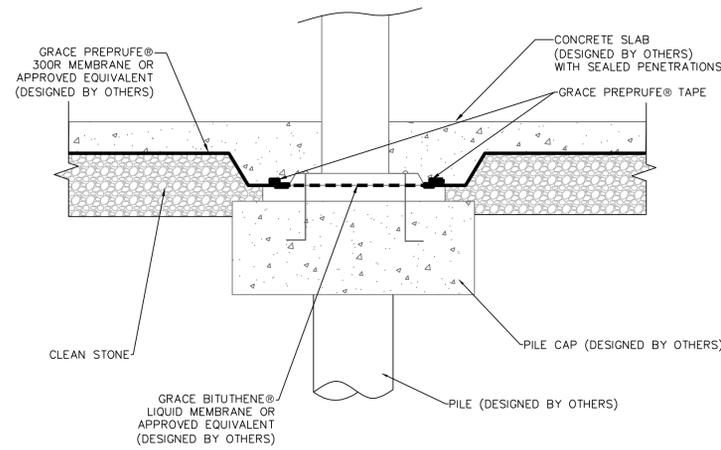
DETAIL 5: TYPICAL VAPOR BARRIER ASSEMBLY AT EXTERIOR FOUNDATION WALL
NOT TO SCALE



DETAIL 6: TYPICAL VAPOR BARRIER ASSEMBLY AT INTERIOR FOUNDATION WALL
NOT TO SCALE



DETAIL 7: TYPICAL ELEVATOR PIT SECTION
NOT TO SCALE



DETAIL 8: TYPICAL DETAIL FOR INTERIOR PILE CAP
NOT TO SCALE

WATERPROOFING/VAPOR BARRIER MEMBRANE SYSTEM NOTES:

1. THE WATERPROOFING/VAPOR BARRIER SHALL BE INSTALLED IN ACCORDANCE WITH APPLICABLE MANUFACTURER GUIDELINES AND DETAILS.
2. THE WATERPROOFING/VAPOR BARRIER SHALL BE INSTALLED BY A MANUFACTURER-CERTIFIED INSTALLER.
3. WATERPROOFING/VAPOR BARRIER SHALL BE INSPECTED BEFORE CONCRETE IS PLACED. ALL PENETRATIONS, HOLES, OR TEARS SHALL BE SEALED BEFORE CONCRETE IS PLACED.
4. WATERPROOFING/VAPOR BARRIER MEMBRANE IS DESIGNED BY OTHERS.

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Langan International LLC
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Project

GREENPOINT LANDING
PARCEL G1
Block 2472, Lot 80,
p/o Lot 50, and p/o Lot 100
BROOKLYN

KINGS NEW YORK

Drawing Title

WATERPROOFING/VAPOR BARRIER MEMBRANE SYSTEM DETAILS

Project No. 170229002 Drawing No.

Date 11/24/2014

Scale NTS 18

Drawn By Gcw Checked By MSR

Submission Date

Sheet 18 of 19



Lincoln Tunnel Restrictions
 13' 0" Height Limit. No Trucks Permitted in Center Tube. No Flammables or Explosives.

NEW Holland Tunnel Restrictions
 NO TRACTOR-TRAILERS OR TRUCKS WITH FOUR OR MORE AXLES. Only two and three-axle single-unit trucks allowed. 12' 6" Height Limit. No Flammables or Explosives.

NEW Kent Avenue
 is a one-way northbound Local Truck Route from Clymer St to N 14 St

Brooklyn Bridge Restrictions
 No Commercial Vehicles

LEGEND

- Local Truck Routes
- Limited Local Truck Routes
- Through Truck Routes
- Through Truck Routes on Expressway
- COMMERCIAL VEHICLES PROHIBITED on Parkways and Other Highways
- Principal Streets
- Parks
- Open Space or Cemeteries
- Industrial or Institutional Areas
- Airports
- Interstate Route 278
- Interstate and Highway Exits 1
- MTA Bridges and Tunnels
- Port Authority of NY & NJ
- Transportation Facility Operator*

GENERAL NOTES

- BASE MAP TAKEN FROM THE 2011-2012 NEW YORK CITY DEPARTMENT OF TRANSPORTATION "NEW YORK CITY TRUCK ROUTE MAP."

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 p/o Lot 50, and p/o Lot 100
 BROOKLYN
 KINGS NEW YORK

Drawing Title
TRUCK ROUTE MAP
PARCEL G1

Project No. 170229002
 Date 11/24/2014
 Scale NTS
 Drawn By SRD Checked By MSR
 Submission Date

Drawing No. **19**
 Sheet 19 of 19

TABLES

Table 1
Proposed Site-Specific Soil Cleanup Objectives (SCOs)

Remedial Action Plan
Parcel G1
Greenpoint Landing
37 Blue Slip, Brooklyn, NY
Langan Project No. 170229002

Constituent	Site-Specific SCO (mg/kg)
Total SVOCs	250
Total PCBs	1
Arsenic	23
Barium	750
Cadmium	9.3
Chromium, Total (Cr)	200
Chromium, Trivalent (Cr III)	200
Chromium, Hexavalent (Cr VI)	200
Copper	300
Lead	1,000
Mercury	2.8
Nickel	500
Zinc	10,000

Notes:

1. For the purposes of this RAP, consistent with CP-51, subsurface soil shall mean soil beneath permanent structures, impervious pavement, or similar cover systems or soil beneath 2 feet of soil cover for residential and restricted-residential uses.
2. mg/kg - milligrams per kilogram

APPENDIX A
PROPOSED DEVELOPMENT PLANS

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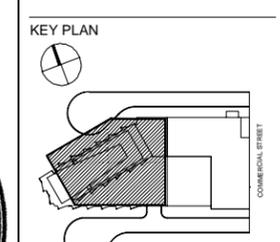
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No.	Date:	Revision:
-	09/15/14	ISSUED FOR DOB FILING

Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
Brooklyn New York

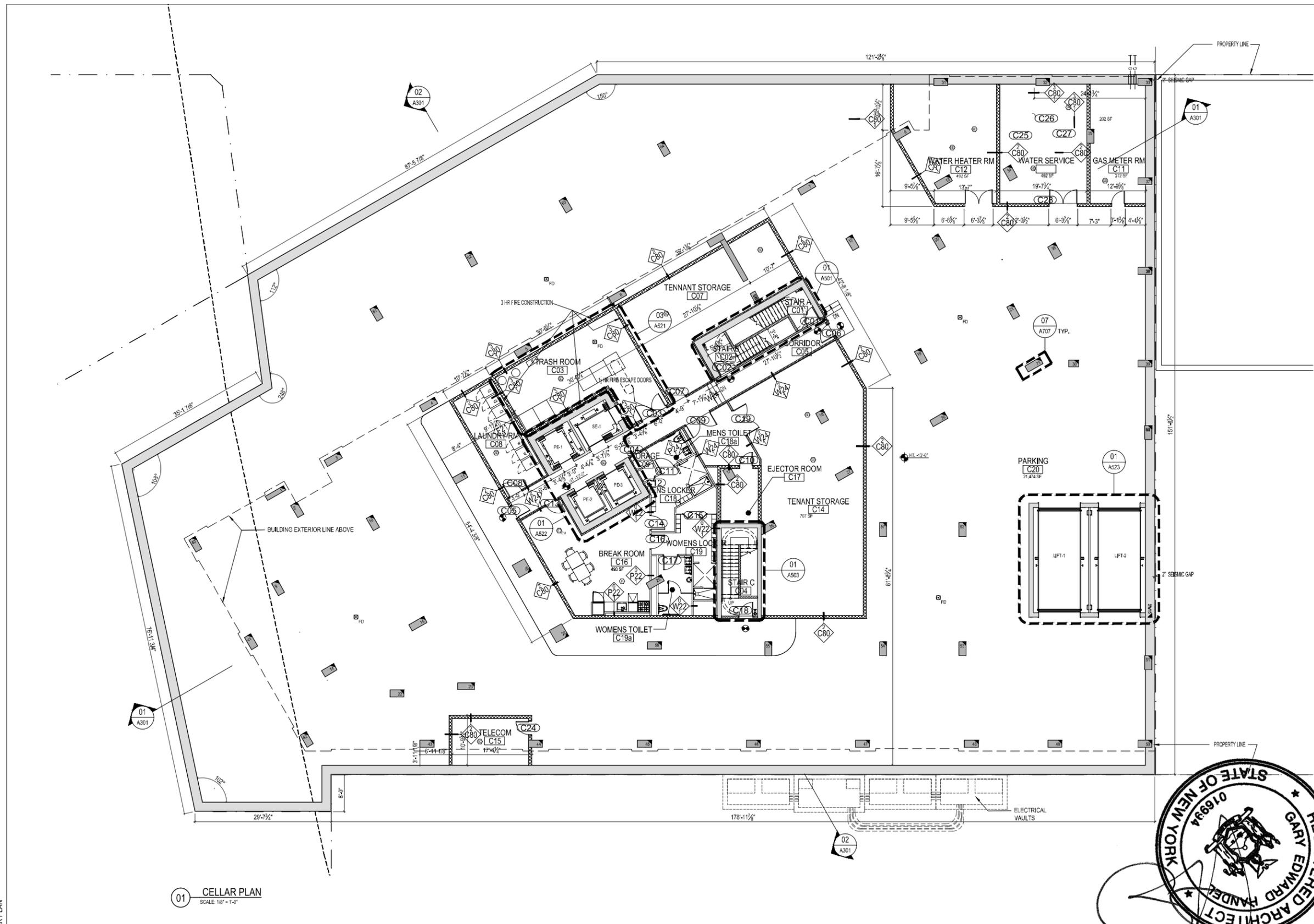


Drawing Title
FLOOR 00 CELLAR PLAN

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Scale: 1/8" = 1'-0"

Drawn By: XX
Checked By: XX
Project Number: 433.00
Drawing Number: **A100.00**

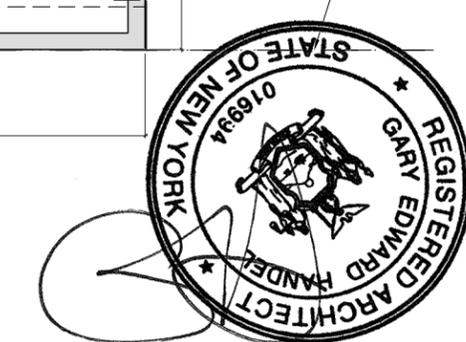
NYC DOB NO: 320627327



01 CELLAR PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES:		DOOR NOTES:		LEGEND		PARTITION TYPES	
1. ALL DIMENSIONS ARE FROM FACE OF GYPSUM WALL BOARD OR C.M.U. WALL, AS APPLICABLE, U.O.N.	7. REFER TO DRAWINGS A500 SERIES FOR PLANS AND SECTIONS AT CORES / STAIRS / ELEVATORS.	1. ALL DOORS ARE 4" FROM FACE OF GWB U.O.N.	1. VESTIBULE ROOM TAG	1. ILLUMINATED CEILING MTD. EXIT SIGN	1. 2 HR. CMU WALL		
2. REFER TO MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION DRAWINGS FOR ADDITIONAL INFORMATION.	8. REFER TO DRAWINGS A900 SERIES FOR ROOM FINISH SCHEDULE.	2. REFER TO A800 SERIES FOR DOOR SCHEDULE.	2. UNIT TAG	2. ILLUMINATED CEILING MTD. EXIT SIGN	2. 2 HR. RATED SHAFTWALL		
3. REFER TO STRUCTURAL DRAWINGS FOR ALL ADDITIONAL INFORMATION ON SHEAR WALLS, COLUMNS, PILASTERS, ETC.	9. PROVIDE FIRE RATED PLYWOOD BACKING ALONG THE ENTIRE WIDTH AND FROM FLOOR TO CEILING IN ALL TELECOM AND UNOCCUPIED EL/TEL/DATA CLOSETS. COORDINATE CLOSET ASSIGNMENTS WITH OWNER, V.I.F.	3. REFER TO SPECIFICATIONS FOR DOOR HARDWARE GROUPS.	3. DOOR TAG	3. ILLUMINATED WALL MTD. EXIT SIGN	2. 2 HR. RATED STUD WALL		
4. FIRESTOP ALL PLUMBING SLAB PENETRATION(ABOVE) & ALL THROUGH WALL PENETRATION ON F.R. CONDITIONS TYPICAL.	10. FOR DIMENSION & LOCATION OF ALL CMU WALLS, STEEL COLUMNS, AND LOCATION OF ALL SLAB OPENINGS AND BREAKS, REFER TO SERIES A-120'S	4. ALL CLOSET DOORS TO BE CENTERED IN OPENING U.O.N.	4. SEE FIRE PROTECTION DWG	4. ILLUMINATED WALL MTD. EXIT SIGN	1. 1 HR. RATED ACUSTIC DEMISING STUD WALL		
5. ALL FLOOR DRAINS ARE TO BE FLUSH WITH THE FINISHED FLOOR U.O.N. SEE PLUMBING DRAWINGS FOR LOCATION SLOPE SLAB TO DRAIN 1.8" PLF MAX SLOPE	11. PROVIDE TRICKLE VENTS, ONE PER HABITABLE ROOM. SEE SPECIFICATIONS FOR MORE INFORMATION.				TYPICAL INTERIOR WALL, NON-RATED PARTITION		
6. REFER TO DRAWINGS A700 SERIES FOR KITCHENS.							

Drawing: c:\433_greenpoint\CAD\G1\080-dob_filing\Sheets\FLOOR 00 CELLAR PLAN.dwg
Date: January 5, 2015 - Layout: FLOOR 00 CELLAR PLAN



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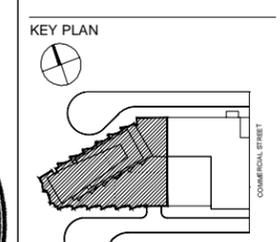
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37 Blue Slip
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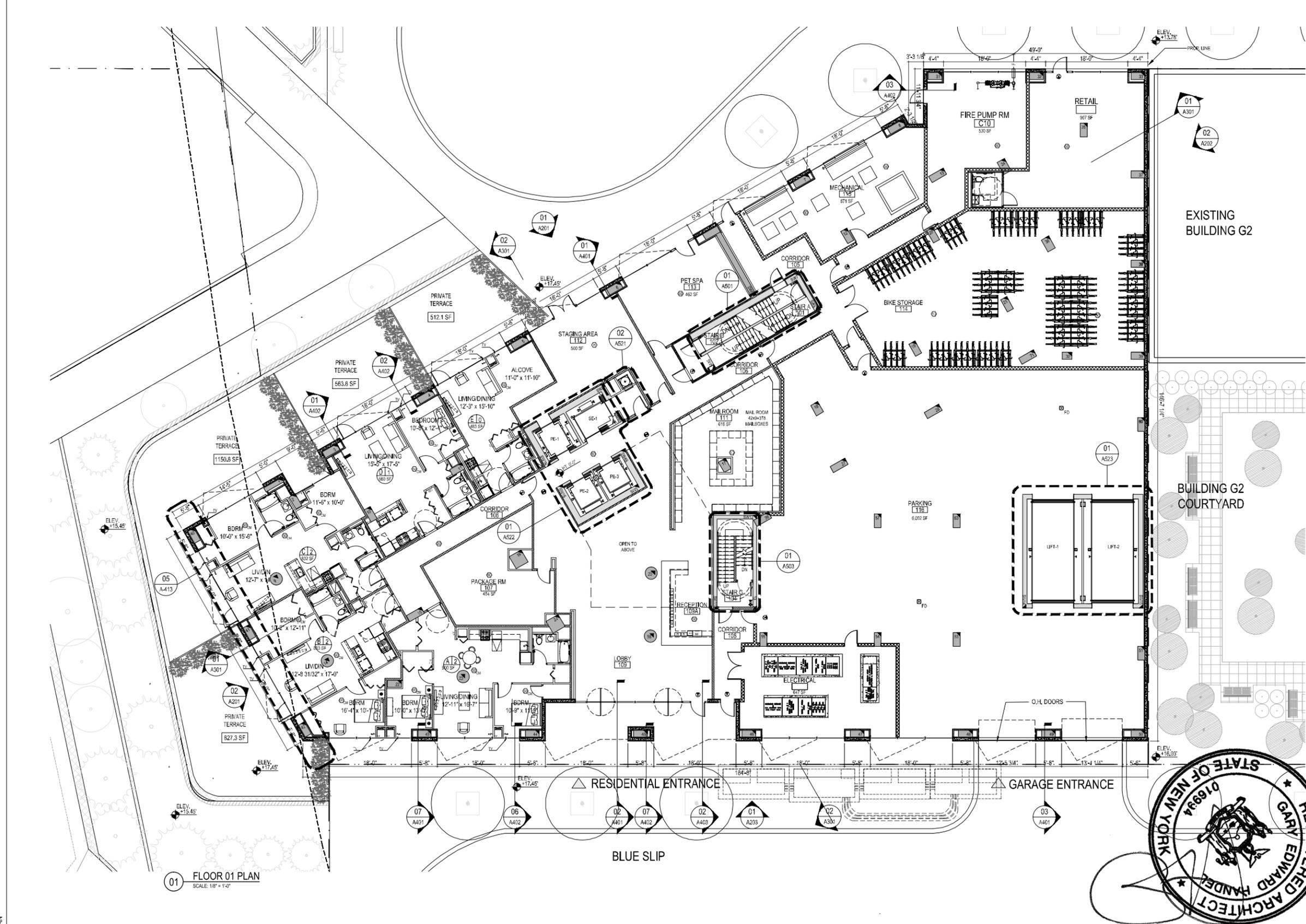
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Checked By: XX
Project Number

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Drawing Number:
A101.00

NYC DOB NO. 320627327



01 FLOOR 01 PLAN
SCALE: 1/8" = 1'-0"



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GENERAL NOTES:		DOOR NOTES:		LEGEND		PARTITION TYPES	
1. ALL DIMENSIONS ARE FROM FACE OF GYPSUM WALL BOARD OR C.M.U. WALL, AS APPLICABLE, U.O.N.	7. REFER TO DRAWINGS A500 SERIES FOR PLANS AND SECTIONS AT CORES / STAIRS / ELEVATORS.	1. ALL DOORS ARE 4" FROM FACE OF GWB U.O.N.	1. VESTIBULE ROOM TAG	1. ILLUMINATED CEILING MTD. EXIT SIGN	2 HR. CMU WALL		
2. REFER TO MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION DRAWINGS FOR ADDITIONAL INFORMATION.	8. REFER TO DRAWINGS A900 SERIES FOR ROOM FINISH SCHEDULE.	2. REFER TO A800 SERIES FOR DOOR SCHEDULE.	2. UNIT TAG	2. ILLUMINATED CEILING MTD. EXIT SIGN	2 HR., RATED SHAFT WALL	PARTITION TAG, REFER TO A780	
3. REFER TO STRUCTURAL DRAWINGS FOR ALL ADDITIONAL INFORMATION ON SHEAR WALLS, COLUMNS, PLASTERS, ETC.	9. PROVIDE FIRE RATED PLYWOOD BACKING ALONG THE ENTIRE WIDTH AND FROM FLOOR TO CEILING IN ALL TELECOM AND UNOCCUPIED EL/TEL/DATA CLOSETS. COORDINATE CLOSET ASSIGNMENTS WITH OWNER, V.I.F.	3. REFER TO SPECIFICATIONS FOR DOOR HARDWARE GROUPS.	3. DOOR TAG	3. ILLUMINATED WALL MTD. EXIT SIGN	2 HR., RATED STUD WALL	FIRE RATING (# OF HOURS) STUD SIZE # OF LAYERS GWB, TOTAL ALL SIDES MODIFIER	
4. FIRESTOP ALL PLUMBING SLAB PENETRATION(ABOVE) & ALL THROUGH WALL PENETRATION ON F.R. CONDITIONS TYPICAL	10. FOR DIMENSION & LOCATION OF ALL CMU WALLS, STEEL COLUMNS, AND LOCATION OF ALL SLAB OPENINGS AND BREAKS, REFER TO SERIES A-120'S	4. ALL CLOSET DOORS TO BE CENTERED IN OPENING U.O.N.	4. SEE FIRE PROTECTION DWG		1 HR., RATED ACOUSTIC DEMISING STUD WALL		
5. ALL FLOOR DRAINS ARE TO BE FLUSH WITH THE FINISHED FLOOR U.O.N. SEE PLUMBING DRAWINGS FOR LOCATION SLOPE SLAB TO DRAIN 1.8" PLF MAX SLOPE	11. PROVIDE TRICKLE VENTS, ONE PER HABITABLE ROOM. SEE SPECIFICATIONS FOR MORE INFORMATION.		5. SMOKE DETECTOR		TYPICAL INTERIOR WALL		
6. REFER TO DRAWINGS A700 SERIES FOR KITCHENS.			6. ILLUMINATED CEILING MTD. EXIT SIGN		NONRATED PARTITION		
			7. ILLUMINATED WALL MTD. EXIT SIGN				

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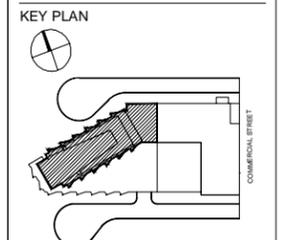
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Job Title
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37 Blue Slip
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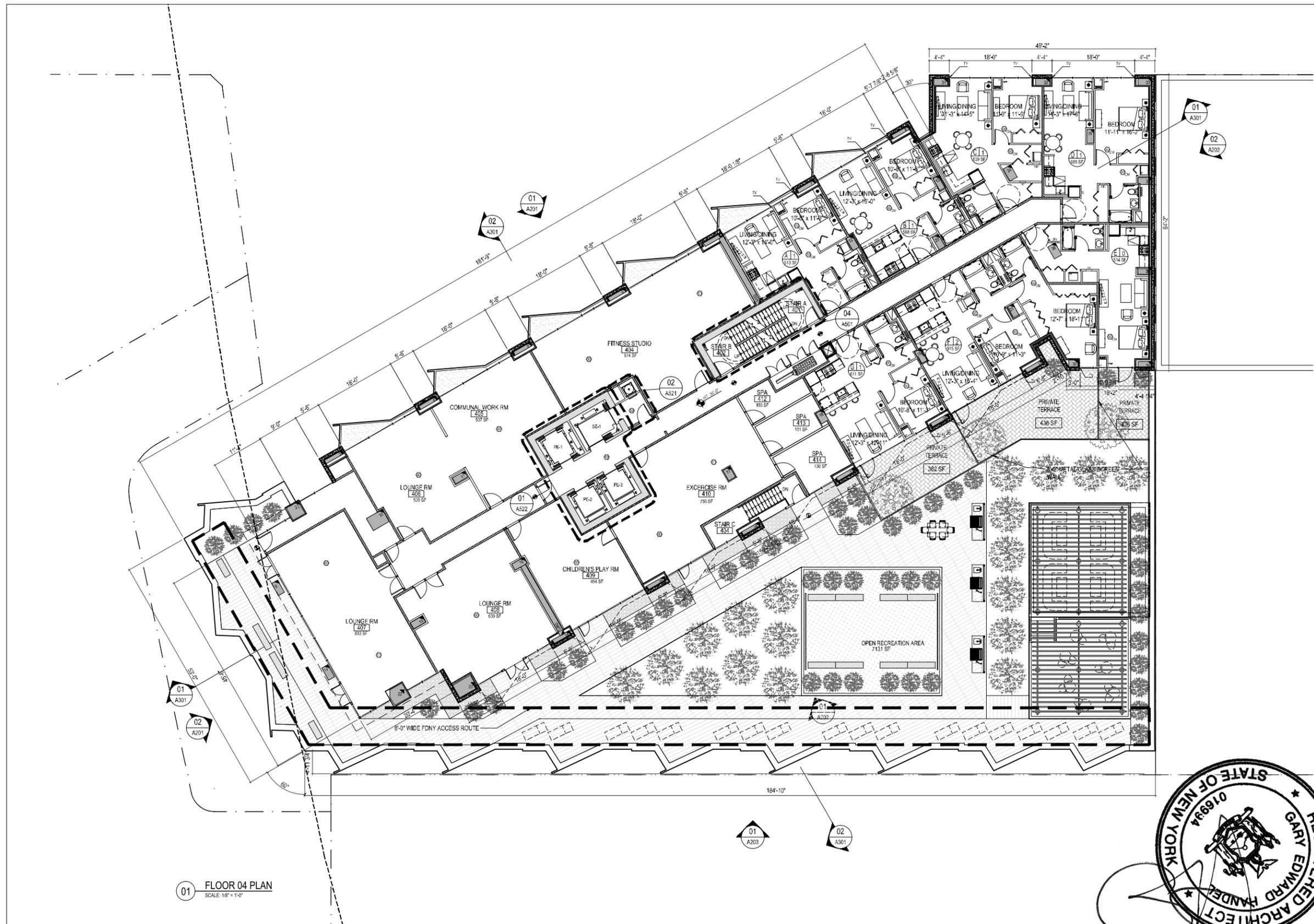


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Project Number

433.00
Drawing Number:
A103.00

NYC DOB NO: 320627327



01 FLOOR 04 PLAN
SCALE: 1/8" = 1'-0"



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- REFER TO STRUCTURAL DRAWINGS FOR ALL ADDITIONAL INFORMATION ON SHEAR WALLS, COLUMNS, PILASTERS, ETC.
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- REFER TO DRAWINGS A700 SERIES FOR KITCHENS.
- REFER TO DRAWINGS A500 SERIES FOR PLANS AND SECTIONS AT CORES / STAIRS / ELEVATORS.
- REFER TO DRAWINGS A900 SERIES FOR ROOM FINISH SCHEDULE.
- PROVIDE FIRE RATED PLYWOOD BACKING ALONG THE ENTIRE WIDTH AND FROM FLOOR TO CEILING IN ALL TELECOM AND UNOCCUPIED EL/TEL/DATA CLOSETS. COORDINATE CLOSET ASSIGNMENTS WITH OWNER, V.I.F.
- FOR DIMENSION & LOCATION OF ALL CMU WALLS, STEEL COLUMNS, AND LOCATION OF ALL SLAB OPENINGS AND BREAKS, REFER TO SERIES A-120'S
- PROVIDE TRICKLE VENTS, ONE PER HABITABLE ROOM. SEE SPECIFICATIONS FOR MORE INFORMATION.

DOOR NOTES:

- ALL DOORS ARE 4" FROM FACE OF GWB U.O.N.
- REFER TO A800 SERIES FOR DOOR SCHEDULE.
- REFER TO SPECIFICATIONS FOR DOOR HARDWARE GROUPS.
- ALL CLOSET DOORS TO BE CENTERED IN OPENING U.O.N.

LEGEND

VESTIBULE 101	ROOM TAG	APT. ELECTRICAL PANEL SEE ELECT. DWGS.
UNIT TAG	APT. CABLE/DATA/VOICE BOX, SEE LOW VOLTAGE PLANS TYP.	
DOOR TAG	TV	TRICKLE VENT
SEE FIRE PROTECTION DWG	ILLUMINATED CEILING MTD. EXIT SIGN	SMOKE DETECTOR
	ILLUMINATED CEILING MTD. EXIT SIGN	COMB. SMOKE AND CARBON DETECTOR
	ILLUMINATED WALL MTD. EXIT SIGN	HEAT DETECTOR

PARTITION TYPES

- 2 HR. CMU WALL
- 2 HR. RATED SHAFTWALL
- 2 HR. RATED STUD WALL
- 1 HR. RATED ACOUSTIC DEMISING STUD WALL
- TYPICAL INTERIOR WALL, NONRATED PARTITION

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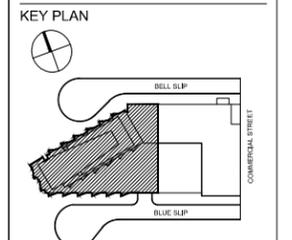
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No.	Date	Revision
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Job Title
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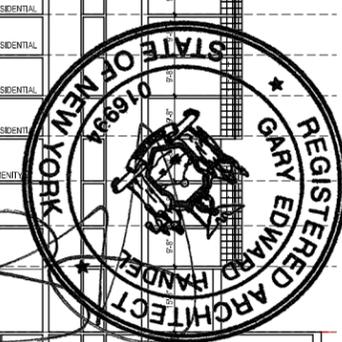
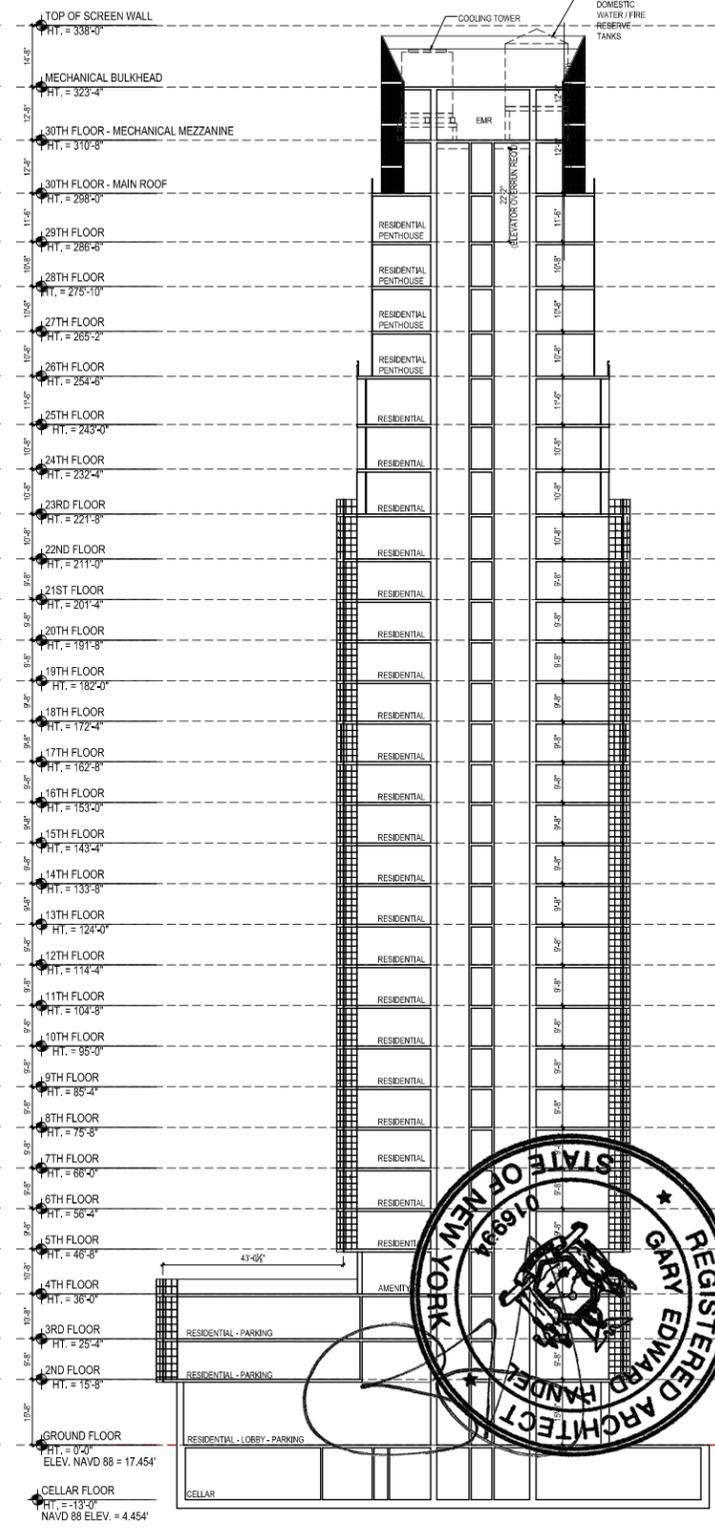
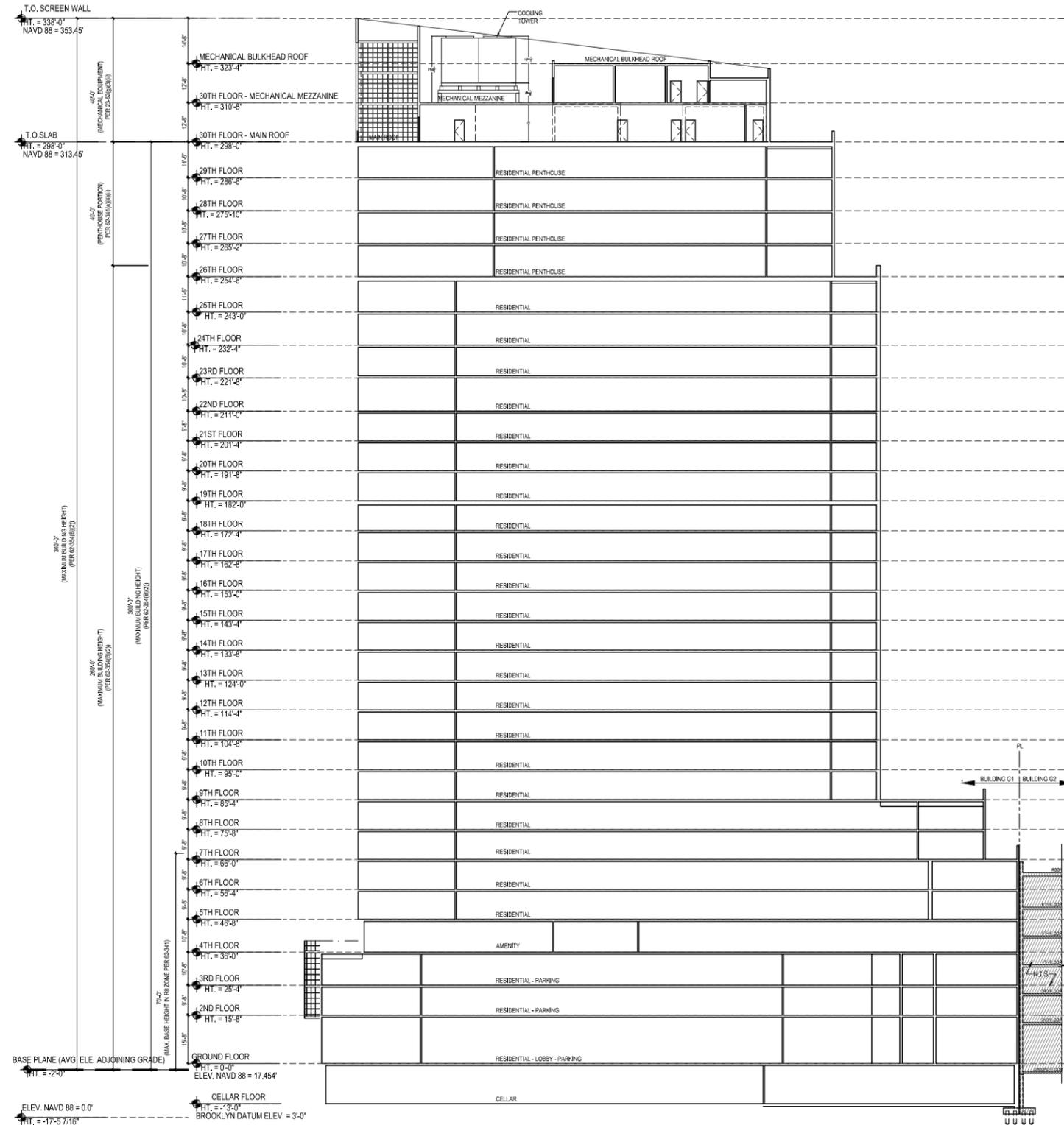


BUILDING SECTIONS

Date: 09/15/2014
Scale: 1/16" = 1'-0"
Seal: SD AD
Project Number: 433.00

A-301.00

NYC DOB NO: 320627327



Drawing: o:\433_greenpoint\CAD\G1\080-dob filing\Sheets\A301 BUILDING SECTIONS.dwg
Date: January 5, 2015 - Layout: A301 BUILDING SECTIONS

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No: Date: Revision:
09/15/14 ISSUED FOR DOB FILING

Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
Brooklyn New York

KEY PLAN

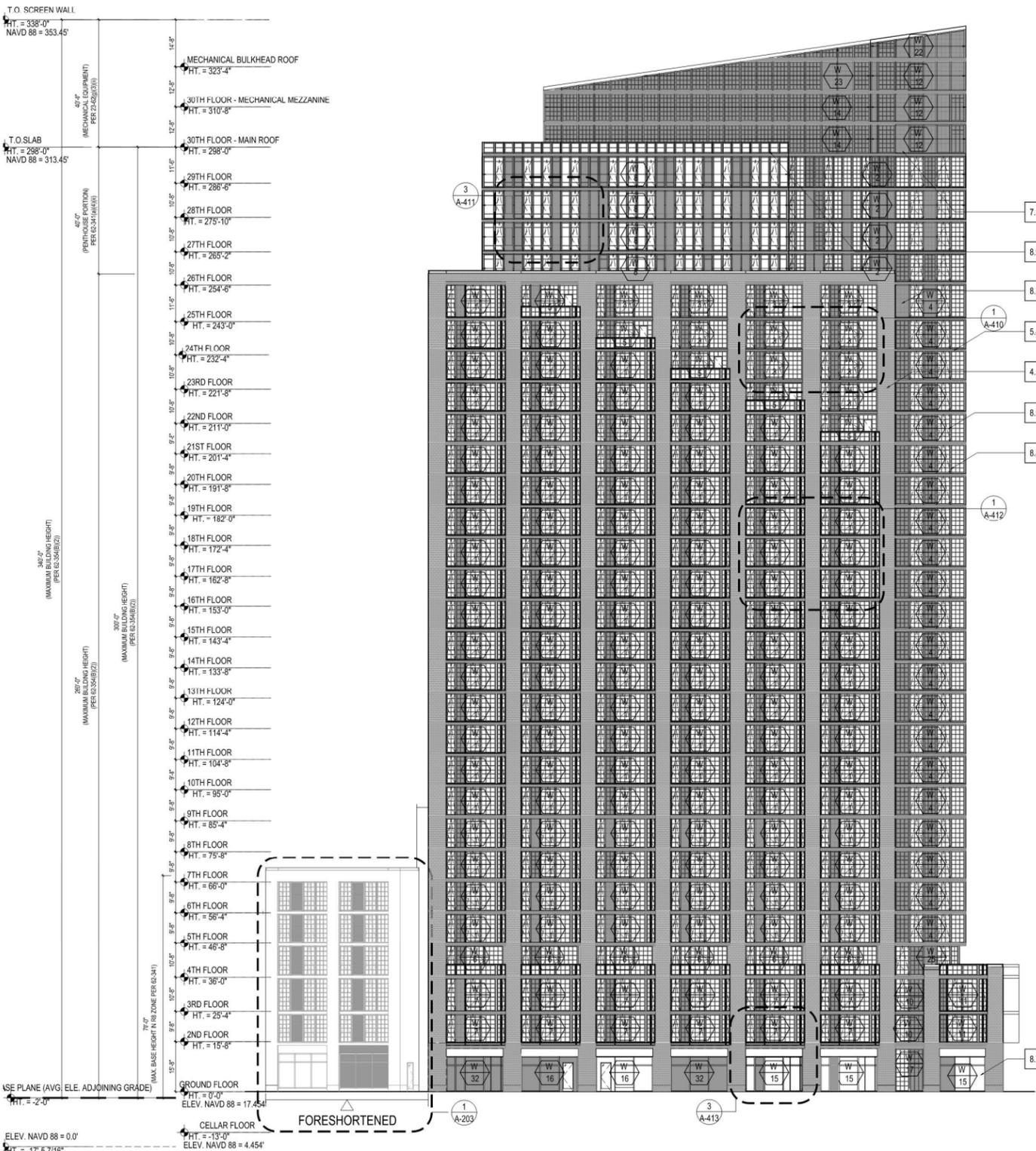
Drawing Title
NORTH AND WEST ELEVATIONS

Date: 09/15/2014 Scale: 1/16" = 1'-0"
Seal: Drawn By: SD Checked By: AD
Project Number: 433.00
Drawing Number: **A201**

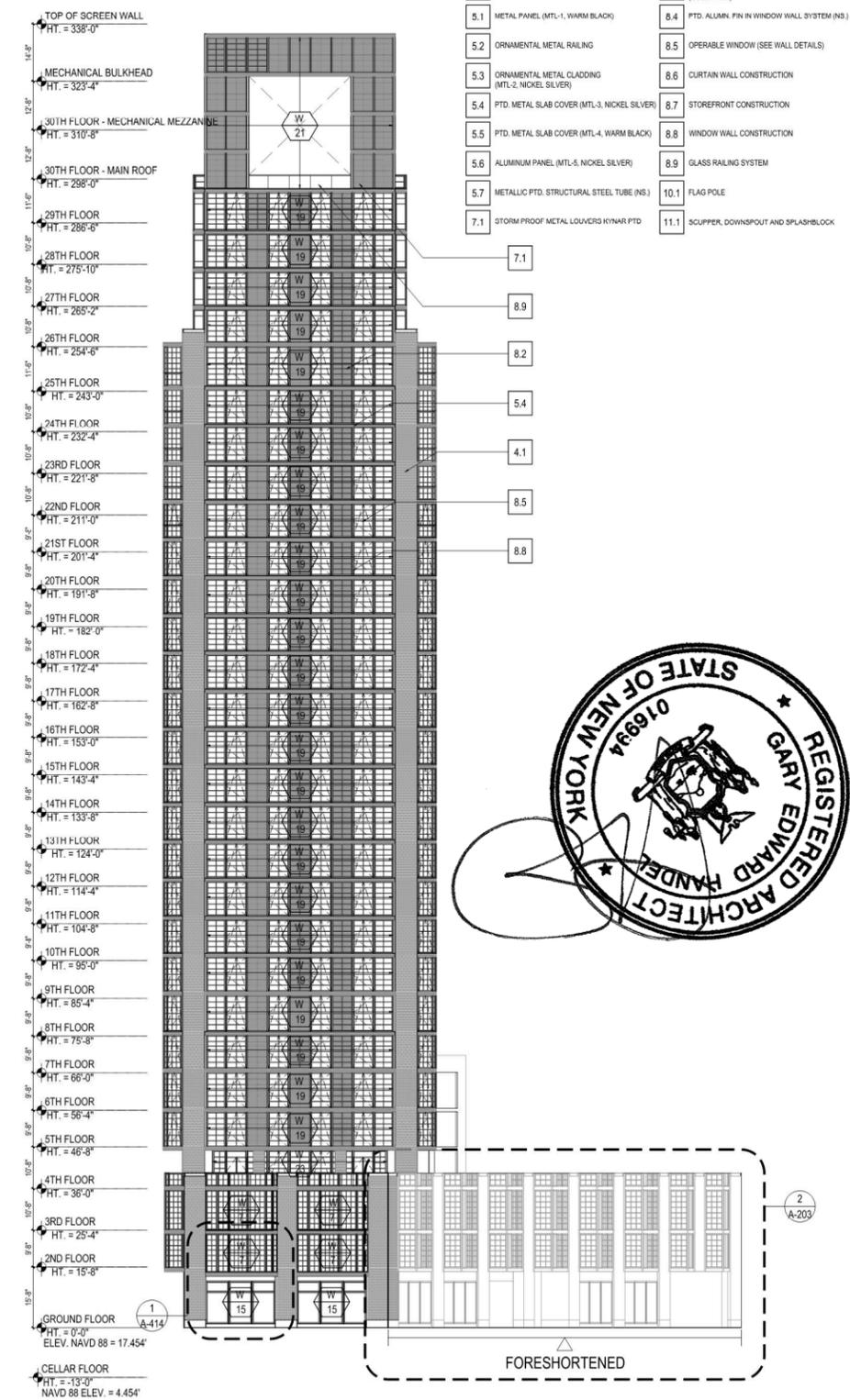
NYC DOB NO: 320627327

EXTERIOR ELEVATIONS MATERIAL LEGEND

3.1	PRECAST CONCRETE	7.2	EFS
3.2	CAST STONE	8.1	FRITTED GLASS
4.1	BELDEN BRICK NORMAN 470-479 DARK VELOUR, TYPE FBX	8.2	SPANDREL GLASS
4.2	JET MIST / FINISH THERMAL (ST-1)	8.3	PTD. ALUMN. FIN IN CURTAIN WALL SYSTEM (COLOR TBD)
5.1	METAL PANEL (MTL-1, WARM BLACK)	8.4	PTD. ALUMN. FIN IN WINDOW WALL SYSTEM (NS)
5.2	ORNAMENTAL METAL RAILING	8.5	OPERABLE WINDOW (SEE WALL DETAILS)
5.3	ORNAMENTAL METAL CLADDING (MTL-2, NICKEL SILVER)	8.6	CURTAIN WALL CONSTRUCTION
5.4	PTD. METAL SLAB COVER (MTL-3, NICKEL SILVER)	8.7	STOREFRONT CONSTRUCTION
5.5	PTD. METAL SLAB COVER (MTL-4, WARM BLACK)	8.8	WINDOW WALL CONSTRUCTION
5.6	ALUMINUM PANEL (MTL-5, NICKEL SILVER)	8.9	GLASS RAILING SYSTEM
5.7	METALLIC PTD. STRUCTURAL STEEL TUBE (NS)	10.1	FLAG POLE
7.1	STORM PROOF METAL LOUVER/RY KYNAR PTD	11.1	SCUPPER, DOWNSPOUT AND SPLASHBLOCK



01 NORTH ELEVATION
SCALE: 1/16" = 1'-0"



02 WEST ELEVATION
SCALE: 1/16" = 1'-0"



Drawing: o:\1433_greenpoint\CAD\G1\080-dob_filing\Sheets\A201 NORTH AND WEST ELEVATIONS.dwg
Date: February 4, 2015 - Layout: A201 NORTH AND WEST ELEVATIONS



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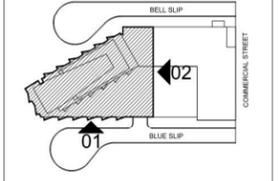
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No: Date: Revision:
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Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
Brooklyn New York

KEY PLAN
BELL SLIP
BLUE SLIP
COMMERCIAL STREET



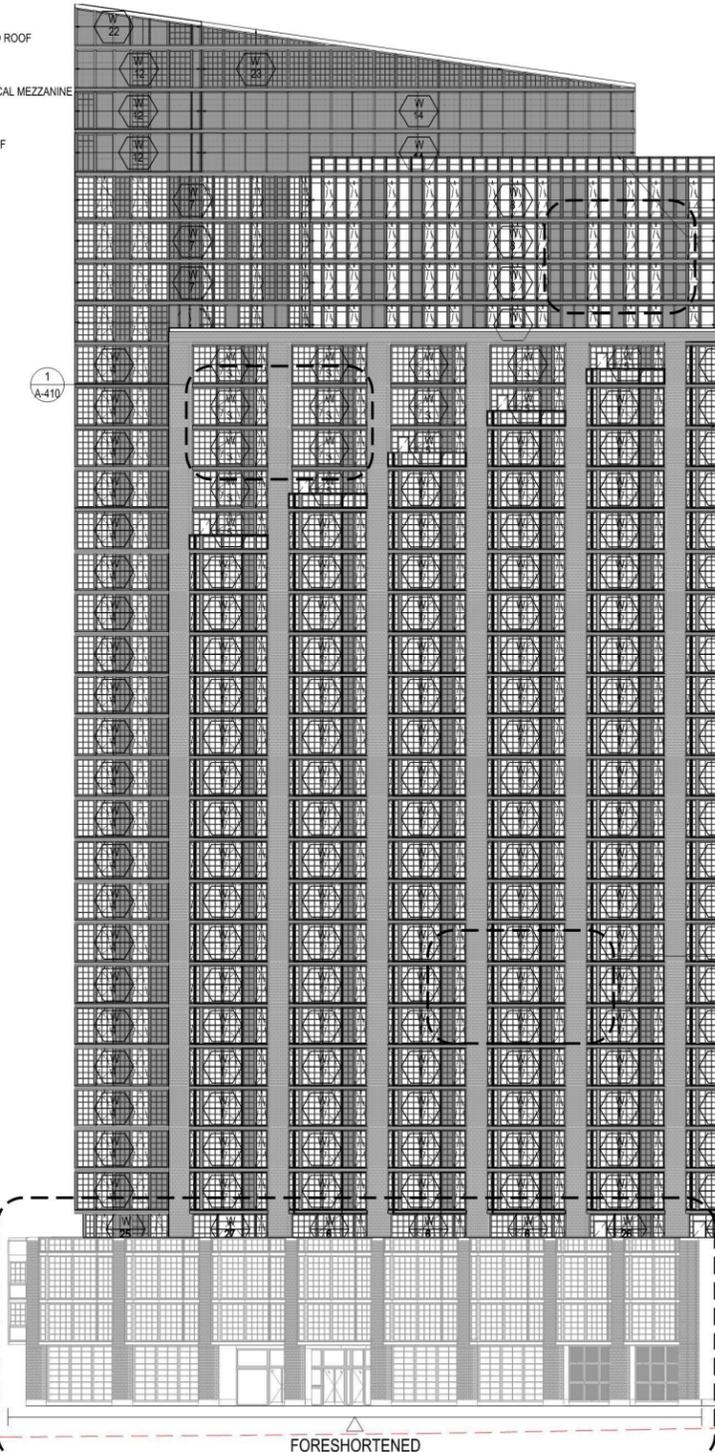
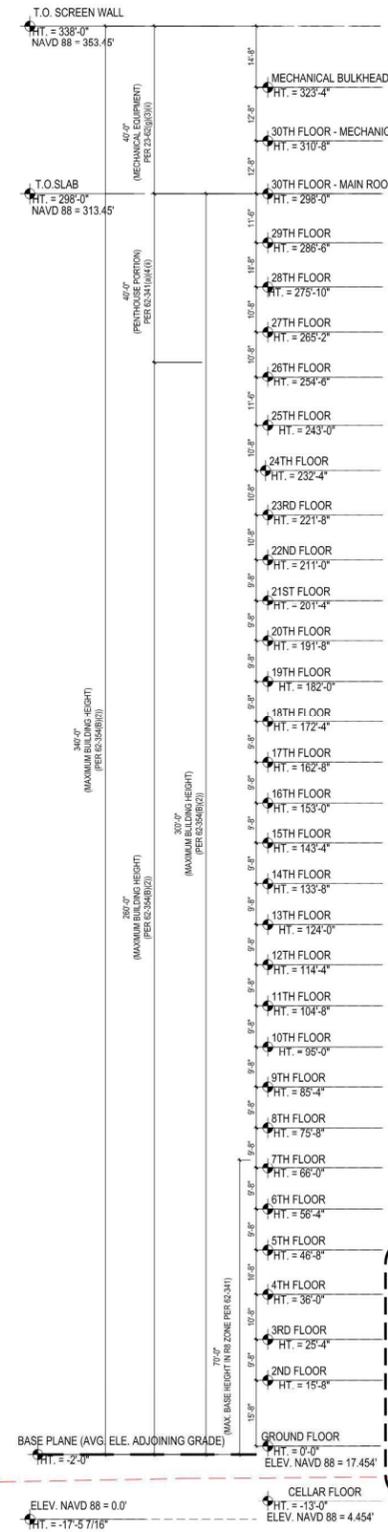
Drawing Title
SOUTH AND EAST ELEVATIONS

Date: 09/15/2014 Scale: 1/16" = 1'-0"
Seal: Drawn By: SD Checked By: AD
Project Number: 433.00

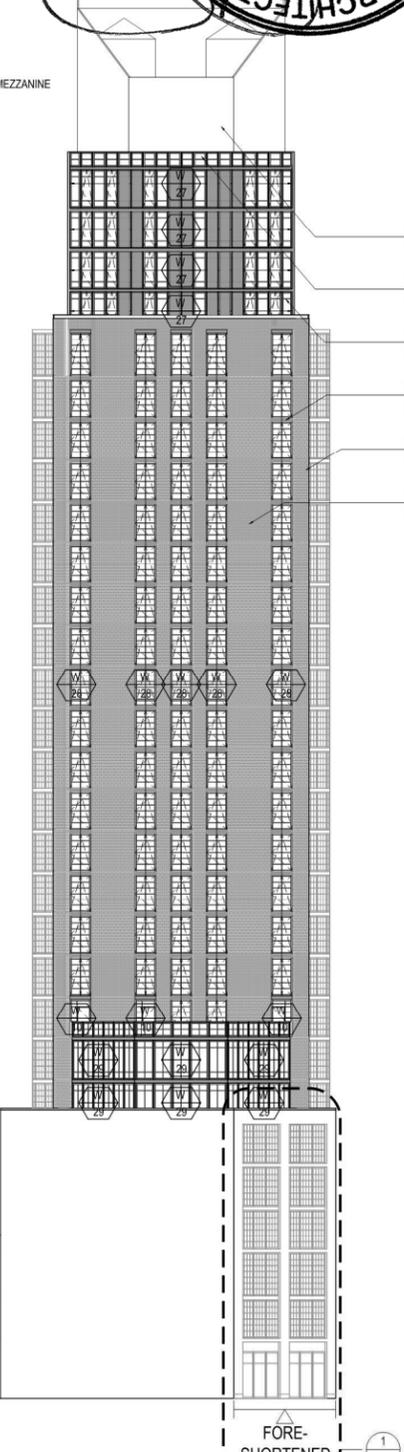
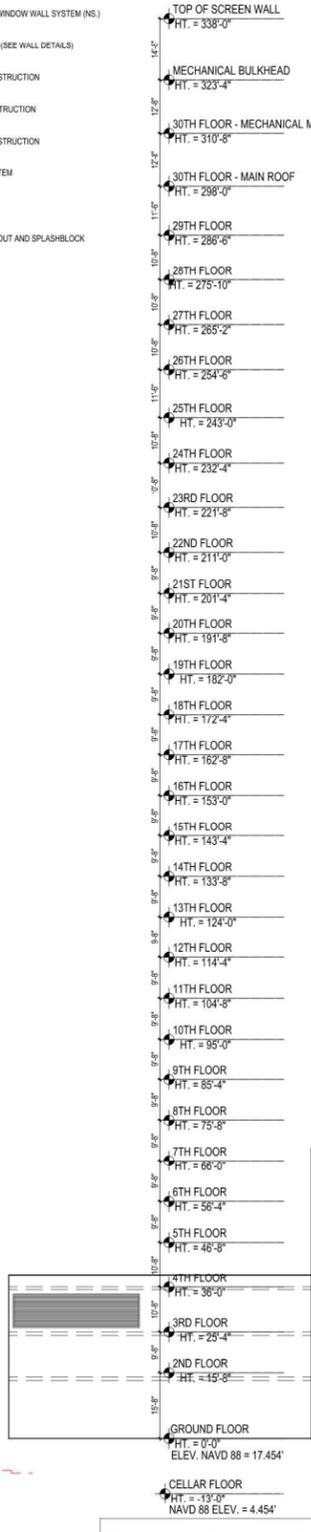
Drawing Number: **A202**
NYC DOB NO: 320627327

EXTERIOR ELEVATIONS MATERIAL LEGEND

- | | |
|---|---|
| 3.1 PRECAST CONCRETE | 7.2 EIFS |
| 3.2 CAST STONE | 8.1 FRITTED GLASS |
| 4.1 SELDEN BRICK NORMAN 470-479 DARK VELOUR, TYPE FBX | 8.2 SPANDREL GLASS |
| 4.2 JET MIST / FINISH, THERMAL (ST-1) | 8.3 PTD. ALUMIN. FIN IN CURTAIN WALL SYSTEM (COLOR TBD) |
| 5.1 METAL PANEL (MTL-1, WARM BLACK) | 8.4 PTD. ALUMIN. FIN IN WINDOW WALL SYSTEM (NS) |
| 5.2 ORNAMENTAL METAL RAILING | 8.5 OPERABLE WINDOW (SEE WALL DETAILS) |
| 5.3 ORNAMENTAL METAL CLADDING (MTL-2, NICKEL SILVER) | 8.6 CURTAIN WALL CONSTRUCTION |
| 5.4 PTD. METAL SLAB COVER (MTL-3, NICKEL SILVER) | 8.7 STOREFRONT CONSTRUCTION |
| 5.5 PTD. METAL SLAB COVER (MTL-4, WARM BLACK) | 8.8 WINDOW WALL CONSTRUCTION |
| 5.6 ALUMINUM PANEL (MTL-5, NICKEL SILVER) | 8.9 GLASS RAILING SYSTEM |
| 5.7 METALLIC PTD. STRUCTURAL STEEL TUBE (NS) | 10.1 FLAG POLE |
| 7.1 STORM PROOF METAL LOUVERS KYNAR PTD | 11.1 SCUPPER, DOWNSPOUT AND SPLASHBLOCK |



South Façade				
Material	Area	Percentage Area	U-Factor	Weighted U-Factor
Window System	26870	50.91512693	0.46	0.234
Window Spandrel	7289	13.8116993	0.119	0.016
Storefront System	723	1.369990204	0.46	0.006
Storefront Spandrel	1012	1.917607311	0.106	0.002
Metal Slab Cover	4004	7.587055014	0.075	0.006
Brick @ Wall	12876	24.39833176	0.063	0.015
Total	52774.1	99.99981051		0.279



East Façade				
Material	Area	Percentage Area	U-Factor	Weighted U-Factor
Window System	9321.64	52.39702311	0.46	0.241
Window Spandrel	890.99	5.008262883	0.119	0.006
Storefront System	196.59	1.105034176	0.46	0.005
Storefront Spandrel	44.68	0.251146686	0.106	0.00027
Metal Slab Cover	948.48	5.331414696	0.075	0.004
Brick @ Wall	6387.98	35.90689361	0.063	0.023
Total	17790.4	99.99977516		0.27927

Drawing: c:\433_greenpoint\CAD\G1\080-dob_filing\Sheets\A202 SOUTH AND EAST ELEVATIONS.dwg
Date: February 4, 2015 - Layout: A202 SOUTH AND EAST ELEVATIONS

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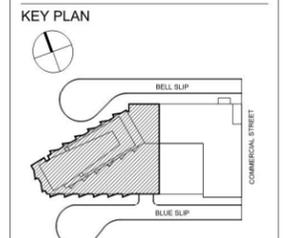
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No: _____ Date: _____ Revision: _____
-- 09/15/14 ISSUED FOR DOB FILING

Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
Brooklyn New York



Drawing Title
SOUTH & EAST PODIUM ELEVATIONS

Date: 09/15/2014 Scale: 1/8" = 1'-0"

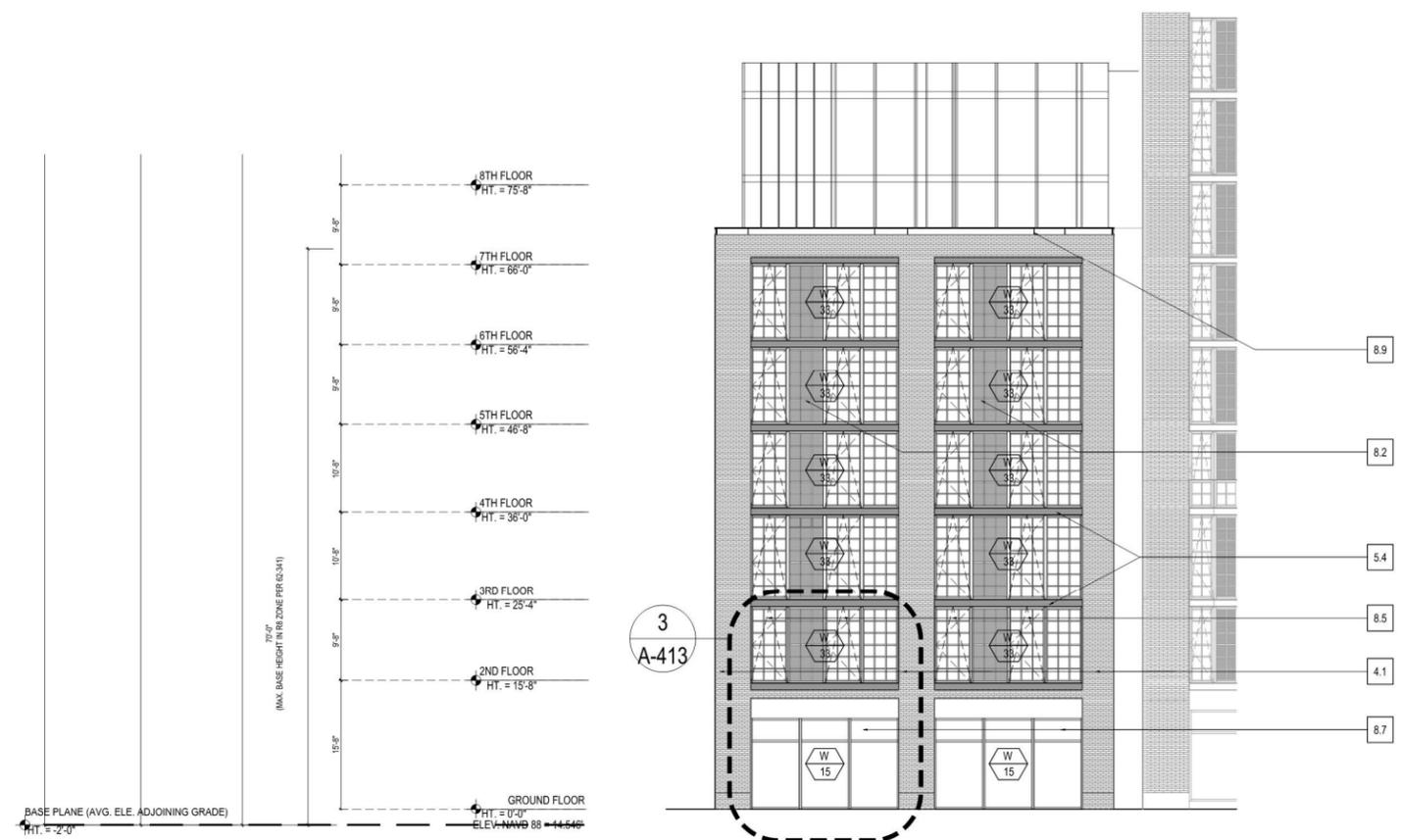
Drawn By: SD Checked By: AD
Project Number

433.00
Drawing Number:
A203

NYC DOB NO: 320627327

EXTERIOR ELEVATIONS MATERIAL LEGEND

3.1	PRECAST CONCRETE	7.2	EFS
3.2	CAST STONE	8.1	FRITTED GLASS
4.1	BELDEN BRICK NORMAN 470-479 DARK VELOUR, TYPE FBX	8.2	SPANDREL GLASS
4.2	BELDEN BRICK NORMAN 470-479 DARK VELOUR, TYPE FBX	8.3	PTD. ALUM. FIN IN CURTAIN WALL SYSTEM (COLOR TBD)
5.1	METAL PANEL (MTL-1, WARM BLACK)	8.4	PTD. ALUM. FIN IN WINDOW WALL SYSTEM (NS)
5.2	ORNAMENTAL METAL RAILING	8.5	OPERABLE WINDOW (SEE WALL DETAILS)
5.3	ORNAMENTAL METAL CLADDING (MTL-2, NICKEL SILVER)	8.6	CURTAIN WALL CONSTRUCTION
5.4	PTD. METAL SLAB COVER (MTL-3, NICKEL SILVER)	8.7	STOREFRONT CONSTRUCTION
5.5	PTD. METAL SLAB COVER (MTL-4, WARM BLACK)	8.8	WINDOW WALL CONSTRUCTION
5.6	ALUMINUM PANEL (MTL-5, NICKEL SILVER)	8.9	GLASS RAILING SYSTEM
5.7	METALLIC PTD. STRUCTURAL STEEL TUBE (NS)	10.1	FLAG POLE
7.1	STORM PROOF METAL LOUVERS KYMAR PTD	11.1	SCUPPER, DOWNSPOUT AND SPRINKLER
		11.2	RENLITA O.H. DOORS



01 EAST PODIUM ELEVATION
SCALE: 1/8" = 1'-0"



02 SOUTH PODIUM ELEVATION
SCALE: 1/8" = 1'-0"

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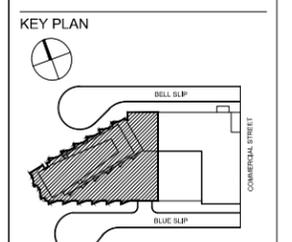
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No: 09/15/14 Date: 09/15/14 Revision: ISSUED FOR DOB FILING

Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
Brooklyn New York



WINDOW SCHEDULE

Date: 09/15/2014 Scale: N.T.S.
Seal: SD Drawn By: AD Checked By:
Project Number: 433.00
Drawing Number: **A241**

NYC DOB NO: 320627327

- GENERAL NOTES:
1. ALL EXTERIOR GLAZING SHALL BE MINIMUM ASSEMBLY U-FACTOR=0.29, SHGC=0.38
 2. EXTERIOR WINDOW + DOOR ASSEMBLIES SHALL BE ENGINEERED AS PER AAMA / WDMA / CAS 101 / I.S.2 / A440 / OR NFRC 40.
 3. STOREFRONT ENTRANCE DOORS SHALL BE TESTED IN ACCORDANCE WITH ASTM E283 AND HAVING SELF CLOSING HARDWARE.
 4. PROVIDE TEMPERED GLASS AT ALL AREAS BELOW 18" AFF. AT DOORS & GLASS AREAS IMMEDIATELY ADJACENT TO DOORS TO MEET APPLICABLE CODE.
 5. ALL GLASS UNITS TO BE 1/4" IGI WITH OITC MIN. OF 30, REFER TO SPEC FOR ADDL INFO
 6. ALL SPANDREL GLASS UNITS TO HAVE LOW 'E' COATING TO MATCH THAT OF THE VISION UNITS ON #2 SURFACE. SEE SPEC
 7. ALL DOOR HARDWARE ON GLASSMETAL STOREFRONT TO BE BY STORE FRONT/WINDOW CONTRACTOR, REFER TO HARDWARE SCHEDULE FOR ALL ADDL INFO
 8. PREPARE DOOR FRAMES AS REQ'D TO RECEIVE SECURITY & LOW VOLTAGE REQUIREMENTS, 9, R.O./M.O. SHALL BE INCLUDED (3/4", 1 1/2" AND 1 3/4") FOR BLOCKING, SHIMMING & CAULKING, 10, PROVIDE TRICKLE VENTS, ONE PER HABITABLE ROOM, SEE ARCHITECTURAL PLANS (A, 100S) FOR SPECIFIC LOCATIONS.

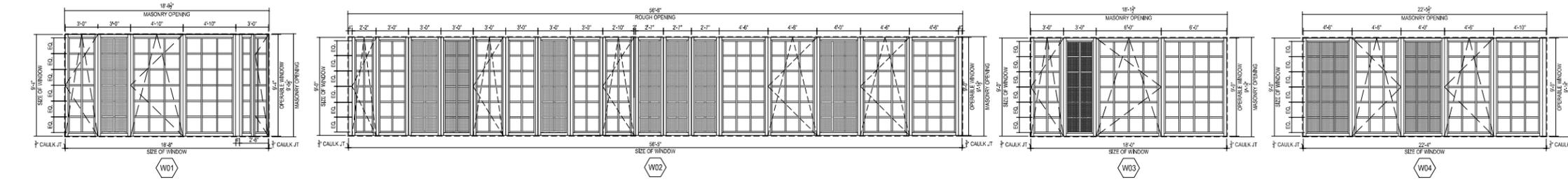
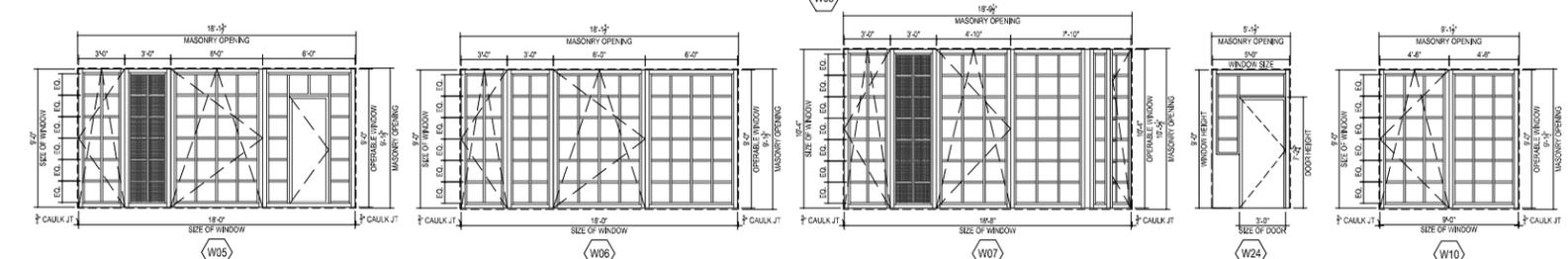
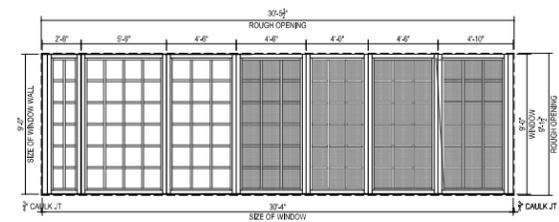
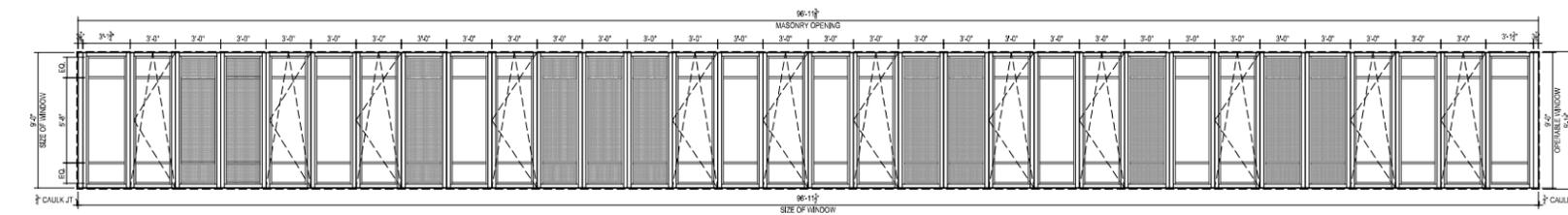
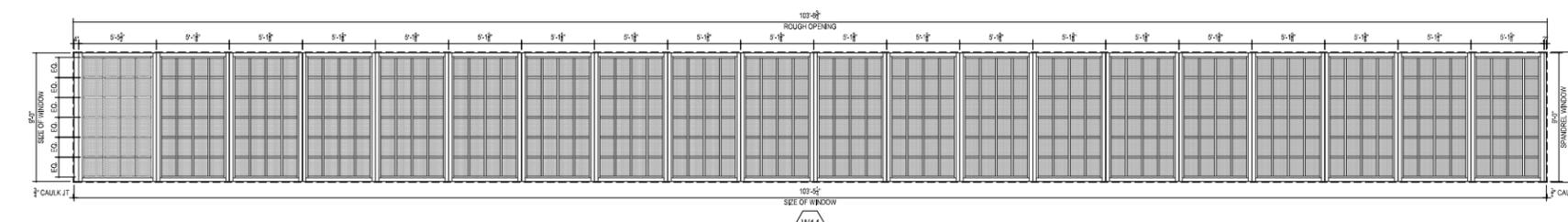
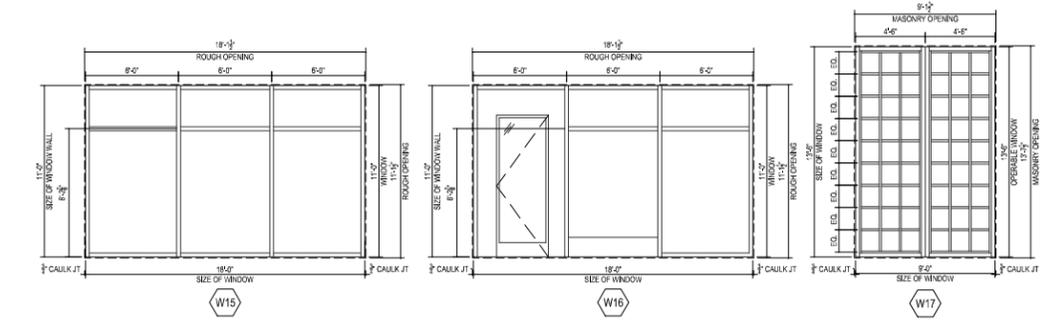
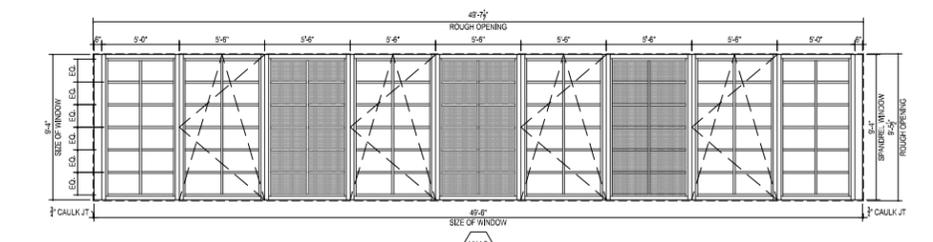


TYPE	OPENING DIMENSIONS		UNIT DIMENSIONS		REMARKS
	WIDTH	HEIGHT	WIDTH	HEIGHT	
W01	18'-8"	9'-4"			MIN. OITC 30
W02	56'-5"	9'-0"			MIN. OITC 30
W03	18'-0"	9'-2"			MIN. OITC 30
W04	22'-4"	9'-0"			MIN. OITC 30
W05	18'-0"	9'-0"			MIN. OITC 30
W06	18'-0"	9'-0"			MIN. OITC 30
W07	18'-8"	10'-4"			MIN. OITC 30
W08	96'-11 1/2"	9'-0"			MIN. OITC 30
W09	97'-0"	10'-2"			MIN. OITC 30
W10	5'-0 1/8"	9'-0"			MIN. OITC 30
W11	15'-1 1/8"	9'-2"			MIN. OITC 30
W12	30'-2"	10'-4"			MIN. OITC 26 MECHANICAL SPANDREL
W13	NOT USED	-			-
W14	103'-5 1/4"	9'-0"			MIN. OITC 26 MECHANICAL SPANDREL
W15	18'-0"	11'-0"			MIN. OITC 30
W16	18'-0"	11'-0"			MIN. OITC 26 STOREFRONT
W17	9'-0"	13'-6"			MIN. OITC 30
W18	NOT USED	-			-
W19	49'-6"	9'-4"			MIN. OITC 30
W20	NOT USED	-			-
W21	49'-6"	40'-0"			MIN. OITC 26 MECHANICAL SPANDREL
W22	30'-2"	8'-11 7/8"			MIN. OITC 26 MECHANICAL SPANDREL
W23	103'-5 1/4"	14'-8 3/8"			MIN. OITC 26 MECHANICAL SPANDREL
W24	5'-0"	9'-0"			DOOR
W25	20'-4"	9'-4"			MIN. OITC 30
W26	18'-0"	9'-4"			MIN. OITC 30
W27	18'-0"	9'-4"			MIN. OITC 26 MECHANICAL SPANDREL
W28	49'-6 1/8"	9'-4"			MIN. OITC 30
W29	18'-0"	13'-6"			MIN. OITC 30
W30	13'-6 1/2"	9'-0"			MIN. OITC 30
W31	18'-0"	13'-6"			MIN. OITC 26
W32	13'-6 1/2"	9'-0"			MIN. OITC 26
W33	17'-8"	9'-2"			MIN. OITC 30

LEGEND:

- SPANDREL GLASS
- LOUVERS - 50% FREE AREA
- OPERABLE FOR CLEANING ONLY PROVIDE TAMPER PROOF HARDWARE, SUBMIT CUTS FOR REVIEW

GENERAL SHEET NOTE U.O.N. - SPANDREL WALL R-8.37 GLAZING: U-0.46



Drawing: o:\433_greenpoint\CAD\G1\080-dob filing\Sheets\A-241 WINDOW SCHEDULE @ EAST ELEVATION.dwg Date: February 4, 2015 - Layout: A241 WINDOW SCHEDULE

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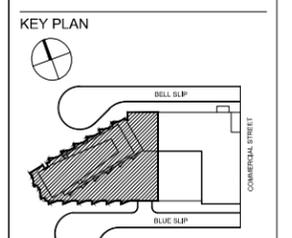
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No: 09/15/14 Date: 09/15/14 Revision: ISSUED FOR DOB FILING

Job Title
GREENPOINT LANDING BUILDING G1
37 Blue Slip
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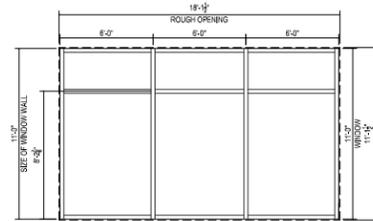
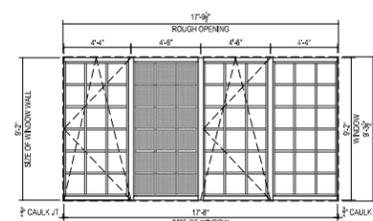
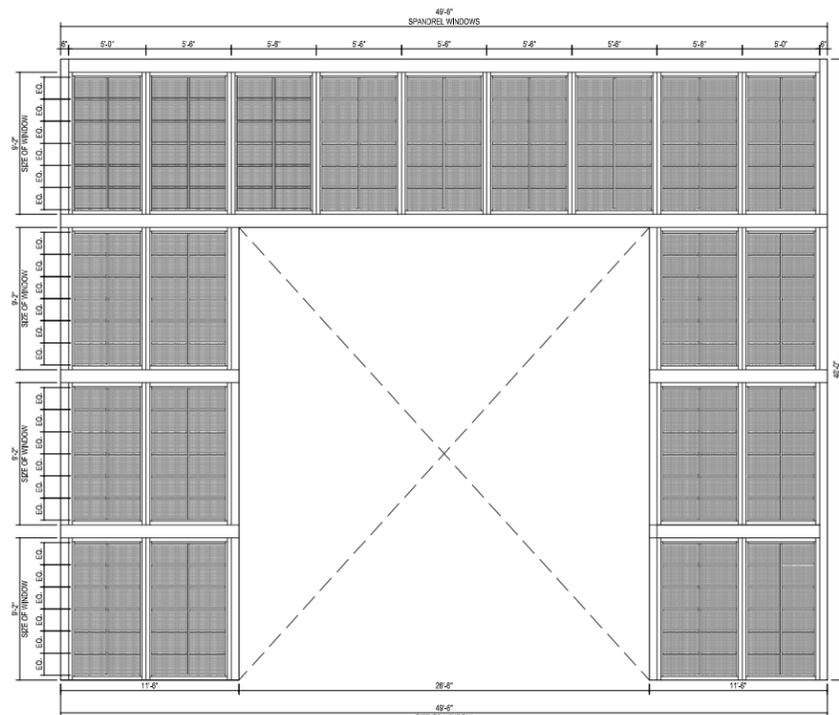
WINDOW SCHEDULE

Date: 09/15/2014 Scale: N.T.S.
Seal: SD Project Number: 433.00
Drawing Number: **A242**

NYC DOB NO: 320627327

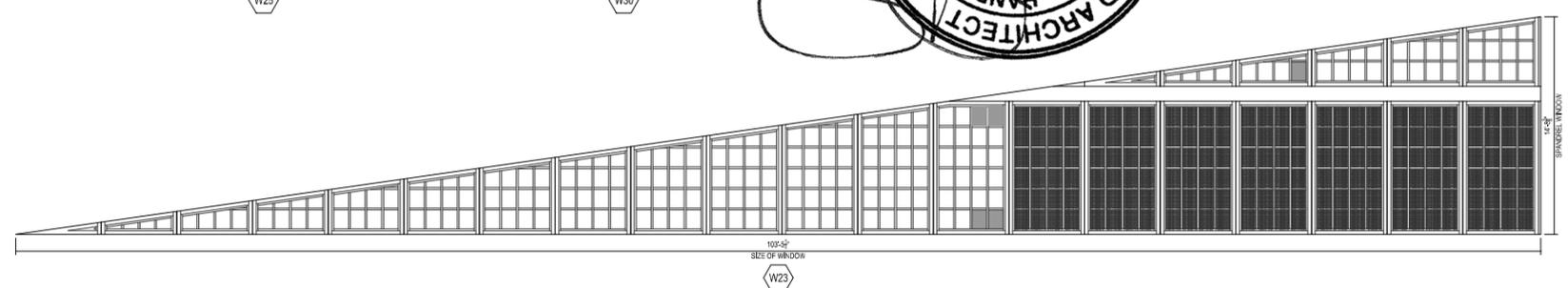
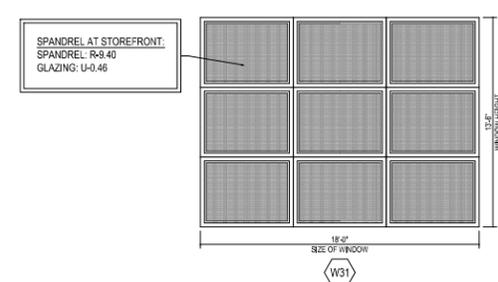
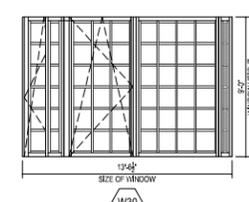
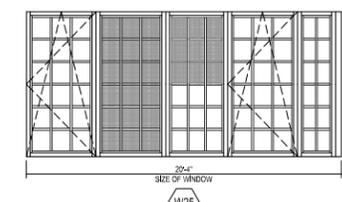
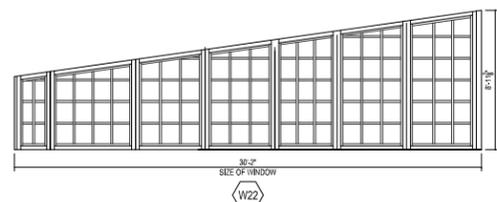
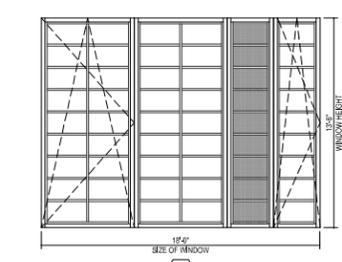
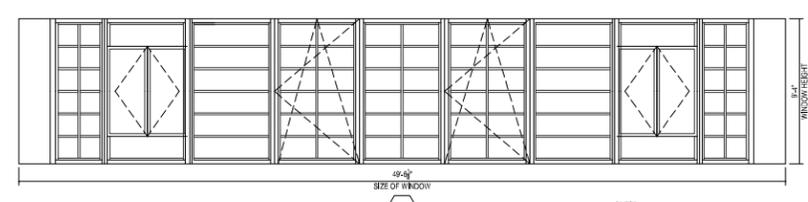
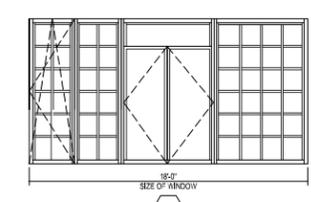
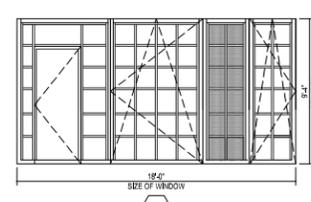
- GENERAL NOTES:
1. ALL EXTERIOR GLAZING SHALL BE MINIMUM ASSEMBLY U-FACTOR=0.28, SHGC=0.39
 2. EXTERIOR WINDOW + DOOR ASSEMBLIES SHALL BE ENGINEERED AS PER AAMA / WDMA / CAS 101 / IS 2 / A440 / OR NFRC 40.
 3. STOREFRONT ENTRANCE DOORS SHALL BE TESTED IN ACCORDANCE WITH ASTM E283 AND HAVING SELF CLOSING HARDWARE.
 4. PROVIDE TEMPERED GLASS AT ALL AREAS BELOW 18" AFF. AT DOORS & GLASS AREAS IMMEDIATELY ADJACENT TO DOORS TO MEET APPLICABLE CODE.
 5. ALL GLASS UNITS TO BE 1 3/4" IGU WITH OITC MIN. OF 31. REFER TO SPEC FOR ADD'L INFO
 6. ALL SPANDREL GLASS UNITS TO HAVE LOW 'E' COATING TO MATCH THAT OF THE VISION UNITS ON #2 SURFACE. SEE SPEC.
 7. ALL DOOR HARDWARE ON GLASS METAL STOREFRONT TO BE BY STORE FRONT WINDOW CONTRACTOR. REFER TO HARDWARE SCHEDULE FOR ALL ADD'L INFO
 8. PREPARE DOOR FRAMES AS REQ'D TO RECEIVE SECURITY & LOW VOLTAGE REQUIREMENTS.
 9. R.O.M.O. SHALL BE INCLUDED (3/4", 1 1/2" AND 1 3/4") FOR BLOCKING, SHIMMING & CAULKING.
 10. PROVIDE TRICKLE VENTS, ONE PER HABITABLE ROOM. SEE ARCHITECTURAL PLANS (A.1005) FOR SPECIFIC LOCATIONS.

TYPE	OPENING DIMENSIONS		UNIT DIMENSIONS		REMARKS
	WIDTH	HEIGHT	WIDTH	HEIGHT	
W01	18'-8"	9'-4"			MIN. OITC 30
W02	56'-5"	9'-0"			MIN. OITC 30
W03	18'-0"	9'-2"			MIN. OITC 30
W04	22'-4"	9'-0"			MIN. OITC 30
W05	18'-0"	9'-0"			MIN. OITC 30
W06	18'-0"	9'-0"			MIN. OITC 30
W07	18'-8"	10'-4"			MIN. OITC 30
W08	96'-11 1/2"	9'-0"			MIN. OITC 30
W09	97'-0"	10'-2"			MIN. OITC 30
W10	5'-0 1/8"	9'-0"			MIN. OITC 30
W11	15'-1 1/8"	9'-2"			MIN. OITC 30
W12	30'-2"	10'-4"			MIN. OITC 26 MECHANICAL SPANDREL
W13	NOT USED	-			-
W14	103'-5 1/4"	9'-0"			MIN. OITC 26 MECHANICAL SPANDREL
W15	18'-0"	11'-0"			MIN. OITC 30
W16	18'-0"	11'-0"			MIN. OITC 26 STOREFRONT
W17	9'-0"	13'-6"			MIN. OITC 30
W18	NOT USED	-			-
W19	49'-6"	9'-4"			MIN. OITC 30
W20	NOT USED	-			-
W21	49'-6"	40'-0"			MIN. OITC 26 MECHANICAL SPANDREL
W22	30'-2"	8'-11 7/8"			MIN. OITC 26 MECHANICAL SPANDREL
W23	103'-5 1/4"	14'-8 3/8"			MIN. OITC 26 MECHANICAL SPANDREL
W24	5'-0"	9'-0"			DOOR
W25	20'-4"	9'-4"			MIN. OITC 30
W26	18'-0"	9'-4"			MIN. OITC 30
W27	18'-0"	9'-4"			MIN. OITC 26 MECHANICAL SPANDREL
W28	49'-6 1/8"	9'-4"			MIN. OITC 30
W29	18'-0"	13'-6"			MIN. OITC 30
W30	13'-6 1/2"	9'-0"			MIN. OITC 30
W31	18'-0"	13'-6"			MIN. OITC 26
W32	13'-6 1/2"	9'-0"			MIN. OITC 26
W33	17'-8"	9'-2"			MIN. OITC 30



- LEGEND:
- SPANDREL GLASS
 - LOUVERS - 50% FREE AREA
 - OPERABLE FOR CLEANING ONLY PROVIDE TAMPER PROOF HARDWARE, SUBMIT CUTS FOR REVIEW

GENERAL SHEET NOTE U.O.N.:
SPANDREL WALL: R-8.37
GLAZING: U-0.46



Drawing: o:\433_greenpoint\CAD\G1\080-dob filing\Sheets\A242 WINDOW SCHEDULE.dwg
Date: February 4, 2015 - Layout: A242 WINDOW SCHEDULE

APPENDIX B
CUT FILL DIAGRAM

LEGEND

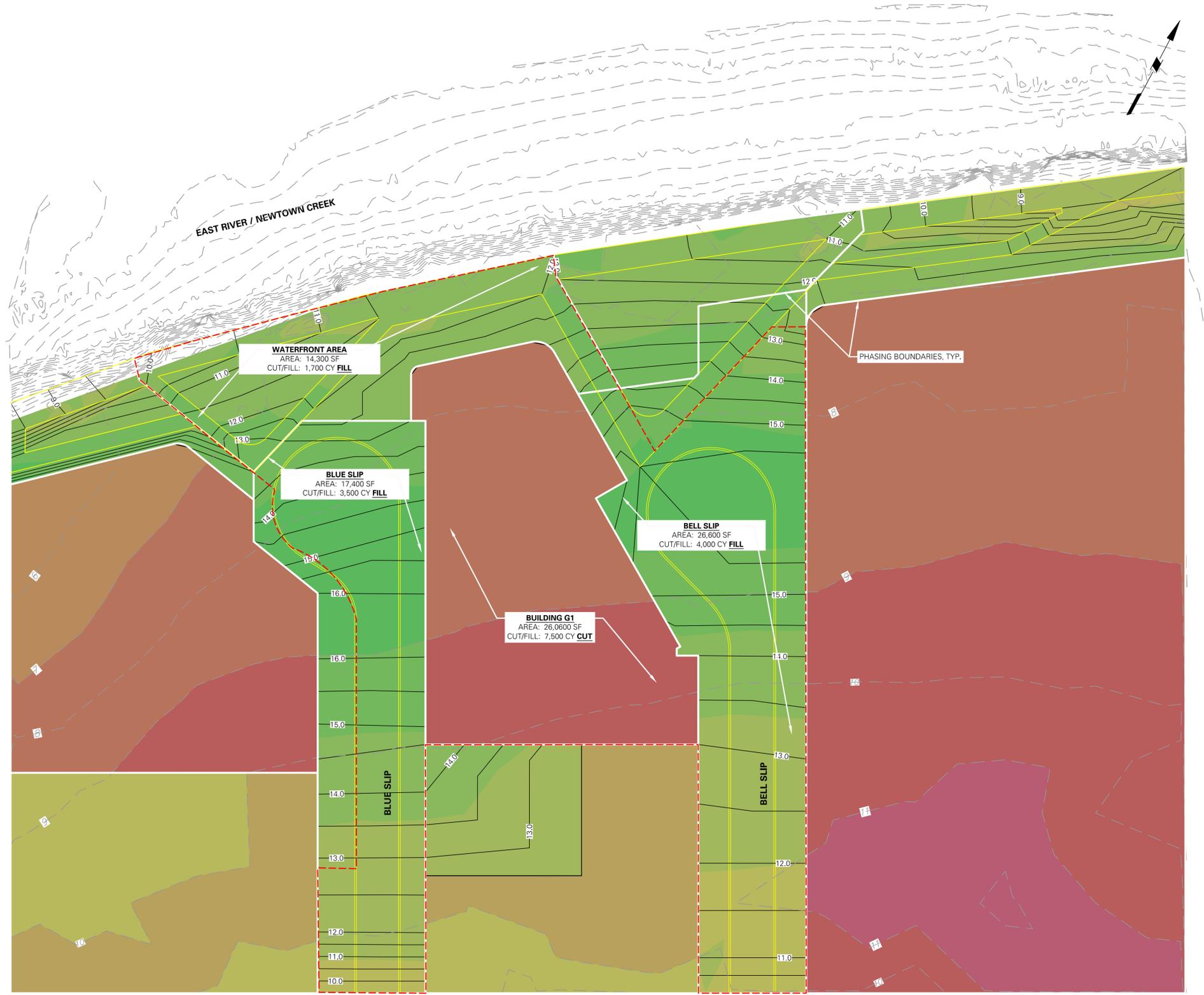
- ELEVATION CONTOUR (EXISTING)
- ELEVATION CONTOUR (PROPOSED)
- APPROXIMATE PARCEL G1 BOUNDARY

GENERAL NOTES

1. ELEVATIONS ARE BASED IN THE BOROUGH OF BROOKLYN DATUM (BBHD). BBHD IS 2.56 FEET ABOVE MEAN SEAL LEVEL DATUM AT SANDY HOOK NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGICAL SURVEY (USGS NGVD 1929).

CUT-FILL ELEVATIONS LEGEND (ALL PARCELS)

NUMBER	MIN. DEPTH OF CUT/FILL	MAX. DEPTH OF CUT/FILL	AREA (SF)	COLOR
1	-12.0	-10.0	15529	Red
2	-10.0	-8.0	50603	Dark Red
3	-8.0	-6.0	61896	Red
4	-6.0	-4.0	7600	Light Red
5	-4.0	-2.0	19929	Orange
6	-2.0	0.0	20828	Yellow
7	0.0	2.0	20356	Light Green
8	2.0	4.0	32097	Green
9	4.0	6.0	22178	Dark Green
10	6.0	8.0	12554	Dark Green



COMMERCIAL STREET

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.



Date	Description	No.

PROFESSIONAL XXXXXXXXX
STATE LIC. No. XXXXX

LANGAN

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NEW JERSEY NEW YORK VIRGINIA CALIFORNIA
PENNSYLVANIA CONNECTICUT FLORIDA

ABU DHABI ATHENS DOHA
DUBAI ISTANBUL

Langan Engineering, Environmental, Surveying and Landscape Architecture, P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan

Project
GREENPOINT LANDING
Block 2472, Lot 80, p/o Lot 50, and p/o Lot 100
BROOKLYN
NEW YORK

Drawing Title
**CUT-FILL PLAN
PARCEL G1**

Project No. 170229002	Appendix No. B
Date 3/23/2015	
Scale 1" = 30'	
Drawn By WGS/GCW	

APPENDIX C

SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

**Parcel G1
Greenpoint Landing
37 Blue Slip
Brooklyn, New York
OER Project # 15EH-N082K**

Prepared For:

**G Owner LLC
535 Madison Avenue
New York, New York 10022**

Prepared By:

**Langan Engineering, Environmental, Surveying
and Landscape Architecture, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001**

LANGAN

**March 24, 2015
170229002**

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1.0 INTRODUCTION

1.1 General

This Site-Specific Construction Health and Safety Plan (CHASP) has been developed by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan) to comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response (HAZWOPER). The plan addresses the activities related to the redevelopment of the property at 37 Blue Slip (Parcel G1) in the Greenpoint section of Brooklyn, New York (the "Site"). Parcel G1 is one of many development parcels associated with the Greenpoint Landing development project. The Greenpoint Landing project includes the construction of residential (affordable and market housing) buildings, a public elementary/intermediate school, new street infrastructure, new combined sewer overflows (CSO) and outfalls, a public promenade along the East River, public open space, as well as bulkhead reconstruction and shoreline stabilization.

This site-specific CHASP is to be implemented by Langan personnel while on-site. Compliance with this site-specific CHASP is required of all Langan personnel who enter this area of site operations. The management of the day-to-day activities concerning this site and implementation of this site-specific CHASP in the field is the responsibility of the site Health and Safety Officer (HSO). Assistance in the implementation of this site-specific CHASP can also be obtained from the Langan Health and Safety Manager (HSM). The content of this site-specific CHASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the scope of work. Any changes proposed must be reviewed by Health and Safety staff and are subject to the approval of the Langan HSM.

1.2 Objectives

The purpose of this site-specific CHASP is to establish personnel protection standards and mandatory safety practices and procedures for potential encounters with non-hazardous soil or groundwater during construction and to inform employees of the potential hazards that may be encountered during work activities pursuant to the OSHA Hazard Communication Standard (29 CFR 1910 and 1926), also known as the "Right-To-Know" law (Appendix A). This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted during construction.

Langan's primary responsibility is to implement the *Remedial Action Plan* pursuant to the Notice to Proceed issued by the New York City Office of Environmental Remediation (OER).

Construction activities will include, but are not limited to, soil and fill and groundwater management, a community air monitoring program (CAMP), and installation of engineering controls.

1.3 Roles and Responsibilities

The following briefly describes the health and safety (H&S) designations and general responsibilities that may be employed for this phase of work. The titles have been established to accommodate the site requirements in order to ensure the safe conduct of on-site work. The number and type of H&S personnel for a given work location is to be based upon the particular H&S requirements relative to the proposed site activities or operations.

1.3.1 Project Manager

The project manager (PM) has overall responsibility to ensure that personnel working on-site are safe. The specific responsibilities of the project manager include:

- Ensuring that the site-specific CHASP is developed prior to the field work or site visit;
- Reviewing and approving the site-specific CHASP prior to the field work or site visit;
- Ensuring employee understanding of and compliance with the site-specific CHASP; and
- Ensuring that project tasks are performed in a manner consistent with Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* and the site-specific CHASP.

1.3.2 Corporate Health and Safety Manager

The corporate health and safety manager (HSM) provides guidance to the project manager and health and safety officer (HSO) on site-specific CHASP preparation and reviews and approves the site-specific CHASP. The specific responsibilities of the corporate health and safety manager include:

- Serving as a resource in the development and implementation of site-specific CHASPs;

- Providing guidance and serving as a resource to the Langan HSO;
- Assisting the HSO with development of the site-specific CHASP, updating site-specific CHASP as dictated by changing conditions, jobsite inspection results, etc.;
- Assisting the HSO to conduct jobsite safety Inspections and assisting with the correction of shortcomings found;
- Ensuring training requirements are satisfied in a timely manner;
- Ensuring medical evaluations of Langan personnel are current; and
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

1.3.3 Health and Safety Officer

The health and safety officer (HSO) is responsible and authorized to implement this site-specific CHASP and verify compliance. The HSO reports to the PM and is on-site or readily accessible to the site during all work operations. The HSO is responsible for assessing site conditions and direction and controlling emergency response activities. The specific responsibilities of the HSO include the following:

- Participating in the development and implementation of this site-specific CHASP;
- Conducting jobsite safety inspections and correcting any shortcomings in a timely manner;
- Helping to select proper PPE (Personal Protective Equipment) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;

- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department; and
- Resolving conflicting situations which may arise concerning safety requirements and working conditions.

1.3.4 Key Personnel and Contact Information

Title	Name	Affiliation	Work Telephone	Cell Phone
Project Manager	Mimi Raygorodetsky	Langan	212-479-5441	917-952-9906
HSO	Gregory Wyka	Langan	212-479-5476	347-267-2679
HSM	Tony Moffa	Langan	212-491-6545	212-756-2523
N/A	Incident/Injury Hotline	Langan	201-398-4699	N/A
Site Contact	Al Bradshaw	G Owner LLC	212-310-9796	212-355-7570
Client Contact	Al Bradshaw	G Owner LLC	212-310-9796	212-355-7570

1.3.5 Subcontractor Responsibilities

Each subcontractor shall develop and implement their own site-specific CHASP, which identifies a lead individual responsible for H&S compliance for each of their employees, lower-tier subcontractors, and consultants. The subcontractor's site-specific CHASP will be at least as stringent as this Langan site-specific CHASP. The subcontractor must be familiar with and abide by the requirements outlined in their own site-specific CHASP. A subcontractor may elect to adopt Langan's site-specific CHASP as its own provided that it has given written notification to Langan, but where Langan's site-specific CHASP excludes provisions pertinent to the subcontractor's work (i.e., confined space entry), the subcontractor must provide written addendums to this site-specific CHASP. Additionally, the subcontractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site, the hazards associated with the material, and must provide a -SDS for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees have received current training in the appropriate levels of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER);
- Ensure their employees have been medically cleared to work in Hazardous Waste Sites and to wear a respirator, if necessary;
- Ensure their employees have been fit-tested within the year on the type respirator they will wear;
- Ensure that its employees have been briefed on this site-specific CHASP and have signed the site-specific CHASP Compliance Agreement.

2.0 EMERGENCY RESPONSE PLAN

The following section discusses emergency recognition and prevention and emergency response and notification. Emergency situations include, but are not limited to, injury or chemical exposure to personnel, fire or explosion, environmental release, or serious weather conditions.

2.1 Emergency Prevention, Recognition, Response and Notification

It is the responsibility of all personnel to monitor work at the site for potential safety hazards. All personnel are required to immediately report any unsafe conditions to the HSO. The HSO is responsible to immediately take steps to remedy any unsafe conditions observed at the site.

If an emergency at the site warrants evacuation, all personnel shall immediately evacuate the affected area, report to the predetermined emergency assembly location, and then report the emergency to the HSO. The predetermined emergency assembly location will be at the **southwest corner of Commercial Street and Franklin Street**. The predetermined emergency assembly location is illustrated on Figure 1.

In case of injury, field personnel should take precautions to protect the victim from further harm, immediately administer emergency first aid (as necessary), and notify local or facility emergency services and the HSM immediately. Emergency medical care will be provided by the FDNY/NYPD.

All work-related incidents, injuries of any personnel (e.g., Langan employees, subcontractors, property owners, visitors, etc.) associated with field activities, and near-misses and all property damage and injuries must immediately be report to the Langan Incident/Injury Hotline. The affected employee and the HSO must complete and submit the Employee Exposure/Injury Incident Report (Appendix B) as soon as possible following the incident.

In all situations when an on-site emergency results in an evacuation, Langan personnel shall not re-enter until:

- The conditions resulting in the emergency have been corrected;
- The hazards have been reassessed;
- This site-specific CHASP has been reviewed and revised, as necessary; and
- Langan field personnel have been briefed on changes to this site-specific CHASP.

2.2 Hospital Route Map

In case of emergency, the nearest hospital to the site is New York University Medical Center located at 550 First Avenue, Manhattan, New York. A route map to the hospital is provided as Figure 2. Travel time from the site to NYU Medical Center is about 10 minutes.

Directions to NYU Medical Center

START: Corner of Franklin and Commercial Streets, Brooklyn, NY 11222

1. Head south on Franklin Street
2. Turn left onto Green Street
3. Take the 2nd left onto McGuinness Boulevard
4. Continue straight onto Pulaski Bridge
5. Slight right toward 49th Avenue
6. Take the 1st right onto 49th Avenue
7. Turn right onto 11th Place
8. Turn right onto 50th Avenue
9. Turn left onto the I-495 W ramp
10. Keep left and merge onto I-495 W
11. Take the exit on the left toward E 35th Street
12. Turn left onto E 35th Street
13. Take the 1st right onto 2nd Avenue
14. Turn left onto E 30th Street
15. Turn left onto 1st Avenue

END: 550 1st Ave, New York, NY 10016

2.3 Emergency Contact Information

Local Resource	Name	Telephone
Fire	FDNY	911
Police	NYPD	911
Ambulance	FDNY	911
Hospital	NYU Medical Center	212-263-7300
Poison Control Center	N/A	1-800-222-1222
Pollution Toxic Chemical Oil Spills	N/A	1-800-424-8802

3.0 SITE LOCATION AND BACKGROUND

Site Description

The Site is located at 37 Blue Slip in the Greenpoint neighborhood of Brooklyn, New York. Parcel G1, as named in previous investigations, encompasses an area of about 52,600 square feet on Lot 100 (formerly p/o Lot 100), about 14,300 square feet on Lot 80 (formerly p/o Lot 100 and Parcel F in previous investigations), and about 17,400 square feet on Lot 50 (formerly p/o Lot 100) of Block 2472. The combined square footage of redefined Parcel G1, subject to this RAP, is about 84,000 square feet.¹ A Site location map is included as Figure 1. The Site is currently vacant and paved and is bound by the confluence of the East River and Newtown Creek to the north, a vacant lot used by a film production vehicle and truck rental company to the east (Lot 70 of Block 2472 [Parcel H], formerly p/o Lot 100) and area F1B of Parcel F1 (vacant) to the east, a new 6-story building under construction (Lot 60 of Block 2472 [Parcel G2], formerly p/o Lot 100) and Commercial Street to the south, and area F1A of Parcel F1 (vacant) and a vacant lot (Lot 65 of Block 2472 [Parcel F2], formerly p/o Lot 100) to the west.

The elevation of Parcel G1 ranges from about el. 8.0 feet² near the East River to about el. 12.5 feet near the southern perimeter of the Site. Groundwater elevation ranges from about el. 0.5 feet (about 8 feet bgs) near the East River to about el. 2.5 feet (about 10 feet bgs) near the southern perimeter of the Site. An abandoned underground NYCDEP (CSO pipe currently runs under Parcel G2 (adjacent southeast parcel) and Parcel G1 from Commercial Street towards the East River, where it terminates as an outfall. The relocation of the CSO pipe will be completed in early 2015.

The Site is under the regulatory oversight of the OER pursuant to the May 11, 2005 Greenpoint-Williamsburg Rezoning (CEQR 04DCP003K).

¹ Parcel G1 as described in the Supplemental RIR for Parcel G1, included a portion of Lot 90 which is described in the RAP for Parcel F1 as area F1B. Parcel F1 as described in the Supplemental RIR for Parcel F1 included portions of Lots 50 and Lot 80, which are described in the RAP for Parcel G1.

² National Vertical Datum of 1988 (NAVD88). Datum refers to the National Vertical Datum of 1988 which is approximately 1.1 feet above mean sea level datum at Sandy Hook, New Jersey as defined by the United States Geologic Survey (USGS NGVD 1929).

Site History

The Site was historically used for light industrial activities including the transfer and storage of lumber, coal, and construction materials and equipment. Coal and lumber storage were the primary uses for more than 100 years from the late 1800s until approximately 1980. The lumber yard operations were phased out during the 1980s when the former owner (Lumber Exchange Terminal, Inc.) began to lease the Site to tenants to use for materials and heavy equipment storage. During the 1980s, the Site was leased to the New York City Housing Authority and construction contractors to store materials and heavy equipment as well as trucking companies for materials storage, truck parking, and basic auto repair (e.g. oil changing, truck washing, and tire changing). Most recently, the Site was leased to HBO for film/television production.

Proposed Redevelopment Plan

The proposed development on Parcel G1 includes the construction of a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The proposed development also includes a waterfront park/esplanade on Lot 80 (about 13,800 square feet), private roadway on Lot 100 (Bell Slip) (about 26,600 square feet), and a private roadway on part of Lot 50 (Blue Slip) (about 17,400 square feet). The tower will include 372 market-rate housing units and three levels of above ground parking. The cellar will be used for parking, storage, amenity space and building systems. The waterfront park/esplanade will consist of a primary waterfront walkway,³ planted terraces,⁴ a secondary walkway,⁵ and a picnic area (including an asphalt area⁶ and planted area⁷). Bell Slip, a private roadway,⁸ will consist of a road (about 24 feet wide by about 300 feet long) and two 18-foot wide sidewalks.⁹ Blue Slip, another private roadway,¹⁰ will

³ Concrete pavers underlain in descending order by about 8 inches of binding course, a 2-foot thick concrete slab, about 2 feet 8 inches of compacted aggregate base.

⁴ Top soil and mulch underlain by a minimum 2 feet of certified clean soil.

⁵ Concrete underlain in descending order by about 8 inches of binding course, about 2 feet of asphalt base.

⁶ About 8 inches of coarse aggregate asphalt, underlain in descending order by about 2 feet of asphalt base, about 2 feet 8 inches of compacted aggregate base.

⁷ Top soil and mulch underlain in descending order by minimum 2 feet of certified clean soil.

⁸ Concrete pavers underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

⁹ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁰ Concrete cobbles (roadway) and concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

consist of a road (about 60 feet wide by 300 feet long), and one 18-foot wide sidewalk.¹¹ New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) will be constructed under the private roadways.

The construction will require removing the existing asphalt pavement and excavating an approximately 26,000-square-foot area to about el. 2.5 feet (about 8 to 10 feet below grade surface [bgs]) to accommodate the foundation slab. The Site will be excavated to the following development elevations/depths:

In the area of the proposed building:

- Approximately el. 2.95 feet (approximately 8 to 10 feet bgs) to accommodate the foundation slab;
- Approximately el. -2.5 feet (approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
- Approximately el. -4 feet (approximately 14 feet bgs) to accommodate the elevator pits; and
- Approximately el. 2 feet (approximately 10 feet bgs) to accommodate the parking lift pits.

In the area of the proposed private streets:

- Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways;
- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3);

In the area of the proposed esplanade:

- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities.

About 11,250 tons (7,500 cubic yards) of soil/fill material will be excavated to accommodate the proposed construction and disposed off-Site in accordance with local, state, and federal laws and regulations as well as with the OER-approved Soil/Materials Management Plan (SMMP) (Appendix C), and in compliance with applicable laws and regulations and with any special

¹¹ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

conditions established by the NYSDEC. About 2,500 tons (1,650 cubic yards) of soil/fill material will be excavated to accommodate the proposed utilities and associated structures. The remainder of the proposed utilities will be constructed above the current Site grades in the imported fill layer. Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Dewatering is anticipated during construction because excavation of foundation components (including slab, pile caps, grade beams, elevator pits, and parking lift pits) will extend below the groundwater table. The development will require importing soil/fill material to raise the grade of the private roadways and waterfront park/esplanade to achieve final development grades. Soil/fill import will be conducted in accordance with the OER-approved Soil/Materials Management Plan (SMMP), New York State Department of Environmental Conservation (NYSDEC) laws and regulations and with any special conditions established by the NYSDEC, and those of any other agency with jurisdiction over the Site and/or project. About 9,200 cubic yards of soil/fill material will be imported to raise the grade to achieve final development grades of the private roadways (about 7,500 cubic yards) and the waterfront park/esplanade in Lot 80 (about 1,700 cubic yards).

Surrounding Properties

The Site is currently vacant and paved and is bound by the confluence of the East River and Newtown Creek to the north, a vacant lot used by a film production vehicle and truck rental company to the east (Lot 70 of Block 2472 [Parcel H], formerly p/o Lot 100) and area F1B of Parcel F1 (vacant) to the east, a new 6-story building under construction (Lot 60 of Block 2472 [Parcel G2], formerly p/o Lot 100) and Commercial Street to the south, and area F1A of Parcel F1 (vacant) and a vacant lot (Lot 65 of Block 2472 [Parcel F2], formerly p/o Lot 100) to the west. The East River and Newtown Creek are the two closest ecological receptors. The property one block southeast across Commercial Street from Parcel G1, is the former NuHart Plastics Manufacturing facility located at 280 Franklin Street, Brooklyn, NY (Block 2487 Lots 1, 10 and 78). The NuHart site is listed as an NYSDEC inactive hazardous waste disposal site.

The Site is located in a dense urban area generally improved with multi-story commercial, residential and industrial buildings in zoning districts designated for commercial, residential and manufacturing uses, which are summarized in the following table:

Direction	Adjacent Properties	Surrounding Properties
North	Confluence of the East River and Newtown Creek	
East	Lightnin' Production Rentals Area F1A (Vacant)	Metropolitan Transit Authority- Department of Subways- Division of Car Equipment's Office of Emergency Response Motor vehicle storage lot Industrial and manufacturing
South (across Commercial Street)	Parcel G2 (a new 6-story building under construction)	Multi-story mixed-use residential and commercial Industrial and manufacturing Former NuHart plastics manufacturing facility Greenpoint Playground
West	Area F1A (Vacant) Parcel F2 (Vacant)	Vacant land Newtown Barge Playground

The surrounding properties beyond the adjoining properties consist of multi-story residential buildings, some with ground-level retail stores and restaurants; houses of worship; office buildings; television and movie production studios; small-scale industrial and manufacturing facilities; and park land owned and operated by the New York City Department of Parks and Recreation. The zoning classifications of the surrounding area include R6, R6A, R6B, R8, M1-1, and M1-2.

A search was performed for sensitive receptors, including, but not limited to, schools, daycare facilities, parks, hospitals, and senior care facilities, within an approximate 500-foot radius of the Site boundary. Three sensitive receptors were identified within the search radius:

- Newtown Barge Playground; and
- Greenpoint Playground; and
- Mary D's Senior Housing

Environmental Background

The results of previous environmental investigations are consistent with the historical property use and confirmed the presence of historic fill material at the Site. The previous analytical results are consistent with what one would expect to find on urban waterfront property across New York City.

Four previous environmental investigations were performed at the Site, including AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental remedial investigation of Parcel G1, Langan's supplemental remedial investigation of the former area described as Parcel F1, and Langan's waste characterization investigation of the proposed building footprint of Parcel G1. A summary of previous environmental findings and results for soil, groundwater, and soil vapor is as follows:

1. The elevation of Parcel G1 ranges from about el. 8.0 feet near the East River to about el. 12.5 feet near the southern perimeter of the Site.
2. Groundwater elevation ranges from about el. 0.5 feet (about 8 feet below ground surface [bgs]) near the East River to about el. 2.5 feet (about 10 feet bgs) near the southern perimeter of the Site.
3. The stratigraphy comprises a surficial layer of historic fill material overlying native fine-to coarse-grained sandy soil and silty soil. The surficial historic fill material generally extends from ground surface to about 10 feet below grade surface (bgs) and is composed of varying amounts of sand, silt, and gravel, and slag, coal, and wood fragments.
4. The geophysical survey did not identify subsurface anomalies with reflections or signatures consistent with underground storage tanks (USTs).
5. Four previous environmental investigations were performed at the Site, including AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental remedial investigation of Parcel G1, Langan's supplemental remedial investigation of the former area described as Parcel F1, and Langan's waste characterization investigation of the proposed building footprint of

Parcel G1. A summary of all previous environmental investigation results for soil, groundwater, and soil vapor is presented by media type as follows:

- Maximum concentrations, or where appropriate, concentration ranges, of contaminants in soil detected above their 6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UU SCOs). Concentrations also exceeding their 6 NYCRR Part 375-6.8(b) Restricted-Use Restricted-Residential Use SCOs (RR SCO) are bolded.
- Maximum concentrations, or where appropriate, concentrations ranges of contaminants in groundwater detected above their NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA waters.
- Maximum concentrations, or where appropriate, concentration ranges of contaminants in soil vapor detected above their New York State Department of Health (NYSDOH) Air Guidance Values (AGV) .

6. Soil:

- VOCs
 - 1,2-Dichloroethane - < 0.02 mg/kg to 1.1 mg/kg (G1_SB-03B_4-4.5) (UU SCO 0.02 mg/kg)
 - Acetone - < 0.05 mg/kg to 0.26 mg/kg (G1_SB-03B_4-4.5) (UU SCO 0.05 mg/kg)
 - Benzene - < 0.06 mg/kg to 0.21 mg/kg (G1_SB-05B_3-3.5) (UU SCO 0.06 mg/kg)
 - Methylene Chloride – < 0.05 mg/kg to 0.21 mg/kg (G1_SB-04A_2-2.5) (UU SCO 0.05 mg/kg)
 - Naphthalene - < 12 mg/kg to 100 mg/kg (G1_SB-06A_3-3.5) (UU SCO 12 mg/kg)
 - Toluene - < 0.7 mg/kg to 0.77 mg/kg (G1_SB-06A_7-7.5) (UU SCO 0.7 mg/kg)
 - Trichloroethene - < 0.47 mg/kg to 1.1 mg/kg (SB-44_0-2) (UU SCO 0.47 mg/kg)
 - Xylene (Total) - < 0.26 mg/kg to 0.59 mg/kg (G1_SB-05B_3-3.5) (UU SCO 0.26 mg/kg)
- SVOCs

- 3-Methylphenol - < 0.33 mg/kg to 0.87 mg/kg (G1_COMP-10D_5-10) (UU SCO 0.33 mg/kg)
- Acenaphthene - < 20 mg/kg to 22 mg/kg (G1_COMP-10D_5-10) (UU SCO 20 mg/kg)
- Benzo(a)anthracene - < 1 mg/kg to **80 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)
- Benzo(a)pyrene - < 1 mg/kg to **82 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)
- Benzo(b)fluoranthene - < 1 mg/kg to **88 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 1 mg/kg)
- Benzo(k)fluoranthene - < 0.8 mg/kg to **35 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.8 mg/kg, RR SCO 3.9 mg/kg)
- Chrysene - < 1 mg/kg to **75 mg/kg** (G1_COMP-10D_5-10) (UU SCO 1 mg/kg, RR SCO 3.9 mg/kg)
- Dibenz(a,h)anthracene - < 0.33 mg/kg to **20 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.33 mg/kg, RR SCO 0.33 mg/kg)
- Dibenzofuran - < 7 mg/kg to 25 mg/kg (G1_COMP-10D_5-10) (UU SCO 7 mg/kg)
- Fluoranthene - < 100 mg/kg to **180 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Indeno(1,2,3-c,d)pyrene - < 0.5 mg/kg to **66 mg/kg** (G1_COMP-10D_5-10) (UU SCO 0.5 mg/kg, RR SCO 0.5 mg/kg)
- Naphthalene - < 12 mg/kg to 35 mg/kg (G1_COMP-10D_5-10) (UU SCO 12 mg/kg)
- Phenanthrene - < 100 mg/kg to **220 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Pyrene - < 100 mg/kg to **140 mg/kg** (G1_COMP-10D_5-10) (UU SCO 100 mg/kg, RR SCO 100 mg/kg)
- Total SVOCs - < 1.464 mg/kg (SB-21_3.5-5.5) to 1245.17 mg/kg (G1_COMP-10D_5-10)
- No PCBs exceeded their Unrestricted Use SCOs.
- Pesticides
 - p,p'-DDT - < 0.0033 mg/kg to 0.0318 mg/kg (G1_COMP-02S_0-5) (UU SCO 0.0033 mg/kg)

- 4,4'-DDD - < 0.0033 mg/kg to 0.00775 mg/kg (SB-23_0-2) (UU SCO 0.0033 mg/kg)
- 4,4'-DDE - < 0.0033 mg/kg to 0.0073 mg/kg (SB-21_0-2) (UU SCO 0.0033 mg/g)
- 4,4'-DDT - < 0.0033 mg/kg to 0.0101 mg/kg (SB-21_0-2) (UU SCO 0.0033 mg/kg)
- No herbicides were detected above the reporting limit.
- Metals
 - Arsenic - < 13 mg/kg to **54 mg/kg** (G1_COMP-01D_5-10) (UU SCO 13 mg/kg, RR SCO 16 mg/kg)
 - Barium - < 350 mg/kg to **550 mg/kg** (SB-22_0-2) (UU SCO 350 mg/kg, RR SCO 400 mg/kg)
 - Beryllium - < 7.2 mg/kg to 15 mg/kg (SB-22_0-2) (UU SCO 7.2 mg/kg)
 - Cadmium - < 2.5 mg/kg to **22 mg/kg** (SB-22_3.5-5.5) (UU SCO 2.5 mg/kg, RR SCO 4.3 mg/kg)
 - Chromium Trivalent - < 30 mg/kg to 170 mg/kg (SB-22_0-2) (UU SCO 30 mg/kg)
 - Copper - < 50 mg/kg to **2,500 mg/kg** (SB-22_0-2) (UU SCO 50 mg/kg, RR SCO 270 mg/kg)
 - Lead - < 63 mg/kg to **3,300 mg/kg** (SB-22_0-2) (UU SCO 63 mg/kg, RR SCO 400 mg/kg)
 - Mercury - < 0.18 mg/kg to **2.2 mg/kg** (SB-22_3.5-5.5) (UU SCO 0.18 mg/kg, RR SCO 0.81 mg/kg)
 - Nickel - < 30 mg/kg to **320 mg/kg** (SB-22_0-2) (UU SCO 30 mg/kg, RR SCO 310 mg/kg)
 - Selenium - < 3.9 mg/kg to 4.8 mg/kg (G1_COMP-01D_5-10) (UU SCO 3.9 mg/kg)
 - Zinc - < 109 mg/kg to **19,000 mg/kg** (SB-22_0-2) (UU SCO 109 mg/kg, RR SCO 10,000 mg/kg)
- TCLP Metals
 - Lead, TCLP – **5.4 mg/L** (G1_COMP-05S_0-5) (Maximum Concentration of Contaminants for the Toxicity Characteristic, 5.0 mg/L)

7. Groundwater:

- VOCs

- p-Isopropyltoluene - < 5 µg/L to 27 µg/L (MW-21) (TOGS SGVs – Class GA 5 µg/L)
- trans-1,2-Dichloroethene - < 5 µg/L to 16 µg/L (MW-34) (TOGS SGVs – Class GA 5 µg/L)
- SVOCs
 - Benzo(a)pyrene – ND to 0.32 µg/L (MW-21) (TOGS SGVs – Class GA ND)
 - Benzo(b)fluoranthene - < 0.002 µg/L to 0.3 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Benzo(k)fluoranthene - < 0.002 µg/L to 0.18 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Bis(2-Ethylhexyl)phthalate - < 5 µg/L to 5.6 µg/L (MW-22) (TOGS SGVs – Class GA 5 µg/L)
 - Chrysene - < 0.002 µg/L to 0.33 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
 - Indeno(1,2,3-cd)Pyrene - < 0.002 µg/L to 0.21 µg/L (MW-21) (TOGS SGVs – Class GA 0.002 µg/L)
- No PCBs were detected above the reporting limit.
- No pesticides were detected above the reporting limit.
- No herbicides were detected above the reporting limit.
- Metals
 - Arsenic - < 25 µg/L to 58.5 µg/L (MW-34) (TOGS SGVs – Class GA 25 µg/L)
 - Iron – 1,970 µg/L (MW-22) to 33,500 (MW-28) (TOGS SGVs – Class GA 300 µg/L)
 - Lead - < 25 µg/L to 69.01 µg/L (MW-23) (TOGS SGVs – Class GA 25 µg/L)
 - Magnesium - 43,400 µg/L (MW-22) to 143,000 µg/L (MW-23) (TOGS SGVs – Class GA 35,000 µg/L)
 - Manganese – 902 µg/L (MW-28) to 1,687 µg/L (MW-34) (TOGS SGVs – Class GA 300 µg/L)
 - Sodium – 285,000 µg/L (MW-23) to 368,000 µg/L (MW-34) (TOGS SGVs – Class GA 20,000 µg/L)
- Dissolved Metals
 - Antimony - < 3 µg/L to 11.99 µg/L (MW-21) (TOGS SGVs – Class GA 3 µg/L)

- Arsenic - < 25 µg/L to 28.15 µg/L (MW-34) (TOGS SGVs – Class GA 25 µg/L)
- Iron - < 300 µg/L to 16,200 µg/L (MW-23) (TOGS SGVs – Class GA 300 µg/L)
- Magnesium – 46,600 µg/L (MW-34) to 134,000 µg/L (MW-23) (TOGS SGVs – Class GA 35,000 µg/L)
- Manganese – 788.2 µg/L (MW-28) to 1684 µg/L (MW-34) (TOGS SGVs – Class GA 300 µg/L)
- Sodium – 31,300 µg/L (MW-23) to 427,000 µg/L (MW-21) (TOGS SGVs – Class GA 20,000 µg/L)

8. Soil Vapor:

- VOCs
 - Trichloroethene - < 5 µg/m³ to 338 µg/m³ (SV-11) (NYSDOH AGV 5 µg/m³)

The VOCs, SVOCs, pesticides and metals found in soil above their Unrestricted Use and/or Restricted-Residential Use SCOs are attributed to the quality of historic fill and are characteristic of the urban environment. The VOCs found in groundwater above their TOGS SGVs are likely attributable to historic fill, which extends into the groundwater table in areas across the Site, or to upgradient and off-Site source(s). The SVOCs found in groundwater above their TOGS SGVs are attributed to historic fill, which extends into the groundwater table in areas across the Site. The metals found in groundwater above their TOGS SGVs are consistent with brackish and naturally-occurring groundwater conditions and demonstrate that groundwater directly communicates with the estuarine waters of the East River and Newtown Creek. The TCE concentrations in soil vapor can be attributed to the low-level concentrations of TCE in historic fill or to upgradient and off-Site source(s).

4.0 SCOPE OF WORK

4.1 Construction

The proposed development on Parcel G1 includes the construction of a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The proposed development also includes a waterfront park/esplanade on Lot 80 (about 13,800 square feet), private roadway on Lot 100 (Bell Slip) (about 26,600 square feet), and a private roadway on part of Lot 50 (Blue

Slip) (about 17,400 square feet). The tower will include 372 market-rate housing units and three levels of above ground parking. The cellar will be used for parking, storage, amenity space and building systems. The waterfront park/esplanade will consist of a primary waterfront walkway,¹² planted terraces,¹³ a secondary walkway,¹⁴ and a picnic area (including an asphalt area¹⁵ and planted area¹⁶). Bell Slip, a private roadway,¹⁷ will consist of a road (about 24 feet wide by about 300 feet long) and two 18-foot wide sidewalks.¹⁸ Blue Slip, another private roadway,¹⁹ will consist of a road (about 60 feet wide by 300 feet long), and one 18-foot wide sidewalk.²⁰ New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) will be constructed under the private roadways.

The construction will require removing the existing asphalt pavement and excavating an approximately 26,000-square-foot area to about el. 2.5 feet (about 8 to 10 feet below grade surface [bgs]) to accommodate the foundation slab. The Site will be excavated to the following development elevations/depths:

In the area of the proposed building:

- Approximately el. 2.95 feet (approximately 8 to 10 feet bgs) to accommodate the foundation slab;
- Approximately el. -2.5 feet (approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
- Approximately el. -4 feet (approximately 14 feet bgs) to accommodate the elevator pits; and
- Approximately el. 2 feet (approximately 10 feet bgs) to accommodate the parking lift pits.

¹² Concrete pavers underlain in descending order by about 8 inches of binding course, a 2-foot thick concrete slab, about 2 feet 8 inches of compacted aggregate base.

¹³ Top soil and mulch underlain by a minimum 2 feet of certified clean soil.

¹⁴ Concrete underlain in descending order by about 8 inches of binding course, about 2 feet of asphalt base.

¹⁵ About 8 inches of coarse aggregate asphalt, underlain in descending order by about 2 feet of asphalt base, about 2 feet 8 inches of compacted aggregate base.

¹⁶ Top soil and mulch underlain in descending order by minimum 2 feet of certified clean soil.

¹⁷ Concrete pavers underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁸ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

¹⁹ Concrete cobbles (roadway) and concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

²⁰ Concrete pavers (sidewalk) underlain in descending order by about 16 inches of asphalt base, about 16 inches of compacted aggregate base.

In the area of the proposed private streets:

- Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways;
- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3);

In the area of the proposed esplanade:

- Approximately el. 3 feet (approximately 6 feet bgs) to accommodate associated utilities.

About 11,250 tons (7,500 cubic yards) of soil/fill material will be excavated to accommodate the proposed construction and disposed off-Site in accordance with local, state, and federal laws and regulations as well as with the OER-approved Soil/Materials Management Plan (SMMP) (Appendix C), and in compliance with applicable laws and regulations and with any special conditions established by the NYSDEC. About 2,500 tons (1,650 cubic yards) of soil/fill material will be excavated to accommodate the proposed utilities and associated structures. The remainder of the proposed utilities will be constructed above the current Site grades in the imported fill layer. Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Dewatering is anticipated during construction because excavation of foundation components (including slab, pile caps, grade beams, elevator pits, and parking lift pits) will extend below the groundwater table. The development will require importing soil/fill material to raise the grade of the private roadways and waterfront park/esplanade to achieve final development grades. Soil/fill import will be conducted in accordance with the OER-approved Soil/Materials Management Plan (SMMP), New York State Department of Environmental Conservation (NYSDEC) laws and regulations and with any special conditions established by the NYSDEC, and those of any other agency with jurisdiction over the Site and/or project. About 9,200 cubic yards of soil/fill material will be imported to raise the grade to achieve final development grades of the private roadways (about 7,500 cubic yards) and the waterfront park/esplanade in Lot 80 (about 1,700 cubic yards).

The proposed remedial action consists of:

1. Performance of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds;

2. Establishment of Site-specific soil cleanup objectives (SCOs) for contaminants of concern;
3. Site mobilization involving security setup, equipment mobilization, utility mark outs and marking excavation areas;
4. Implementation of stormwater and soil erosion control measures in compliance with applicable laws and regulations;
5. Excavation to the following development elevations/depths:
 - In the area of the proposed building:
 - Approximately el. 2.95 feet (Approximately 8 to 10 feet bgs) to accommodate the foundation slab;
 - Approximately el. -2.5 feet (Approximately 12.5 to 14.5 feet bgs) to accommodate the pile caps and grade beams;
 - Approximately el. -4 feet (Approximately 14 feet bgs) to accommodate the elevator pits;
 - Approximately el. 2 feet (Approximately 10 feet bgs) to accommodate the parking lift pits; and
 - In the area of the proposed private roadways:
 - Approximately el. 10 feet (up to 1-2 feet bgs) directly adjacent to Commercial Street to accommodate the roadways;
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities; deeper excavations will be required for utility structures (see Section 2.3);
 - In the area of the proposed esplanade:
 - Approximately el. 3 feet (Approximately 6 feet bgs) to accommodate associated utilities.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual and olfactory observation and monitoring with a photoionization detector (PID);

7. Excavation and off-Site disposal of soil identified as hazardous waste. Post-excavation endpoint samples will be collected for laboratory analysis to confirm that the hazardous waste was removed. Depending on the results of post-excavation endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER;
8. Excavation and off-Site disposal of soil/fill material (both hotspot²¹ and non-hotspot material) removed for construction purposes;
9. No hotspot endpoint samples will be collected around areas within the mass excavation where soil exceeds the Site-specific SCOs, unless required for petroleum spills or other circumstances under the authority of NYS DEC, as these areas will be over-excavated to reach development depth. Post-excavation confirmation endpoint samples will be collected, consistent with DER-10, at development subgrade to determine the performance of the remedy with respect to attainment of the Site-specific SCOs. At locations outside of the mass excavation area where soil exceeds the Site-specific SCOs, hotspot endpoint confirmation samples will be collected, consistent with DER-10, to document performance of the remedy with respect to attainment of the Site-specific SCOs. Depending on the results of hotspot endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The OER may approve a proposal for management in-place of soil that exceeds Site-specific SCOs based upon a proposal demonstrating that management in-place is protective of public health and the environment;
10. Management of excavated materials, including screening of construction and demolition (C&D) debris, as defined by 6 NYCRR Part 360-1.2(b)(38), temporary stockpiling and segregation of materials to prevent commingling of contaminated materials and non-contaminated materials, in compliance with applicable laws and regulations and with any special conditions established by the NYSDEC. Prior to performing screening/segregation activities on-Site, the means and methods will be presented to the OER, whose approval will be obtained;

²¹ A hotspot is defined as a previous soil boring location from either AKRF's Phase II environmental site investigation, Langan's area-wide remedial investigation, Langan's supplemental parcel-specific remedial investigations of Parcels G1 and F1, or Langan's waste characterization investigation of Parcel G1 where sampled soil exceeded the site-specific SCOs defined in this RAP. A hotspot is also defined as a new area at which soil exceeding the Site-specific SCOs defined in this RAP is identified during construction.

11. Transportation and off-Site disposal of excavated soil and fill material at permitted facilities in accordance with this plan and applicable laws and regulations for handling, transport, and disposal. Sampling and analysis of soil and fill material designated for off-Site disposal will be conducted, as required by disposal facilities. Excavated materials will be segregated based on the characterization results;
12. Off-Site recycling or disposal of other uncontaminated construction and demolition (C&D) debris at a registered Part 360-16 C&D debris processing facility or permitted C&D landfill in accordance with applicable laws and regulations for handling, transport, and disposal, this plan, and with any special conditions established by the NYSDEC;
13. Dewatering and disposal of water through one or more of the following methods: containerization and off-Site disposal, discharge to the East River, discharge to the NYCDEP municipal sewer system, and/or discharge to groundwater, in accordance with applicable laws and regulations, including any permits and pretreatment requirements;
14. Removal of underground storage tanks (if encountered), and closure of petroleum spills, in compliance with applicable local, state and federal laws and regulations;
15. Import of materials for backfilling excavations and raising land elevations and for clean cover material in compliance with this RAP and in accordance with applicable laws and regulations;
16. Residual (existing) soil and fill material outside of the proposed building footprint will be demarcated in accordance with the SMMP;
17. Construction and maintenance of an engineered composite cover system consisting of concrete or asphalt pavement²², a 20-inch-thick concrete building slab, or 2 feet of certified clean soil²³ imported from an OER-approved source to prevent human exposure to residual (existing) soil/fill material;

²² The private roadways, sidewalks, and primary and secondary walkways on Parcel G1 will be comprised of impervious surfaces (concrete and/or asphalt).

²³ The landscaped areas, including planted terraces, planted areas in the picnic area, and tree beds in the sidewalks of the private roadways, will be capped with 2 feet of certified clean soil.

18. Installation of a waterproofing/vapor barrier system (with a minimum thickness of 20 mils) as per manufacturer's specifications under the new building slab (including elevator pits), grade beams, and pile caps, extending along all subsurface walls of the foundation from the base of excavation to the surface grade level;
19. Submission of a Remedial Closure Report (RCR) that describes the remedial activities, certifies that the remedial requirements have been achieved, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAP;
20. Submission for OER approval of a Site Management Plan (SMP) in the RCR for the inspection and certification of engineering controls and reporting at a specified frequency; and
21. Continuation of the E-Designation requiring ongoing site management, establishment of engineering controls and institutional controls, including a requirement that management of engineering and institutional controls must be in compliance with the approved SMP.

4.2 Task Descriptions

4.2.1 Task #1 – Excavation Oversight

Soil and fill management on-site and off-site, including excavation, screening, handling and disposal, import, and reuse will be conducted in accordance with the *Remedial Action Plan*. The Contractor shall be responsible for all excavation and earthwork. Langan field personnel will be on site to oversee excavation, screening, and earthwork and document and compliance with the remedial action requirements described in the *Remedial Action Plan*. In addition, Langan field personnel will be monitoring trucks loaded with excavated materials and may be signing waste manifests on behalf of the owner/generator.

4.2.2 Task #2 – Community Air Monitoring Program

Real-time air monitoring for VOCs and particulate matter at the upwind and downwind perimeter of the construction area will be performed by Langan field personnel on a continuous basis during soil disturbance activities and the handling of contaminated soil and fill material.

Soil disturbance activities include, but are not limited to, soil/fill material excavation, screening of soil/fill material, handling, stockpiling, and loading, grading, trenching, sheeting and lagging. Particular matter will be monitored using a real-time Dust Trak aerosol monitor. A PID (MiniRAE 2000 or equivalent) will be used to monitor for VOCs.

4.2.3 Task #3 – Hazardous Waste Removal

Previous waste characterization sampling identified two areas with soil/fill material exhibiting characteristic hazardous lead soil and total copper above its Site-specific SCO (SB-5A and SB-5B). Hazardous waste locations are indicated on Figure 15. Hazardous waste will be removed prior to mass excavation. In an effort to minimize the amount of hazardous waste presently associated with the sample locations named above, a work plan to delineate the extent of the hazardous waste will be presented to the OER for review and approval; the analytical results and findings and strategy for disposal will also be presented to the OER for review and approval. The work plan will incorporate the collection of endpoint samples at a frequency and at locations as defined in DER-10 for laboratory analysis to confirm that the hazardous waste is fully delineated. The endpoint samples will be analyzed for total and TCLP lead and total copper. Depending on the results of endpoint soil samples, over-excavation beyond the proposed development cut may be required by the OER. The extent of the hazardous waste excavation areas will be mapped horizontally and vertically by GPS or in a site survey.

4.2.4 Task #4 – Post-Excavation and Hotspot Confirmation Endpoint Sampling

Previous environmental investigations identified 18 hotspot areas with total metals (arsenic, cadmium, copper, lead, mercury, and zinc) and total SVOCs concentrations that exceed Site-specific SCOs (see Section 1.9). The hotspots are summarized in the table below:

Hotspot Summary				
Boring Location(s)	Contaminant	Depth (feet bgs)	Concentration (mg/kg)	Classification
SB-1A / SB-1B	Arsenic	5-10	54	Hotspot
	Copper	0-5	810	
SB-2A / SB-2B	Arsenic	5-10	46	Hotspot
	Copper	0-5	480	
	Lead	0-5	1,600	

Hotspot Summary				
Boring Location(s)	Contaminant	Depth (feet bgs)	Concentration (mg/kg)	Classification
SB-3A / SB-3B	Arsenic	5-10	34	Hotspot
	Copper	0-5	500	
SB-5A / SB-5B	Copper	0-5	620	Hotspot
SB-7A / SB-7B	Copper	0-5	920	Hotspot
SB-8A / SB-8B	Arsenic	5-10	30	Hotspot
	Copper	0-5	440	
SB-9A / SB-9B	Copper	0-5	680	Hotspot
		5-10	2,900	
SB-10A / SB-10B	Total SVOCs	5-10	1,246.17	Hotspot
SB-22	Arsenic	3.5-5.5	33	Hotspot
	Cadmium	3.5-5.5	22	
	Copper	0-2	2,500	
	Lead	0-2	3,300	
	Zinc	0-2	19,000	
B14	Lead	2-3.5	1,870	Hotspot

All hotspot areas, with the exception of SB-22, will be removed as part of the mass excavation for the new building's foundation. For the area of the building foundation mass excavation, post-excavation confirmation endpoint samples will be collected at development grade to determine the performance of the remedy with respect to attainment of the Site-specific SCOs.

SB-22 is located outside of the new building footprint in the proposed waterfront park/esplanade. The initial excavation area for SB-22 will be 10-feet by 10-feet to 10 feet bgs, or to native soil. Hotspot confirmation endpoint grab samples will be collected and analyzed for total arsenic, cadmium, copper, lead and zinc. Additional excavation will be completed, if required by the OER or any other agency with jurisdiction over the Site and/or project, based on the hotspot confirmation endpoint sample results and to the extent practical in accordance with the criteria for confirmation samples described in NYCDEC DER-10, modified to substitute the OER Project Manager's determination for that of DER project manager. The extent of the hotspot excavation areas will be mapped horizontally and vertically by GPS or in a site survey.

If areas of grossly-contaminated soil are identified during construction, they will be treated as hotspots and removed to the extent practical. If encountered, the extent of grossly-contaminated soil will be delineated horizontally and vertically by visual observations, field instrumentation, and mapped by GPS or on a site survey. The OER will be consulted in the event that endpoint sample results exceed Site-specific SCOs or if gross contamination is encountered during RAP implementation. Sources of groundwater impacts, if encountered, will be remediated. If conditions indicative of a petroleum discharge are encountered, the NYSDEC will be notified, as required by law.

To evaluate attainment of the Site-specific SCOs, the following samples will be collected/evaluated:

- Ten post-excavation confirmation endpoint soil samples will be collected promptly after reaching development grade from the top of foundation subgrade within the footprint of Building G1.
- Limited excavation (up to 1-2 feet bgs) may be required directly adjacent to Commercial Street to construct the roadways. Depending on the amount of excavation required, up to two post-excavation confirmation endpoint samples will be collected promptly after reaching subgrade.
- Two post-excavation confirmation endpoint soil samples will be collected promptly after reaching subgrade within the footprint of utility cut/excavations.
- Shallow soil samples associated with seven soil borings (B5, SB-21, SB-23, SB-34, SB-36, SB-37, and SB-44) completed by previous investigations comply with Site-specific SCOs and shall serve as pre-cap data points in the waterfront park/esplanade and roadway. Two additional pre-cap samples will be collected before these areas are filled with imported material and capped.
- No excavation is anticipated to accommodate the 2-feet of clean cover soil in landscaped areas. However, if development plans change and excavation is required, post-excavation confirmation endpoint samples will be collected promptly after reaching subgrade. The endpoint sampling frequency in these areas will be determined in coordination with the OER.

The post-excavation confirmation and pre-cap soil samples will be analyzed for VOCs, SVOCs, PCBs, pesticides, herbicides, metals (including hexavalent and trivalent chromium), and cyanide.

At SB-5A, SB-5B and SB-22 and in any areas where grossly-contaminated soil is identified and removed during construction, sidewall and bottom endpoint samples, will be collected per the frequencies described in DER-10 and analyzed for the contaminants of concern, consistent with the nature of the identified contamination. The endpoint sampling plan will be determined in coordination with the OER, as necessary.

4.2.5 Task #5 – Dewatering

Limited dewatering is anticipated during the construction of the two elevator pits and two parking lift pits because the excavation will extend into the groundwater table. Dewatering liquids removed from the site will be managed by the Contractor in accordance with applicable laws and regulations. The Contractor shall be responsible for handling, treating, and disposing all contaminated groundwater removed from the site. The methods of dewatering shall be at the option of the Contractor, provided that dewatering be accomplished in a manner that shall preserve the strength of foundation strata; shall not cause instability of the excavation sides; shall not result in loss of ground from beyond the property lines; shall not cause damage to existing structures, streets, pavements, and utilities; and complies with all applicable regulations.

Dewatering fluids from temporary construction dewatering will be managed through one or more of the following methods:

- Discharge the surface waters of the East River / Newtown Creek;
- Discharge to the NYCDEP municipal sewer system;
- Discharge to groundwater; and/or
- Containerization and off-site disposal.

Dewatering activities will be conducted in accordance with the *Remedial Action Plan*. Langan staff, under the supervision and direction of a QEP, will be on-site to oversee dewatering activities and document and verify compliance with the requirements described in the *Remedial*

Action Plan.

4.2.6 Task #6 – Fill Import, Placement, and Grading

Soil or fill material will be imported for use as fill and cover material in accordance with the SMMP. Imported soil and fill material shall meet geotechnical requirements and comply with the requirements of 6 NYCRR Part 360. In addition, imported soil and fill material shall not contain any C&D debris, other than recognizable concrete aggregate as described herein, or exhibit any observable indicators that it was in contact with a spill of petroleum, hazardous waste or industrial waste (i.e., staining and odors). Imported backfill used below the new building slab and waterproofing/vapor barrier membrane, below the clean soil cap, or below other impervious surfaces (e.g., roadways, sidewalks, and walkways) shall meet the NYSDEC 6 NYCRR Part 375-6.8(b) Restricted Use Restricted-Residential SCOs. Landscaped and planted areas will be covered with a minimum of 2 feet of certified clean soil meeting the lower of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Use Restricted-Residential and Protection of Groundwater SCOs. Residual (existing) soil and fill material outside of the new building footprint will be demarcated.

About 9,200 cubic yards of soil/fill material will be imported to raise the grade of private roadways (about 7,500 cubic yards) and the waterfront esplanade (about 1,700 cubic yards) to achieve final development grades. Excavated soil/fill material from within Parcel G1 and/or other areas within the development property will not be used to meet this fill requirement. Proposals for re-use of Site soils, where appropriate, may be submitted at a later date.

Real-time air monitoring of particulates and VOCs will be conducted by Langan field personnel during imported fill placement and grading, as outlined in Section 4.2.2 above.

5.0 HAZARD EVALUATION

This section provides an assessment of the general hazards that may be encountered during field work activities through a task-by-task risk analysis. Potential hazards as chemical exposure and physical hazards are presented below.

5.1 Chemical Hazard Evaluation

Potentially hazardous constituents known to exist at the site are volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and metals. Exposure to chemical hazards is possible during all proposed tasks. These potentially hazardous constituents have been documented to exceed applicable regulatory criteria (e.g. soil cleanup objectives and ambient water quality standards). The stratigraphy underlying Parcel G1 consists of a surficial layer of historic fill material overlying native fine- to coarse-grained sandy soil and silty soil. The surficial historic fill material generally extends from ground surface to about 10 feet bgs and is composed of varying amounts of sand, silt, gravel, coal, coal ash, cinders, slag, and brick, wood, concrete, and asphalt fragments. Depth to bedrock is expected to be more than 50 feet below existing site grade.

5.2 Summary of Potential Chemical Hazards

The following table (Table 1) lists the potentially hazardous constituents that may exist at the site. The table also lists the chemical properties and OSHA permissible exposure limit (PEL), short-term exposure limit (STEL), and immediately dangerous to life and health (IDLH) level.

More information about the potentially hazardous constituents at the site, including acute toxicological symptoms and first aid procedures, can be found on their Safety Data Sheets (SDS) in Appendix C. The SDS in Appendix C are listed in alphabetical order.

Table 1: Potential Chemical Hazards Summary

Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
Volatile Organic Compounds								
1,2,4-Trimethylbenzene	Soil/Groundwater	NIOSH REL 25ppm	--	--	8.27	Flammable	Inhalation Ingestion Contact	PID
1,3,5-Trimethylbenzene	Soil/Groundwater	NIOSH REL 25ppm	--	--	8.39	Flammable	Inhalation Ingestion Contact	PID
Benzene	Groundwater	1ppm	5ppm	500ppm	9.24	Ca, Flammable	Inhalation Ingestion Absorption Contact	PID
Ethylbenzene	Soil/Groundwater	100ppm	NIOSH ST 125ppm	800ppm	8.76	Flammable	Inhalation Ingestion Contact	PID
Toluene	Groundwater	200ppm	300ppm	500ppm	8.82	Flammable	Inhalation Ingestion Absorption Contact	PID
Total Xylenes	Soil/Groundwater	100ppm	NIOSH ST 150ppm	900ppm	8.56	Flammable	Inhalation Ingestion Absorption Contact	PID
Styrene	Groundwater	100ppm	NIOSH ST 100ppm	700ppm	8.40	Flammable	Inhalation Ingestion Absorption Contact	PID
Tetrachloroethene	Groundwater	100ppm	200 for	150ppm	9.32	Ca	Inhalation	PID

Table 1: Potential Chemical Hazards Summary								
Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
			5 minutes in 3-hour period				Ingestion Absorption Contact	
4-Isopropyltoluene	Soil/Groundwater	--	--	--	--	--	--	PID
Naphthalene	Soil/Groundwater	10ppm	NIOSH ST 15ppm	250ppm	8.12	Combustible Solid	Inhalation Ingestion Absorption Contact	PID
p-Diethylbenzene	Soil	--	--	--	--	--	--	PID
p-Ethyltoluene	Soil	--	--	--	--	--	--	PID
Semi-Volatile Organic Compounds								
Anthracene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Benzo[a]anthracene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Benzo[a]pyrene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Benzo[b]fluoranthene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Benzo[k]fluoranthene	Soil	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	Soil	--	--	--	--	--	--	--
Chrysene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible	Inhalation Contact	--

Table 1: Potential Chemical Hazards Summary

Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
						Solid		
Dibenzo(a,h)anthracene	Soil	--	--	--	--	Suspect Ca	Inhalation Ingestion Absorption Contact	--
Indeno(1,2,3-c,d)pyrene	Soil	--	--	--	--	--	--	--
Fluoranthene	Soil	--	--	--	--	--	--	--
Fluorene	Soil	--	--	--	--	--	--	--
Phenanthrene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Phenol	Groundwater	5ppm	--	250ppm	8.50	Combustible Solid	Inhalation Ingestion Absorption Contact	--
Pyrene (CTPV)	Soil	0.2 mg/m ³	--	80 mg/m ³	--	Ca, Combustible Solid	Inhalation Contact	--
Polychlorinated Biphenyls								
Polychlorinated biphenyls	Soil	1 mg/m ³ (1242) 0.5 mg/m ³ (1254)	--	5 mg/m ³	--	Ca	Inhalation Ingestion Absorption Contact	--

Table 1: Potential Chemical Hazards Summary								
Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
Pesticides								
4,4'-DDT	Soil	1 mg/m ³ (skin)	--	500ppm	--	Ca	Inhalation Ingestion Absorption Contact	--
4,4'-DDD	Soil	--	--	--	--	--	--	--
4,4'-DDE	Soil	--	--	--	--	--	--	--
Chlordane	Soil	0.5 mg/m ³ (skin)	--	100 mg/m ³	--	Ca	Inhalation Ingestion Absorption Contact	--
Endrin	Soil	0.1 mg/m ³ (skin)	--	2 mg/m ³	--	--	Inhalation Ingestion Absorption Contact	--
Hexachlorobenzene	Groundwater	TLV 0.002 mg/m ³	--	--	--	Suspect Ca	Inhalation Ingestion Absorption Contact	--
Metals								
Antimony	Groundwater	0.5 mg/m ³	--	50 mg/m ³	--	--	Inhalation Ingestion Contact	--
Arsenic (Inorganic)	Soil	0.010 mg/m ³	--	5 mg/m ³	--	Ca	Inhalation Ingestion	--

Table 1: Potential Chemical Hazards Summary

Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
							Absorption Contact	
Barium (as BaCl ₂)	Soil/Groundwater	0.5 mg/m ³	--	50 mg/m ³	--	--	Inhalation Ingestion Contact	--
Copper (as Cu)	Soil	1 mg/m ³	--	100 mg/m ³	--	--	Inhalation Ingestion Contact	--
Cadmium (as Cd)	Soil	0.005 mg/m ³	--	9 mg/m ³	--	Ca	--	--
Chromium (as Cr)	Soil/Groundwater	1 mg/m ³	--	250 mg/m ³	--	--	Inhalation Ingestion Absorption Contact	--
Iron (Iron Oxide)	Groundwater	10 mg/m ³	--	2500 mg/m ³	--	--	Inhalation	--
Lead (as Pb)	Soil/Groundwater	0.050 mg/m ³	--	100 mg/m ³	--	--	Ingestion Absorption Contact	--
Magnesium	Groundwater	--	--	--	--	--	--	--
Manganese (as Mn)	Groundwater	1 mg/m ³	NIOSH ST 3 mg/m ³	500 mg/m ³	--	Combustible Solid	Inhalation Ingestion	--
Mercury (as Hg)	Soil/Groundwater	0.1 mg/m ³ (skin)	--	10 mg/m ³	--	--	Inhalation Ingestion Absorption Contact	--
Nickel (as Ni)	Soil/Groundwater	1 mg/m ³	--	10 mg/m ³	--	Ca, Combustible Solid	Inhalation Ingestion Contact	--

Table 1: Potential Chemical Hazards Summary

Constituent of Concern	Environmental Medium	OSHA PEL	OSHA STEL	OSHA IDLH	IP (eV)	Hazards	Route of Exposure	Monitoring Device
Sodium	Groundwater	--	--	--	--	--	--	--
Silver (as Ag)	Groundwater	0.01 mg/m ³	--	10 mg/m ³	--	--	Inhalation Ingestion Contact	--
Thallium (as Tl)	Groundwater	0.1 (skin) mg/m ³	--	15 mg/m ³	--	--	Inhalation Ingestion Absorption Contact	--
Zinc (Zinc Oxide)	Soil	15 mg/m ³ (total dust)	--	500 mg/m ³	--	--	Inhalation	--

Notes:

NIOSH – National Institute for Occupational Safety and Health

REL – Recommended Exposure Limit

OSHA – Occupational Safety and Health Administration

PEL – Permissible Exposure Limit

STEL – Short-Term Exposure Limit

IDLH – Immediate Danger to Life and Health

TLV – Threshold Limit Value

CPTV – Coal Tar Pitch Volatiles

IP – Ionization Potential

Ca – Carcinogen

Sources: NIOSH Pocket Guide to Chemical Hazards (Department of Health and Human Services, Centers for Disease Control and Prevention, September 2007); OSHA Chemical Sampling Information Search (http://www.osha.gov/dts/chemicalsampling/toc/toc_chemsamp.html)

5.3 Radiation Hazard Evaluation

No radiation hazards are known or expected at the site.

5.4 Biological Hazard Evaluation

5.4.1 Animals

Animals, such as dogs, pigeons, sea gulls, mice, and rats may be encountered during construction activities. Workers shall use discretion and avoid all contact with animals. Bites and scratches from dogs can be painful and can lead to the worker contracting the rabies virus if the dog is rabid. Contact with rat and mice droppings may lead to the worker contracting hantavirus. Inhalation of dried pigeon droppings may lead to the worker contracting psittacosis; cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings, but these diseases are less likely to occur in a construction-type occupational setting.

5.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, and spiders, may be encountered during construction activities. Individuals allergic to insect bites or stings may succumb to anaphylactic shock, which is a life-threatening condition and may result in death. In addition, mosquito bites may lead to a worker contracting West Nile encephalitis or other contagious diseases known to be carried by a mosquito host. Personnel bitten or stung by an insect should notify the HSO immediately. The following is a list of preventive measures related to insect bites or stings:

- Apply insect repellent prior to work and or as often as needed throughout the work shift;
- Wear protective clothing (work boots, socks and light colored pants);
- When walking in wooded areas, to the extent possible avoid contact with bushes, tall grass, or brush; and

- Field personnel who are allergic to insects or are otherwise susceptible to insect bites and stings should notify the HSO prior to commencing work and shall be responsible for supplying allergy medication for their own use throughout the work shift.
- The HSO or FSO will instruct the project personnel in the recognition and procedures for encountering potentially hazardous insects at the site.

Lyme Disease

Lyme disease is caused by infection from a deer tick that carries *Borrelia burgdorferi*, *B. garinii*, or *B. afzelii*, all spirochaete bacteria. Lyme disease is a flu-like illness most commonly observed in patients between May and October when ticks are the most active. Symptoms of lyme disease may include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. Early signs of an infection may include the characteristic circular and bulls-eye-shaped skin rash (*erythema chronicum migrans*) and joint pain. Lyme disease can cause serious nerve or heart problems as well as a disabling arthritis if left untreated. If a worker feels sick or exhibits any of the symptoms identified above, he or she should notify the HSO immediately.

This site-specific CHASP recommends personnel check themselves when working and after working in areas that could harbor deer ticks and wear light-colored clothing. If a worker finds a tick on his or her body, he or she should notify the HSO immediately. The tick can be removed by pulling gently at the tick's head with tweezers. The affected area should then be disinfected with an antiseptic wipe.

5.5 Physical Hazard Evaluation

5.5.1 Operation of Heavy Equipment

Heavy motorized equipment (i.e., track-mounted excavators, front loaders, pile-driving rigs, and support vehicles) will be used during the construction project. Working with heavy motorized equipment will be a major physical hazard during construction. Injuries may result from equipment hitting, running over, or overturning on personnel and equipment kicking up potentially harmful objects (i.e. rock, concrete, scrap metal, etc.). Occupational Safety and Health Administration (OSHA) guidelines will be followed for operating heavy equipment as outlined in 29 CFR 1926.600-602. To help prevent injuries/accidents, the following precautions will be implemented:

- Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift.
- Large construction motor vehicles will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level or the vehicle is backed up only when an observer signals that it is safe to do so.
- Heavy equipment or motor vehicle cable will be kept free of all nonessential items, and all loose items will be secured.
- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (such as seat belts, roll-over protection, emergency shut-off in case of roll-over, backup warning lights and audible alarms).
- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment or vehicles.

5.5.2 Excavation and Earthwork

Soil and fill material will be excavated to accommodate the new building's foundation and stormwater detention system. The OSHA 29 CFR 1926.651 construction industry standards relating to excavations will be followed during excavation and earthwork activities. These standards include shoring and cutback requirements, equipment specifications, entry requirements, etc. To avoid exposure to site-specific contaminants and to ensure acceptable atmospheric conditions, the following additional requirements apply for excavation work at the site:

- Open excavations should be backfilled as soon as practicable. While excavations remain open, appropriate warnings should be posted and barricades will be erected to protect pedestrian and worker safety. Where possible, excavation side walls should be cut at a gradual slope to maximize egress and access. Workers should not enter excavations unless absolutely required.
- To ensure atmospheric quality, appropriate tests (i.e., flammable gas, oxygen deficiency, etc.) shall be conducted as often as necessary as determined by the HSO.

- When the HSO identifies hazardous atmospheres, emergency rescue equipment and appropriate PPE should be available at the work site and readily accessible to employees (29 CFR 1926.651(g)(2)(I)).
- Daily site safety inspections shall be conducted by the SSO.

5.5.3 Utilities

Encountering underground utilities poses fire, explosion, and electrocution hazards is possible during excavation and earthwork. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the New York One-Call Center. Potential adverse effects of electrical hazards include burns and electrocution, which can result in death.

5.5.4 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress. OSHA guidelines will be followed regarding work in excessive hot or cold temperatures.

5.5.5 Noise

The use of excavation and drilling equipment may generate noise levels that will require the use of hearing protection in the immediate vicinity. Hearing protection will be used around drilling equipment. Appropriate earplugs or earmuffs with a NRR greater than 25 will be worn to prevent overexposure.

5.5.6 Miscellaneous

Applicable OSHA 29 CFR 1910.120(m) standards for illumination shall apply. Work should be conducted during daylight hours whenever possible.

Electrical power should be provided through a ground fault circuit interrupter. Equipment that will enter an excavation must be suitable and approved (i.e. intrinsically safe) for use in potentially explosive environments. Applicable OSHA 29 CFR 1926 Subpart K standards for use of electricity shall apply.

Work where there is a fall hazard should be performed using appropriate ladders and/or protection (e.g. body harness and lifeline). All work should be conducted at the ground surface.

In accordance with 29 CFR 1910.151(c), workers involved in operations where there is the risk of eye injury, (chemical splash, etc.), should have ready access to an approved eye wash unit. Protective eye wear shall be donned in Level D. The full-face APR required by Level C and the pressure demand self-contained breathing apparatus mask required by Level B provide eye protection.

Operations where there is a potential for fire should be conducted in a manner that minimizes risk. Non-sparking tools and fire extinguishers shall be used or available as directed by the site safety officer when work is in potentially explosive atmospheres. Ignition sources shall be removed from work areas. Explosion-proof instruments and/or bonding and grounding should be used to prevent fire or explosion when the site safety officer directs their use.

Overhead utilities should be identified and/or inspected by the Contractor and appropriate safety precautions taken before conducting operations where there is potential for contact or interference.

5.6 Summary of Potential Physical Hazards

The following table (Table 2) presents a summary of possible physical hazardous that are likely to be encountered during completion of field task. Fact sheets for cold and heat stress are included as Appendix D.

Table 2: Potential Physical Hazards Summary			
Task	Possible Hazard	Description	Safety/Control Procedures
#1, #2, #3, #4, #5, #6	Heavy equipment	Excavator, front loaders, pile-driving rigs and support vehicles.	Stay back from operating equipment; wear safety vests and hard hats, coordinate and maintain eye contact with equipment operator.
#1, #2, #3, #4, #5, #6	Noise	Excavator, front loaders, pile-driving rigs, support vehicles, power tools.	Wear hearing protection.
#1, #2, #3, #4, #5, #6	Falling objects	Tools and other equipment falling heavy equipment or from support of excavation.	Wear hard hat.
#1, #2, #3, #4, #5, #6	Underground/overhead utilities	Heavy equipment makes contact with underground object; boom touches overhead power line.	Follow mark-out policy and safe drilling practices.
#1, #2, #3, #4, #5, #6	Biological	Bee stings; dog, tick, snake bites; poison ivy; mosquitoes.	Wear proper PPE; be vigilant; follow safe work practices; wear insect repellent.
#1, #2, #3, #4, #6	Improper material handling	Improper lifting/carrying of equipment and materials causing strains.	Follow safe lifting and general material handling techniques.
#1, #2, #3, #4, #5, #6	Slips, trips, and falls	Various injuries could occur from slips, trips, and falls in carrying out field activities.	Good housekeeping, constant awareness and focus on the task.
#1, #2, #3, #4, #5, #6	Vehicular traffic	Various injuries or incidents could result from vehicular traffic.	Wear high visibility safety vests; use cones to designate work area; follow safe work practices.
#1, #2, #3, #4, #5, #6	Sunburn	Exposure to ultraviolet solar radiation.	Wear broad spectrum sunscreen.
#1, #2, #3, #4, #5, #6	Adverse weather	Severe thunderstorms with strong winds and lightning; heavy precipitation (rain).	Seek shelter; work in adverse weather conditions only with proper training and equipment. In the event of heavy precipitation (rain) conditions will be

Table 2: Potential Physical Hazards Summary			
Task	Possible Hazard	Description	Safety/Control Procedures
			assessed to determine if the work can proceed safely. If it is determined that the weather poses a significant hazard, site operations will be stopped and rescheduled.
#1, #2, #3, #4, #5, #6	Heat stress	Heat exhaustion, heat stroke, dehydration.	Proper and consistent hydration; seek shade during work breaks; wear light-colored and breathable clothing; in cases of heat stroke call for emergency help.
#1, #2, #3, #4, #5, #6	Cold stress	Frostbite, hypothermia.	Proper and consistent hydration; wear warm clothing in cold weather; seek warmth during work breaks; in cases of hypothermia call for emergency help

6.0 PERSONAL PROTECTIVE EQUIPMENT

PPE must protect workers from the specific hazards they are likely to encounter on-site. Selection of the appropriate PPE must be taken into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions, engineering controls and the proposed work tasks to be performed at the site, Level D Protection should be used. The decision to modify standard PPE will be made by the site. The general levels of protection are described below.

Level D

- Safety glasses with side-shields or chemical splash goggles if a splash hazard is present;
- Safety boots/shoes (toe-protected);
- Hard hat;
- Long sleeve work shirt and work pants;
- Nitrile gloves;
- Hearing protection (as needed);
- Traffic vest (if working or adjacent to roadway);
- Coveralls (Tyvek or equivalent) if extensive splashing or contaminated media is expected.

Level C

- Full or half mask respirator, air-purifying, cartridge-equipped, NIOSH approved respirator suitable for the compound of concern
- Inner (latex) and outer (nitrile) chemical resistant gloves;
- Chemical-resistant safety boots/shoes (toe-protected);
- Hard hat;

- Long sleeve work shirt and work pants;
- Coveralls (Tyvek or equivalent);
- Hearing protection (as needed);
- Traffic vest (if working on or adjacent to roadway).

6.1 OSHA PPE Requirements

All personal protective equipment used during construction must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133 29 CFR 1926.102	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134 29 CFR 1926.103	ANSI Z88.1-1980
Head	29 CFR 1910.135 29 CFR 1926.100	ANSI Z89.1-1969
Foot	29 CFR 1910.136 29 CFR 1926.96	ANSI Z41.1-1967
Notes: 1. ANSI – American National Standards Institute		

Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134). Based on performance criteria of air purifying respirators, they cannot be worn under the following conditions:

- Oxygen deficiency;
- Immediately Dangerous to Life or Health (IDLH) concentrations;
- High relative humidity; and
- If contaminant levels exceed designated use concentrations.

7.0 AIR MONITORING

7.1 General

Continuous, real-time air monitoring for VOCs and particulate matter at the perimeter of the construction area will be performed by Langan during excavation, earthwork, and soil disturbance activities. Soil disturbance activities include, but are not limited to, the excavation, handling, stockpiling, and loading of soil and fill material, grading, trenching, sheeting and lagging.

In addition, Langan field personnel will monitor atmospheric conditions in the breathing zone during construction activities (as necessary) to identify potentially hazardous environments, determine reference or background concentrations, determine the appropriate level of PPE to be worn by Langan field personnel, and define work zones. Air monitoring will be performed at the breathing zone. Upgrades/downgrades to PPE will be made based on air monitoring results in the breathing zone. In general, work shall be initiated in Level D PPE with a contingency to upgrade the level of PPE based on exceedances of action levels.

7.2 Instrumentation

Langan field personnel will be equipped with photoionization detectors (PID) (RAE Systems MultiRAE 2000 or 3000 with a 10.6eV lamp) to monitor for total VOCs and real-time Dust Trak aerosol meters to monitor levels of particulate matter (i.e., fugitive dust and aerosols). Instruments will be calibrated before each use; calibration readings will be recorded in the field log book. The PID and Dust Traks must be calibrated daily in accordance with the manufacturer's specifications. The PID calibration typically requires the use of a span gas (e.g., 100 ppm isobutylene) and zero gas (e.g., fresh air). Be sure that all the required calibration equipment and supplies are provided with the PID (e.g., span gas cylinder, regulator, tubing, and Tedlar™ bag).

7.3 Community Air Monitoring Plan

The CAMP requires continuous, real-time air monitoring for VOCs and particulate matter at the perimeter of the construction area during excavation, earthwork, and soil disturbance activities. Soil disturbance activities include, but are not limited to, the excavation, handling, stockpiling, and loading of soil and fill material, grading, trenching, sheeting and lagging.

VOC Monitoring, Action Levels, Responses

Concentrations of VOCs will be monitored at the upwind and downwind site perimeter on a continuous basis during soil disturbance activities. Upwind concentrations will be used to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated daily. The equipment will be equipped with an audible alarm to indicate exceedance of the action levels described below. The equipment will be programmed to record 15-minute 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 exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the work area 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 site perimeter, activities will be shutdown.

The 15-minute average readings will be recorded and presented in the daily reports. Instantaneous readings, if any, will also be recorded by Langan field staff on routine inspection of CAMP stations and used for decision-making purposes.

Particulate Monitoring, Action Levels, Responses

Concentrations of particulate matter will be monitored continuously at the upwind and downwind site perimeters during soil disturbance activities. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers (PM10) in size. The equipment will be calibrated daily. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. The equipment will be programmed to record 15-minute average concentrations, which will be compared to the levels specified below:

- If the downwind PM10 particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) 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 will continue with dust suppression techniques provided that downwind PM10 particulate levels do not exceed $150 \mu\text{g}/\text{m}^3$ above the upwind concentration and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 particulate levels are greater than $150 \mu\text{g}/\text{m}^3$ above the upwind level, work will be stopped and work activities will be reevaluated. Work will resume provided dust suppression measures and other controls are successful in reducing the downwind PM10 particulate concentration to within $150 \mu\text{g}/\text{m}^3$ of the upwind concentration and in preventing visible migration of dust off-site.

In addition, to continuous, real-time monitoring of particulate matter, fugitive dust migration will be visually assessed during all soil disturbance activities by Langan field staff. The 15-minute average readings will be recorded and presented in the daily reports. Instantaneous readings, if any, will also be recorded by Langan field staff on routine inspection of CAMP stations and used for decision-making purposes.

7.4 Major Vapor Emissions and Response Plan

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the

nearest residential or commercial property from the hot zone, the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-foot zone).

The Major Vapor Emission Response Plan shall be implemented if either of the following criteria is exceeded in the 20-foot zone:

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes; or
- Organic vapor levels greater than 5 ppm above background for any time period.

If conditions warrant the activation of the Major Vapor Emission Response Plan, the following activities shall be performed:

- The HSO shall immediately contact the local police authority and inform the police of the situation;
- Air monitoring shall be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the HSO; and
- Emergency contacts will be contacted and informed (as necessary).

8.0 SITE CONTROL

8.1 Work Zones

The need to formally establish specific work zones (e.g., support zone, contamination reduction zone, and exclusion zone) during work activities will be determined by the HSO. The support zone is any area of the site that is outside of the exclusion and contamination reduction zones. The contamination reduction zone is the area between the exclusion and support zones that provides a transition between contaminated and clean areas. The exclusion zone is any area of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to personnel.

8.2 General Safe Work Practices

Hazards should be controlled at site areas by limiting entrance to exclusion zones to essential personnel and by implementing the following rules:

- Non-essential (as judged by the HSO) personnel and unauthorized persons shall not enter the exclusion or decontamination zone;
- Before entering the exclusion or decontamination zones, all personnel should be familiar with emergency response procedures, site safety locations, first aid and communication equipment, and the location of the map to the hospital and the list of emergency telephone numbers;
- The buddy system should be used at all times by field personnel in the exclusion zone; no one is to perform work within the exclusion zone alone. When in Level D or C, visual contact or radio contact should be maintained at all times;
- Contact with contaminated and potentially contaminated surfaces should be avoided. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or place equipment on the ground. Protect equipment from contamination;
- No open flames in the work zone;
- Always use the appropriate level of personal protective equipment (PPE);
- Report any unusual conditions;

- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible;
- The number of personnel and equipment in the work zone will be kept to an essential minimum;
- Be alert to the symptoms of fatigue and heat/cold stress and their effects on the normal caution and judgment of personnel;
- All personnel exiting the exclusion zone should exercise the decontamination procedures described in this site-specific CHASP;
- Beards or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone;
- Each worker will be supplied with and maintain his/her own personal protective equipment;
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas; and
- Smoking is prohibited by Langan personnel and subcontractors in all areas of the site because of the potential for contaminating samples and for the health of the field team.

8.3 Site Safety Meetings

Langan field personnel will be given briefings by the HSO on a daily or as-needed basis to further assist personnel in conducting the work activities safely. Briefings will be provided when new activities are to be conducted, new staff enters the site, changes in work practices are to be implemented due to new information, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safe practices when performance deficiencies are identified during routine daily activities or as a result of jobsite safety inspections. The jobsite safety inspection form is included as Appendix E. The site safety meeting form is included as Appendix F.

8.4 Site Communications

Each field team will carry a cell phone or satellite phone that is in good working order. If there

is any type of emergency that requires the site to be evacuated (e.g., severe thunderstorm with lightening), the field team leader will lead the team to the predetermined emergency assembly location. All other emergency notifications that do not require evacuation will be conducted using a cell phone or satellite. Emergency phone numbers are listed above in Section 2.3.

8.5 Buddy System

The buddy system will be used at the site at all times. The buddy system is a system of organizing employees into field teams in such a manner that each employee of the field team is designated to be observed by at least one other employee in the field team. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

8.6 Personnel Hygiene

The following personnel hygiene practices will be used at the site to reduce exposure to hazards:

- Long hair will be secured away from the face so it does not interfere with any work activities;
- Personnel leaving potentially contaminated areas will wash their hands, forearms and faces in the contamination reduction zone prior to entering any clean areas or eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as possible after leaving the site.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas.
- Smoking is prohibited by Langan personnel and subcontractors in all areas of the site because of the potential for contaminating samples and for the health of the field team.

8.7 Decontamination

Personnel, clothing, equipment, and samples leaving contaminated areas of the site must be decontaminated. Decontamination for this operation is achieved through physical removal and chemical detoxification/disinfection/sterilization. The first step in decontamination is prevention.

Detailed procedures for personnel and equipment decontamination are provided in Appendix G. The following standard operating procedures were established to minimize contact with wastes:

- Wear disposable clothing;
- Practice work habits that minimize contact with hazardous or potentially hazardous substances;
- Use disposable equipment, where appropriate.

Boots and other potentially contaminated garments that have come in contact with hazardous materials should be cleaned in wash tubs with detergent/water solution and rinsed with water and should remain on-site. Decontamination waste (e.g. solutions, etc.) resulting from the decontamination of field equipment (e.g., sampling equipment, etc.) will be collected, containerized in tightly-sealed, well-marked drums, characterized, and properly disposed of. Disposable contaminated clothing and equipment will be collected in plastic bags, containerized in tightly-sealed, well-marked drums, and properly disposed of.

8.8 Standing orders

The site safe practices (i.e., standing orders) for the project are included in Appendix H.

9.0 HEALTH AND SAFETY TRAINING AND MEDICAL SURVEILLANCE

The completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential exposure to hazardous substances exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

The HSO shall inform Langan employees about the activities, procedures, monitoring, and equipment for site operations (including site and facility layout, chemical and physical hazards, emergency services at the site, and the provisions set forth in the site-specific CHASP).

9.1 Respirator Fit Testing Requirements

Langan personnel who may be required to perform work activities while wearing a respirator must receive medical clearance to do so consistent with 29 CFR 1910.134(e), Respiratory Protection. Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Langan employees who have medical clearance to wear a respirator and could be potentially exposed to hazardous substances at the site shall possess a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Results of medical evaluations and quantitative fit-test records are maintained by the HSM.

9.2 Medical Monitoring Requirements

Langan personnel who will be performing work activities involving potential exposure to hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine.

9.3 Confined Space Entry

Entry into confined space is not anticipated. If a project area were identified as a confined space, entry into this confined space by Langan personnel is prohibited by its own policy.

10.0 HEALTH AND SAFETY PLAN APPROVAL

By their signature, the undersigned certify that this site-specific CHASP is approved.

Mimi S. Raygorodetsky, Project Manager (PM)

Date

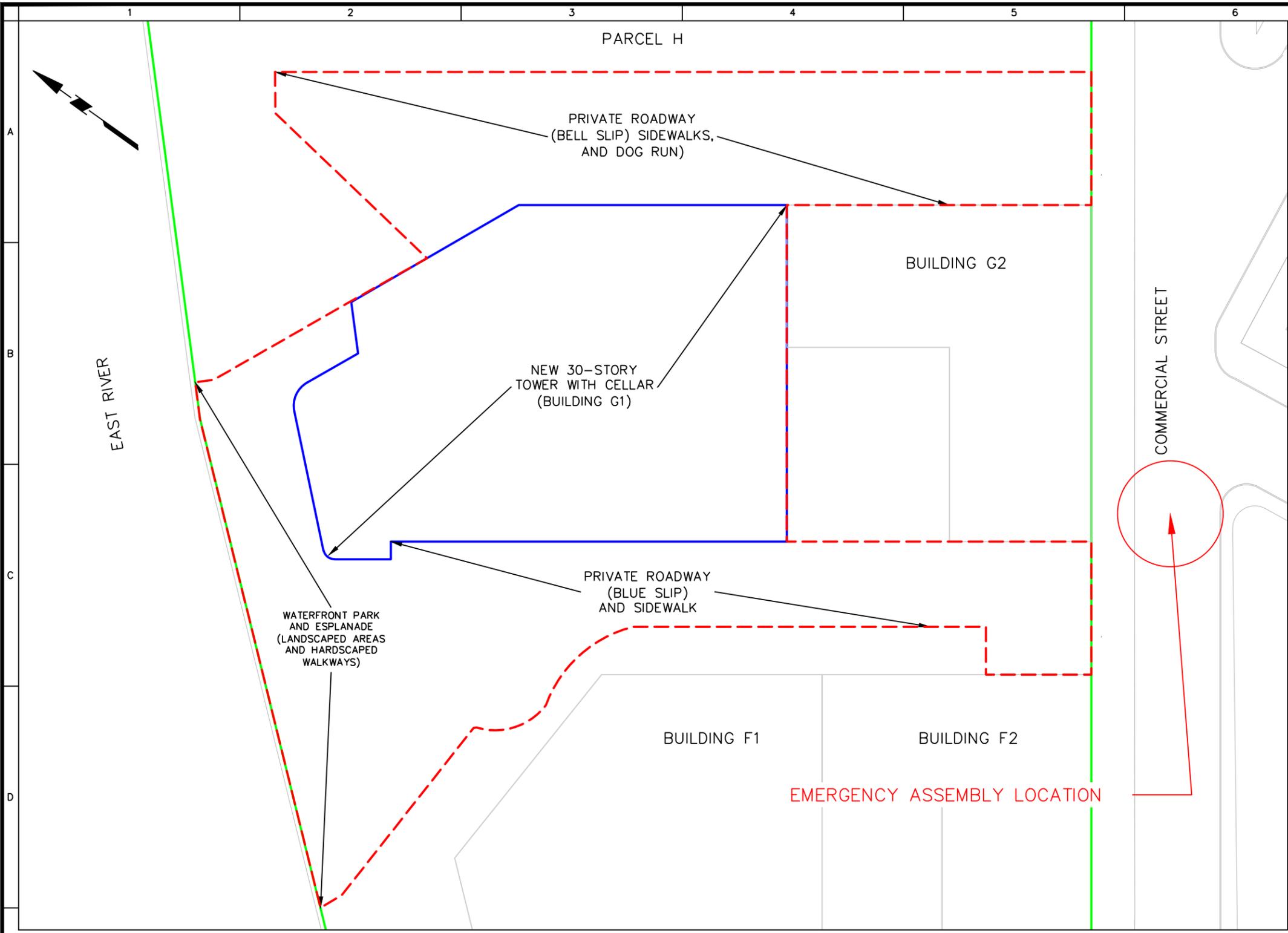
Tony Moffa, CHMM, Health & Safety Manager (HSM)

Date

Gregory Wyka, Site Health & Safety Officer (HSO)

Date

FIGURES



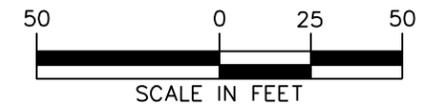
LEGEND

- APPROXIMATE BOUNDARY OF DEVELOPMENT PROPERTY
- APPROXIMATE BUILDING FOOTPRINTS WITHIN DEVELOPMENT PROPERTY
- APPROXIMATE PARCEL G1 BOUNDARY (BLOCK 2472, LOT 80, p/o LOT 50 and p/o Lot 100)
- APPROXIMATE NEW BUILDING FOOTPRINT (BUILDING G1)

GENERAL NOTES

1. BASE MAP SOURCE: LANGAN DRAWING "170229002-COMBINED-SURVEY-BLOCK 2472."
2. NORTH ARROW SHOWS TRUE NORTH.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.



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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan

Project

GREENPOINT LANDING

Block 2472, Lot 80,
p/o Lot 50, and p/o Lot 100
BROOKLYN

KINGS NEW YORK

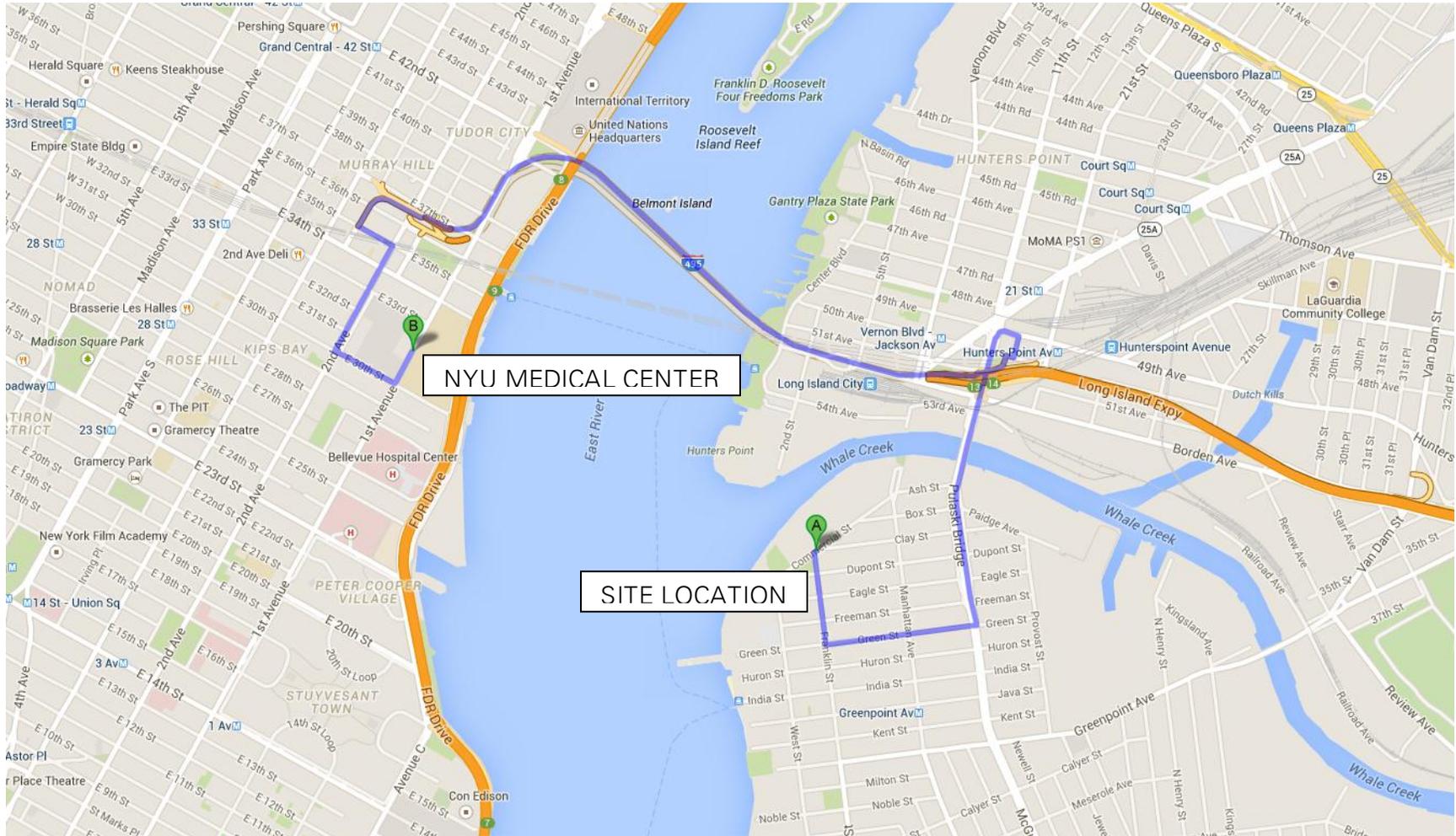
Drawing Title

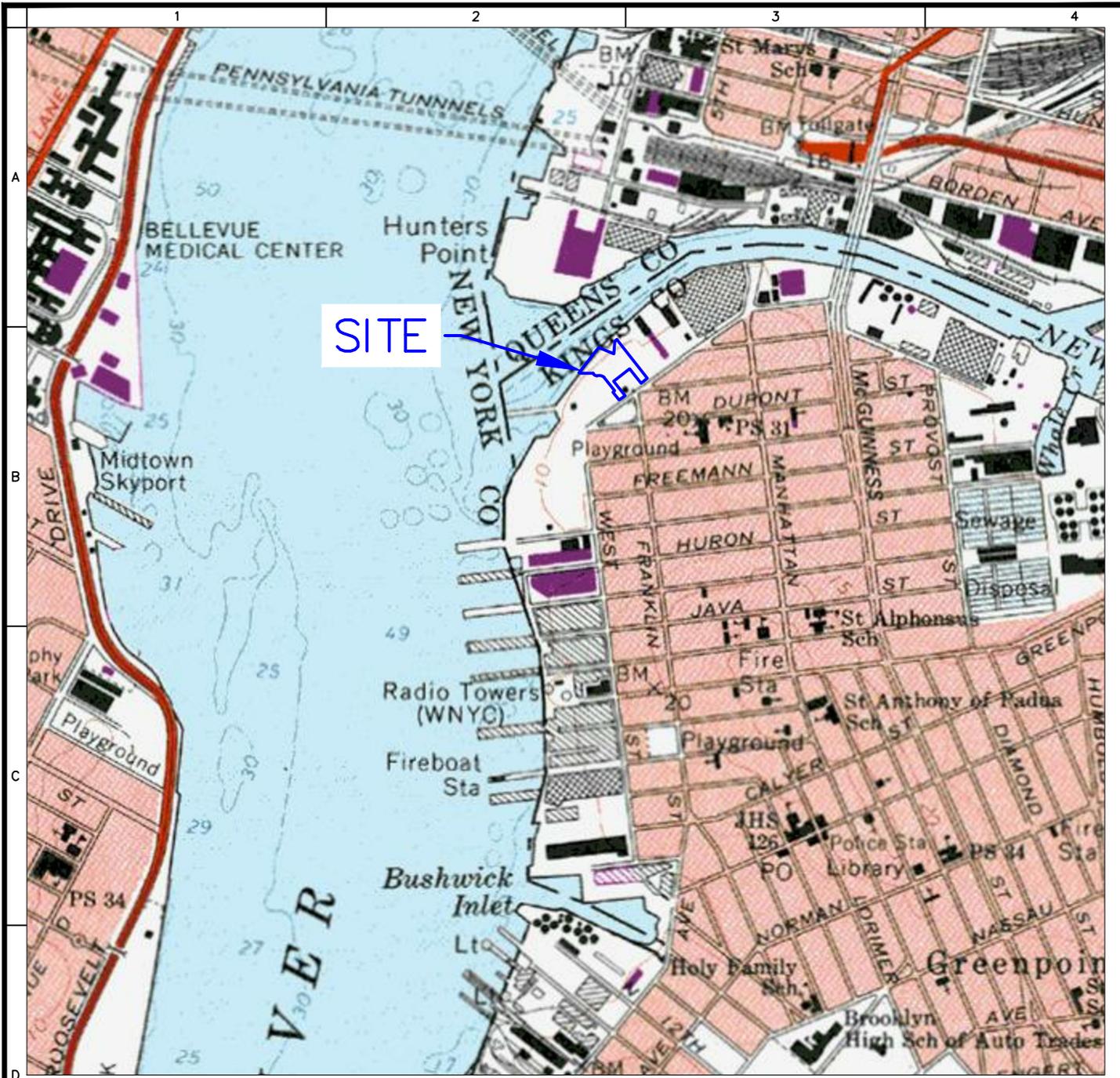
**SITE PLAN
PARCEL G1**

Project No. 170229002	Drawing No.
Date 3/5/2015	1
Scale 1' = 50'	
Drawn By GCW	Checked By MSR
Submission Date	Sheet 1 of 3

FIGURE 2

ROUTE MAP TO HOSPITAL (NYU MEDICAL CENTER)





LEGEND



APPROXIMATE SITE BOUNDARY

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

SOURCE: USGS TOPOGRAPHIC QUADRANGLE MAP, BROOKLYN, NY



<p>21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444 www.langan.com</p> <p>Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan International LLC</p> <p>Collectively known as Langan</p>	Project	Drawing Title	Project No.	Drawing No.	
	<p>GREENPOINT LANDING</p> <p>Block 2472, Lot 80, p/o Lot 50, and p/o Lot 100 BROOKLYN</p> <p>KINGS NEW YORK</p>	<p>SITE LOCATION MAP</p> <p>PARCEL G1</p>	170229002	<p>3</p>	
			Date		3/5/2015
			Scale		NTS
Drawn By	GCW	Submission Date	Sheet 3 of 3		

APPENDIX A

OSHA RIGHT-TO-KNOW FACT SHEET

You Have a Right to a Safe and Healthful Workplace. IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.



The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at www.osha.gov. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA www.osha.gov

U.S. Department of Labor  • Occupational Safety and Health Administration • OSHA 3165

APPENDIX B

EMPLOYEE EXPOSURE / INJURY INDICENT REPORT

INCIDENT REPORT

LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT (Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee Name: _____ Employee No: _____

Sex: M _____ F _____ Age: _____

Region: _____ Location: _____

Project: _____ Project No: _____

Incident: _____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

Radiological: _____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc): _____

Length of stay at the facility? _____

Was the Site Safety Officer contacted? Yes _____ No _____ When? _____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact? _____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain: _____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

List the names of persons who witnessed the exposure/injury incident:

Possible cause of the exposure/injury incident: _____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

Describe protective equipment and clothing used by the employee:

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

Where exactly on site or off site did the exposure/injury occur?

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

Name of person(s) initiating report, job title, phone number:

Employee Signature

Date

Site Safety Officer Signature or Field Team Leader Signature

Date

APPENDIX C
SAFETY DATA SHEETS

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDD

Product Number : 35486
Brand : Fluka

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

GHS Classification

Acute toxicity, Dermal (Category 4)
Acute toxicity, Oral (Category 3)
Carcinogenicity (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H301 : Toxic if swallowed.
H312 : Harmful in contact with skin.
H351 : Suspected of causing cancer.
H400 : Very toxic to aquatic life.
H413 : May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273 : Avoid release to the environment.
P280 : Wear protective gloves/ protective clothing.
P301 + P310 : IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.

HMIS Classification

Health hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
TDE

Formula : C₁₄H₁₀Cl₄
Molecular Weight : 320.04 g/mol

Component	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	
CAS-No. 72-54-8	-
EC-No. 200-783-0	-

4. FIRST AID MEASURES**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES**Suitable extinguishing media**

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

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

6. ACCIDENTAL RELEASE MEASURES**Personal precautions**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

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

Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	94.0 - 96.0 °C (201.2 - 204.8 °F)
Boiling point	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)

Density	1.38 g/cm ³
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.02
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50

LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg

Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg

Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex).

Inhalation LC50

no data available

Dermal LD50

LD50 Dermal - rabbit - 1,200 mg/kg

Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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

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

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

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: KI0700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

Persistence and degradability

no data available

Bioaccumulative potential

Indication of bioaccumulation.

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

OSHA Hazards

Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2009-07-17

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

16. OTHER INFORMATION**Further information**

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1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDE

Product Number : 35487
Brand : Fluka

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Carcinogen, Harmful by ingestion.

GHS Classification

Acute toxicity, Oral (Category 4)
Carcinogenicity (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302 Harmful if swallowed.
H351 Suspected of causing cancer.
H400 Very toxic to aquatic life.
H413 May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273 Avoid release to the environment.
P281 Use personal protective equipment as required.

HMIS Classification

Health hazard: 1
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health hazard: 1
Fire: 0

Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene

Formula : C₁₄H₈Cl₄

Molecular Weight : 318.03 g/mol

Component	Concentration
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	
CAS-No.	72-55-9
EC-No.	200-784-6
	-

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Suitable extinguishing media

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

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	88.0 - 90.0 °C (190.4 - 194.0 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg)
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.51
Relative vapour	no data available

density	
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Strong oxidizing agents, Strong bases

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50

LD50 Oral - rat - 880.0 mg/kg

Inhalation LC50

no data available

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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

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

carcinogen or potential carcinogen by ACGIH.

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

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - <i>Lepomis macrochirus</i> (Bluegill) - 0.2 - 0.3 mg/l - 96.0 h
	LC50 - <i>Oncorhynchus mykiss</i> (rainbow trout) - 0.03 - 0.04 mg/l - 96.0 h
	LC50 - <i>Salmo salar</i> (Atlantic salmon) - 0.05 - 0.18 mg/l - 96.0 h

Persistence and degradability

no data available

Bioaccumulative potential

Bioaccumulation	<i>Gambusia affinis</i> (Mosquito fish) - 33 d
	Bioconcentration factor (BCF): 12,037

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)
Marine pollutant: Marine pollutant

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

15. REGULATORY INFORMATION

OSHA Hazards

Carcinogen, Harmful by ingestion.

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2009-07-17

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2009-07-17

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	2010-06-11

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene

CAS-No.
72-55-9

Revision Date
2010-06-11

16. OTHER INFORMATION**Further information**

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1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 4,4'-DDT

Product Number : 386340
Brand : Aldrich

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Carcinogen, Toxic by ingestion, Toxic by skin absorption

Target Organs

Liver, Pancreas.

GHS Classification

Acute toxicity, Dermal (Category 3)
Acute toxicity, Oral (Category 3)
Carcinogenicity (Category 2)
Specific target organ toxicity - repeated exposure, Oral (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 Toxic if swallowed or in contact with skin
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if swallowed.
H400 Very toxic to aquatic life.
H413 May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P314 Get medical advice/ attention if you feel unwell.

HMIS Classification
Health hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Toxic if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane

Formula : C₁₄H₉Cl₅
Molecular Weight : 354.49 g/mol

Component	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	
CAS-No. 50-29-3	-
EC-No. 200-024-3	-
Index-No. 602-045-00-7	-

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability

Not flammable or combustible.

Suitable extinguishing media

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

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE**Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Components with workplace control parameters**

Components	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
Remarks	Potential Occupational Carcinogen See Appendix A			
		TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Liver damage Confirmed animal carcinogen with unknown relevance to humans			
		TWA	1 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Skin designation Substance listed; for more information see OSHA document 1910.1044			

Personal protective equipment**Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Immersion protection

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: > 480 min

Material tested: Dermatrill® (Aldrich Z677272, Size M)

Splash protection
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: > 30 min
Material tested: Dermatrill® (Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 873000, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an Industrial Hygienist familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Eye protection

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

Skin and body protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 107 - 110 °C (225 - 230 °F) - lit.
Boiling point	260.0 °C (500.0 °F)
Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
Density	0.99 g/cm ³
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.91
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Oxidizing agents, Iron and iron salts.

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION**Acute toxicity****Oral LD50**

LD50 Oral - rat - 87.0 mg/kg

Inhalation LC50

no data available

Dermal LD50

LD50 Dermal - rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

NTP: Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Toxic if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

CNS stimulation.

Synergistic effects

no data available

Additional Information

RTECS: KJ3325000

12. ECOLOGICAL INFORMATION**Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h
	LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d
	NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

Persistence and degradability**Bioaccumulative potential**

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d
	Bioconcentration factor (BCF): 46,670

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811 Class: 6.1 Packing group: III
 Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
 Reportable Quantity (RQ): 1 lbs
 Marine pollutant: No
 Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
 Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
 Marine pollutant: Marine pollutant

IATA

UN number: 2811 Class: 6.1 Packing group: III
 Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION**OSHA Hazards**

Carcinogen, Toxic by ingestion, Toxic by skin absorption

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1990-06-15

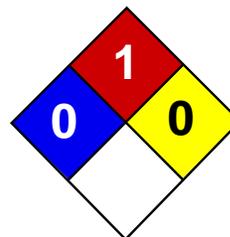
California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1990-06-15

16. OTHER INFORMATION**Further information**

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



Health	0
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Anthracene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Anthracene

Catalog Codes: SLA3670

CAS#: 120-12-7

RTECS: CA9350000

TSCA: TSCA 8(b) inventory: Anthracene

CI#: Not available.

Synonym:

Chemical Formula: C₁₄H₁₀

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
Anthracene	120-12-7	100

Toxicological Data on Ingredients: Anthracene LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

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

Potential Chronic Health Effects:

Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. **CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation: Not available.

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 540°C (1004°F)

Flash Points: CLOSED CUP: 121°C (249.8°F).

Flammable Limits: LOWER: 0.6%

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

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Slight.

Taste: Not available.

Molecular Weight: 178.22 g/mole

Color: Colorless.

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

Boiling Point: 342°C (647.6°F)

Melting Point: 218°C (424.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.25 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 6.15 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. Causes damage to the following organs: kidneys, lungs, mucous membranes.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant, sensitizer), of inhalation. Hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

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

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

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 0

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Right to Know Hazardous Substance Fact Sheet

Common Name: **ANTIMONY**

Synonyms: Antimony Metal; Antimony Powder

Chemical Name: Antimony

Date: June 2004

Revision: February 2012

CAS Number: 7440-36-0

RTK Substance Number: 0141

DOT Number: UN 2871

Description and Use

Antimony is a naturally occurring, silvery-white, hard, brittle metal. It is also formed as a by-product of smelting *Lead* and other metals. It is used in alloys with *Lead* and other metals, electric storage batteries, solder, sheet and pipe metal, castings and pewter.

Reasons for Citation

- ▶ **Antimony** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IRIS, and EPA.

[SEE GLOSSARY ON PAGE 5.](#)

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	2	-
REACTIVITY	0	-
COMBUSTIBLE POWDER POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Antimony** can affect you when inhaled and by passing through the skin.
- ▶ Contact can irritate the skin and eyes. Prolonged or repeated contact may cause redness and itchy skin rash (dermatitis).
- ▶ Inhaling **Antimony** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure to **Antimony** can cause headache, dizziness, nausea and vomiting, abdominal pain, and loss of sleep.
- ▶ Inhaling **Antimony** can cause an ulcer or hole in the "bone" (septum) dividing the inner nose.
- ▶ Repeated exposure can affect the lungs and cause an abnormal chest x-ray to develop.
- ▶ **Antimony** may damage the liver and kidneys and may affect the heart.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.5 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m³** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m³** averaged over an 8-hour workshift.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Antimony**:

- ▶ Contact can irritate the skin and eyes. Prolonged or repeated contact may cause redness and itchy skin rash (dermatitis).
- ▶ Inhaling **Antimony** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure to **Antimony** can cause headache, dizziness, nausea and vomiting, abdominal pain, and loss of sleep.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Antimony** and can last for months or years:

Cancer Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Antimony** has been tested and has not been shown to cause cancer in animals.

Reproductive Hazard

- ▶ There is limited evidence that **Antimony** may affect female fertility.

Other Effects

- ▶ Inhaling **Antimony** can cause an ulcer or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- ▶ Repeated exposure can affect the lungs, cause an abnormal chest x-ray to develop, and lead to permanent lung damage.
- ▶ **Antimony** may damage the liver and kidneys and may affect the heart.

Medical

Medical Testing

For frequent or potentially high exposure (half the PEL or greater), the following is recommended before beginning work and at regular times after that:

- ▶ Urine test for **Antimony**

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Chest x-ray and lung function tests
- ▶ Liver and kidney function tests
- ▶ EKG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Antimony**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Antimony powder** and *dust* may be present, check to make sure that an explosive concentration does not exist.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Antimony**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ The recommended glove materials for **Antimony** are Nitrile, Neoprene and Natural Rubber.

- ▶ The recommended protective clothing material for **Antimony** is Tyvek® or the equivalent.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear direct vent goggles when airborne particles or dust are present.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- ▶ Where the potential exists for exposure over **0.5 mg/m³**, use a negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Antimony**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **5 mg/m³**, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- ▶ Exposure to **50 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **50 mg/m³** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Antimony** is not combustible in bulk form. However, **Antimony powder** and *dust* may be COMBUSTIBLE.
- ▶ Use sand, dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ **DO NOT USE WATER** on *molten Antimony*.
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE**, including *Antimony Oxide* and *Antimony Hydride (Stibine)*.
- ▶ **Antimony** may form an ignitable dust/air mixture in closed tanks or containers.
- ▶ *Finely dispersed Antimony powder* and *dust* may form explosive mixtures in air.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Antimony** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Antimony** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Antimony** you should be trained on its proper handling and storage.

- ▶ **Antimony** reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions.
- ▶ Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and freshly formed (nascent) HYDROGEN can also form toxic *Antimony Hydride (Stibine) gas*.
- ▶ **Antimony** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); IODINE; and POWDERED METALS.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Antimony powder** is used, handled, or stored.
- ▶ Ground and bond containers when transferring **Antimony powder**.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **Antimony powder**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

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 for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **ANTIMONY**

Synonyms: Antimony Metal; Antimony Powder

CAS No: 7440-36-0

Molecular Formula: Sb

RTK Substance No: 0141

Description: Naturally occurring, silvery-white, hard, brittle metal that is also formed from smelting *Lead* and other metals

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p>2 - Health</p> <p>2 - Fire</p> <p>0 - Reactivity</p> <p>DOT#: UN 2871</p> <p>ERG Guide #: 170</p> <p>Hazard Class: 6.1 (Toxic)</p>	<p>Antimony is not combustible in bulk form. However, Antimony powder and <i>dust</i> may be COMBUSTIBLE.</p> <p>Use sand, dry chemical, CO₂, water spray or foam as extinguishing agents.</p> <p>DO NOT USE WATER on <i>molten Antimony</i>.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Antimony Oxide</i> and <i>Antimony Hydride (Stibine)</i>.</p> <p>Antimony may form an ignitable dust/air mixture in closed tanks or containers.</p> <p><i>Finely dispersed Antimony powder</i> and <i>dust</i> may form explosive mixtures in air.</p>	<p>Antimony reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions.</p> <p>Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and freshly formed (nascent) HYDROGEN can also form toxic <i>Antimony Hydride (Stibine) gas</i>.</p> <p>Antimony is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); IODINE; and POWDERED METALS.</p>

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Ground and bond containers when transferring **Antimony powder**.

Use only non-sparking tools and equipment. DO NOT wash into sewer.

PHYSICAL PROPERTIES

Flash Point: Noncombustible (*bulk form*)
Combustible (*powder and dust*)

Vapor Pressure: 1 mm Hg at 1,627°F (886°C)

Specific Gravity: 6.69 (water = 1)

Water Solubility: Insoluble

Boiling Point: 2,975°F (1,635°C)

Melting Point: 1,166°F (630°C)

Molecular Weight: 121.8

EXPOSURE LIMITS

OSHA: 0.5 mg/m³, 8-hr TWA

NIOSH: 0.5 mg/m³, 10-hr TWA

ACGIH: 0.5 mg/m³, 8-hr TWA

IDLH: 50 mg/m³

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m³ PAC-2 = 20 mg/m³

PAC-3 = 50 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Nitrile, Neoprene and Natural Rubber

Coveralls: Tyvek

Respirator: Spill or >0.5 mg/m³: full facepiece APR with *P100 filters*
Fire or >5 mg/m³: SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation, redness and itchy skin rash

Inhalation: Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, dizziness, nausea, vomiting, and abdominal pain

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **ARSENIC**

Synonyms: Gray Arsenic; Arsen

Chemical Name: Arsenic

Date: June 1998 Revision: April 2008

CAS Number: 7440-38-2

RTK Substance Number: 0152

DOT Number: UN 1558

Description and Use

Arsenic is a silver-gray or white metallic, odorless, brittle solid. It is used as an alloying agent for heavy metals, and in solders, medicines and herbicides.

Reasons for Citation

- ▶ **Arsenic** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Seek medical attention.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	4	-
FLAMMABILITY	0	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Arsenic** can affect you when inhaled and may be absorbed through the skin.
- ▶ **Arsenic** is a CARCINOGEN and may cause reproductive damage. HANDLE WITH EXTREME CAUTION.
- ▶ Skin contact can cause irritation, burns, rash and loss of pigment
- ▶ Eye contact can cause irritation and burns.
- ▶ Inhaling **Arsenic** can irritate the nose and throat and can cause an ulcer or hole in the "bone" (septum) dividing the inner nose.
- ▶ Exposure to **Arsenic** can cause weakness, poor appetite, nausea, vomiting, headache, and even death.
- ▶ **Arsenic** may damage the nervous system and the liver.
- ▶ **Arsenic** is a noncombustible solid, but when in *dust* or *fine powder* form it can EXPLODE when exposed to heat, flame or hot surfaces.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.01 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.002 mg/m³**, which should not be exceeded at any time.

ACGIH: The threshold limit value (TLV) is **0.01 mg/m³** averaged over an 8-hour workshift.

- ▶ **Arsenic** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Arsenic**:

- ▶ Skin contact can cause irritation, burns, rash and loss of pigment.
- ▶ Eye contact can cause irritation, burns and red, watery eyes.
- ▶ Inhaling **Arsenic** can irritate the nose and throat causing coughing and wheezing.
- ▶ Exposure to **Arsenic** can cause weakness, poor appetite, nausea, vomiting, headache, muscle cramps and even death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Arsenic** and can last for months or years:

Cancer Hazard

- ▶ **Arsenic** is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ Chronic **Arsenic** exposure has been associated with spontaneous abortions and still births.
- ▶ There is limited evidence that **Arsenic** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Effects

- ▶ Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons may develop white lines on the nails.
- ▶ Long-term exposure can cause an ulcer or hole in the "bone" (septum) dividing the inner nose, hoarseness and sore eyes.
- ▶ **Arsenic** may damage the nervous system causing numbness, "pins and needles," and/or weakness in the hands and feet.
- ▶ **Arsenic** may damage the liver.

Medical

Medical Testing

Before first exposure and every 12 months thereafter, OSHA requires your employer to provide (for persons exposed to greater than **0.005 mg/m³** of **Arsenic**) a work and medical history and exam which shall include:

- ▶ Chest x-ray
- ▶ Exam of the nose, skin and nails
- ▶ Test for urine **Arsenic**. This is most accurate at the end of the workday. Eating shellfish or fish may elevate **Arsenic** levels for up to two days. At NIOSH recommended exposure levels, urine **Arsenic** should not be greater than **100 micrograms per liter** of urine.

After suspected overexposure, repeat these tests and consider exam of the nervous system and liver function tests. Also examine your skin periodically for abnormal growth. Skin cancer from **Arsenic** can be easily cured when detected early.

OSHA requires your employer to provide you and your doctor with a copy of the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Arsenic**.

Conditions Made Worse By Exposure

- ▶ May scientists believe that skin changes such as thickening and pigment changes make those skin areas more likely to develop skin cancer.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Arsenic**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.

- ▶ Safety equipment manufacturers recommend *Nitrile*, *Natural Rubber* or *Silver Shield®* for gloves and DuPont *Tyvek®*, or the equivalent, as protective materials for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear impact resistant eye protection with side shields.
- ▶ Wear a face shield with goggles when working with corrosive, high irritating or toxic substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure not higher than **0.1 mg/m³**, use a half-mask air purifying respirator equipped with high efficiency filters.
- ▶ Where the potential exists for exposure not higher than **0.5 mg/m³**, use a full facepiece, air purifying respirator with high efficiency filters.
- ▶ Where the potential exists for exposure not higher than **5 mg/m³**, use any powered-air purifying respirator with high efficiency filters or a half-mask supplied-air respirator operated in a positive pressure mode.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Arsenic**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Exposure to **5 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Arsenic** is noncombustible, however, **Arsenic dust or fine powder** can explode when exposed to heat, flame or hot surfaces.
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Arsenic Oxides*.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Arsenic** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.
- ▶ Ventilate area of spill after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Arsenic** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Arsenic** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **Arsenic** is handled, used or stored as required by the OSHA *Inorganic Arsenic* Standard (29 CFR 1910.1018).
- ▶ **Arsenic** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.
- ▶ **Arsenic** reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HYDROGEN GAS to produce toxic *Arsine gas*.
- ▶ **Arsenic** is not compatible with powdered METALS (such as ZINC, LITHIUM, RUBIDIUM and PLATINUM); BROMINE AZIDE; LEAD MONOXIDE; and MERCURY OXIDE.
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from COMBUSTIBLES and HEAT.
- ▶ DO NOT store in metal tanks.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
 are not intended to be copied and sold
 for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Common Name: **ARSENIC**

Synonyms: Gray Arsenic; Arsen

CAS No: 7440-38-2

Molecular Formula: As

RTK Substance No: 0152

Description: Silver-gray or white metallic, odorless, brittle solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p>4 - Health</p> <p>0 - Fire</p> <p>0 - Reactivity</p> <p>DOT#: UN 1558</p> <p>ERG Guide #: 152</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Arsenic is noncombustible, however, <i>Arsenic dust</i> or <i>fine powder</i> can explode when exposed to heat, flame or hot surfaces.</p> <p>Use dry chemical, CO₂, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>Arsenic reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p> <p>Arsenic reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HYDROGEN GAS to produce toxic <i>Arsine gas</i>.</p> <p>Arsenic is not compatible with <i>powdered</i> METALS (such as ZINC, LITHIUM, RUBIDIUM and PLATINUM); BROMINE AZIDE; LEAD MONOXIDE; and MERCURY OXIDE.</p>

SPILL/LEAKS

Isolation Distance:

Spills: 25 to 50 meters (75 to 150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

DO NOT wash into sewer.

Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible solid
Vapor Pressure:	1 mm Hg at 701°F (372°C)
Specific Gravity:	5.7 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	1,350°F (613°C)
Ionization Potential:	9.87 eV
Molecular Weight:	74.9

EXPOSURE LIMITS

OSHA:	0.01 mg/m ³ , 8-hr TWA
NIOSH:	0.002 mg/m ³ , 15-min Ceiling
ACGIH:	0.01 mg/m ³ , 8-hr TWA
IDLH:	5 mg/m ³

PROTECTIVE EQUIPMENT

Gloves:	Natural Rubber, Nitrile or Silver Shield®
Coveralls:	DuPont Tyvek®
Respirator:	<0.1 mg/m ³ - Full facepiece APR with High efficiency filter <0.5 mg/m ³ -Supplied air

HEALTH EFFECTS

Eyes:	Irritation, burns, red and watery eyes
Skin:	Irritation, burns, itching, rash and loss of pigment
Inhalation:	Nose and throat irritation with coughing, wheezing and hoarseness Weakness, headache, nausea, vomiting, and muscle cramps
Chronic:	Cancer (skin and lung) in humans

FIRST AID AND DECONTAMINATION

Remove	the person from exposure.
Flush	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
Quickly	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
Begin	artificial respiration if breathing has stopped and CPR if necessary.
Transfer	to a medical facility.

International Chemical Safety Cards

BARIUM

ICSC: 1052

BARIUM Ba Atomic mass: 137.3 CAS # 7440-39-3 RTECS # CQ8370000 ICSC # 1052 UN # 1400			
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames.	Special powder, dry sand, NO hydrous agents, NO water.
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. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
• EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from halogenated solvents, strong oxidants, acids. Dry. Keep under inert gas, petroleum or oxygen-free liquid.	UN Hazard Class: 4.3 UN Packing Group: II	
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 1052	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993		

International Chemical Safety Cards

BARIUM**ICSC: 1052**

I M P O R T A N T D A T A	PHYSICAL STATE; APPEARANCE: YELLOWISH TO WHITE LUSTROUS SOLID IN VARIOUS FORMS.		ROUTES OF EXPOSURE: The substance can be absorbed into the body by ingestion.	
	PHYSICAL DANGERS:		INHALATION RISK:	
	CHEMICAL DANGERS: The substance may spontaneously ignite on contact with air (if in powder form). The substance is a strong reducing agent and reacts violently with oxidants and acids. Reacts with water, forming combustible gas (hydrogen - see ICSC # 0001) and barium hydroxide. Reacts violently with halogenated solvents causing fire and explosion hazard.		EFFECTS OF SHORT-TERM EXPOSURE: The substance irritates the eyes, the skin, and the respiratory tract.	
	OCCUPATIONAL EXPOSURE LIMITS (OELs): TLV: ppm; 0.5 mg/m ³ (as TWA) (ACGIH 1992-1993).		EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:	
PHYSICAL PROPERTIES	Boiling point: 1640°C Melting point: 725°C Relative density (water = 1): 3.6		Solubility in water: reaction Vapour pressure, kPa at 1049°C: 1.3	
ENVIRONMENTAL DATA				
NOTES				
Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide. Rinse contaminated clothes (fire hazard) with plenty of water.				
Transport Emergency Card: TEC (R)-43G14				
ADDITIONAL INFORMATION				
ICSC: 1052		BARIUM		
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Material Safety Data Sheet

Benzene

ACC# 02610

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzene

Catalog Numbers: AC167660000, AC167660010, AC167660025, AC167660250, AC167665000, AC168650250, AC295330000, AC295330010, AC295330025, AC295330250, AC296880000, AC296880010, AC296880025, AC296880250, AC610230010, AC610231000, AC611001000, B243-4, B245-4, B245-500, B411-1, B411-4, B412-1, S79920ACS

Synonyms: Benzol; Cyclohexatriene; Phenyl hydride.**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
71-43-2	Benzene	> 99	200-753-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless liquid. Flash Point: -11 deg C.

Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. Contains benzene. Benzene can cause cancer. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause blood abnormalities. May cause central nervous system effects.

Target Organs: Blood, central nervous system, respiratory system, eyes, bone marrow, immune system, skin.

Potential Health Effects

Eye: Causes eye irritation.

Skin: Causes skin irritation. Harmful if absorbed through the skin. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.

Ingestion: May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation: Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and

central nervous system depression. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia. Potential symptoms of overexposure by inhalation are dizziness, headache, vomiting, visual disturbances, staggering gait, hilarity, fatigue, and other symptoms of CNS depression.

Chronic: May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia and other blood cell abnormalities. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumor composed of cells of the type normally found in the bone marrow). Immunodepressive effects have been reported. This substance has caused adverse reproductive and fetal effects in laboratory animals.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. 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. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Flash Point: -11 deg C (12.20 deg F)

Autoignition Temperature: 498 deg C (928.40 deg F)

Explosion Limits, Lower: 1.3 vol %

Upper: 7.1 vol %

NFPA Rating: (estimated) Health: 2; Flammability: 3; 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. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

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. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm TWA; 2.5 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous route	0.1 ppm TWA 500 ppm IDLH	1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of the benzene standard); 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 C FR 1910.1028)

OSHA Vacated PELs: Benzene: 10 ppm TWA (unless specified in 1910.1028)

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

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: clear colorless
Odor: sweetish odor - aromatic odor
pH: Not applicable.
Vapor Pressure: 75 mm Hg @ 20 deg C
Vapor Density: 2.8 (air=1)
Evaporation Rate:Not available.
Viscosity: 0.647mPa @ 20 deg C
Boiling Point: 80.1 deg C
Freezing/Melting Point:5.5 deg C
Decomposition Temperature:Not available.
Solubility: 0.180 g/100 ml @ 25°C
Specific Gravity/Density:0.8765 @ 20°C
Molecular Formula:C₆H₆
Molecular Weight:78.11

Section 10 - Stability and Reactivity

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

Section 11 - Toxicological Information

RTECS#:

CAS# 71-43-2: CY1400000

LD50/LC50:

CAS# 71-43-2:

Dermal, guinea pig: LD50 = >9400 uL/kg;
 Draize test, rabbit, eye: 88 mg Moderate;
 Draize test, rabbit, eye: 2 mg/24H Severe;
 Draize test, rabbit, skin: 20 mg/24H Moderate;
 Inhalation, mouse: LC50 = 9980 ppm;
 Inhalation, mouse: LC50 = 24 mL/kg/2H;
 Inhalation, rat: LC50 = 10000 ppm/7H;
 Inhalation, rat: LC50 = 34 mL/kg/2H;
 Inhalation, rat: LC50 = 6.5 mL/kg/4H;
 Oral, mouse: LD50 = 4700 mg/kg;
 Oral, rat: LD50 = 930 mg/kg;
 Oral, rat: LD50 = 1 mL/kg;

Oral, rat: LD50 = 1800 Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes. While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.

Carcinogenicity:

CAS# 71-43-2:

- **ACGIH:** A1 - Confirmed Human Carcinogen
- **California:** carcinogen, initial date 2/27/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

Epidemiology: IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is sufficient evidence that benzene is carcinogenic to humans.

Teratogenicity: Inhalation, rat: TCLO = 50 ppm/24H (female 7-14 day(s) after conception) Effects on Embryo or Fetus - extra-embryonic structures (e.g., placenta, umbilical cord) and Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).; Inhalation, mouse: TCLO = 5 ppm (female 6-15 day(s) after conception) Effects on Embryo or Fetus - cytological changes (including somatic cell genetic material) and Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).

Reproductive Effects: Inhalation, rat: TCLO = 670 mg/m³/24H (female 15 day(s) pre-mating and female 1-22 day(s) after conception) female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).; Oral, mouse: TDLo = 12 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

Mutagenicity: DNA Inhibition: Human, Leukocyte = 2200 umol/L.; DNA Inhibition: Human, HeLa cell = 2200 umol/L.; Mutation Test Systems - not otherwise specified: Human, Lymphocyte = 5 umol/L.; Cytogenetic Analysis: Inhalation, Human = 125 ppm/1Y.; Cytogenetic Analysis: Human, Leukocyte = 1 mmol/L/72H.; Cytogenetic Analysis: Human, Lymphocyte = 1 mg/L.

Neurotoxicity: See actual entry in RTECS for complete information.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Mosquito Fish: TLm = 395 mg/L; 24 Hr; Unspecified Fish: Goldfish: LC50 = 46 mg/L; 24 Hr; Modified ASTM D 1345 Fish: Fathead Minnow: LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0) Fish: Rainbow trout: LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0) Fish: Bluegill/Sunfish: LD50 = 20 mg/L; 24-48 Hr; Unspecified If benzene is released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. If benzene is released to water, it will be subject to rapid volatilization. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation.

Environmental: If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase benzene will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Benzene is fairly soluble in water and is removed from the atmosphere in rain.

Physical: Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.

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# 71-43-2: waste number U019 (Ignitable waste, Toxic waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BENZENE	BENZENE
Hazard Class:	3	3
UN Number:	UN1114	UN1114
Packing Group:	II	II
Additional Info:		FLASHPOINT -11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 71-43-2 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# 71-43-2: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogeni

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 71-43-2: immediate, delayed, fire.

Section 313

This material contains Benzene (CAS# 71-43-2, > 99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 71-43-2 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# 71-43-2 is listed as a Hazardous Substance under the CWA. CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-43-2 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# 71-43-2 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 Benzene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzene, a chemical known to the state of California to cause male reproductive toxicity.

California No Significant Risk Level: CAS# 71-43-2: 6.4 æg/day NSRL (oral); 13 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T F

Risk Phrases:

R 11 Highly flammable.

R 36/38 Irritating to eyes and skin.

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.

R 65 Harmful: may cause lung damage if swallowed.

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# 71-43-2: 3

Canada - DSL/NDSL

CAS# 71-43-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2A, D2B.

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# 71-43-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/11/1999

Revision #8 Date: 9/11/2008

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.



Right to Know Hazardous Substance Fact Sheet

Common Name: **BENZ(a)ANTHRACENE**

Synonyms: Naphthanthracene; Tetraphene

Chemical Name: Benz[a]Anthracene

Date: September 1998 Revision: August 2008

CAS Number: 56-55-3

RTK Substance Number: 0193

DOT Number: UN 3077

Description and Use

Benz(a)Anthracene is an odorless, colorless to yellow brown flake, plate or powder. It is not produced commercially, but is used in research laboratories. It is also found in *Coal Tar*, roasted coffee, smoked foods, and automobile exhaust, and is formed as an intermediate during chemical manufacturing.

Reasons for Citation

- ▶ **Benz(a)Anthracene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Benz(a)Anthracene** can affect you when inhaled.
- ▶ **Benz(a)Anthracene** should be handled as a CARCINOGEN and MUTAGEN--WITH EXTREME CAUTION.
- ▶ For more information, consult the Right to Know Hazardous Substance Fact Sheet on COAL TAR PITCH.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m³** (as Coal Tar Pitch Volatiles, Benzene-soluble fraction) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m³** (as Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- ▶ **Benz(a)Anthracene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

Determining Your Exposure

- ▶ Read the product manufacturer’s Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility’s RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benz(a)Anthracene**:

- ▶ No acute (short-term) health effects are known at this time.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benz(a)Anthracene** and can last for months or years:

Cancer Hazard

- ▶ **Benz(a)Anthracene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes cancer in humans and it has been shown to cause liver and lung cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen. Such substance may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Benz(a)Anthracene** has not been tested for its ability to affect reproduction.

Other Effects

- ▶ No chronic (long-term) health effects are known at this time.

Medical

Medical Testing

There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a Class I, Type B, biological safety hood when mixing, handling, or preparing **Benz(a)Anthracene**.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Benz(a)Anthracene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile or Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.1 mg/m³** (as *Coal Tar Pitch Volatiles*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **80 mg/m³** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Benz(a)Anthracene** may burn, but does not readily ignite.
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE.**
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benz(a)Anthracene** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Benz(a)Anthracene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benz(a)Anthracene** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **Benz(a)Anthracene** is handled, used, or stored.
- ▶ **Benz(a)Anthracene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Common Name: **BENZ(a)ANTHRACENE**

Synonyms: Naphthanthracene; Tetraphene

CAS No: 56-55-3

Molecular Formula: C₁₈H₁₂

RTK Substance No: 0193

Description: Odorless, colorless to yellow brown flake, plate or powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p>3 - Health</p> <p>1 - Fire</p> <p>0 - Reactivity</p> <p>DOT#: UN 3077</p> <p>ERG Guide #: 171</p> <p>Hazard Class: 9 (Environmentally hazardous substance)</p>	<p>Benz(a)Anthracene may burn, but does not readily ignite.</p> <p>Use dry chemical, CO₂, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>Benz(a)Anthracene is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p>

SPILL/LEAKS

Isolation Distance:

Small Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

Bioaccumulation may occur in seafood.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	May burn
Vapor Pressure:	2 mm Hg at 68°F (20°C)
Specific Gravity:	1.3 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	820°F (438°C)
Melting Point:	324°F (162°C)
Molecular Weight:	228.3

EXPOSURE LIMITS

OSHA: 0.2 mg/m³, 8-hr TWA (as *Coal Tar Pitch Volatiles, Benzene soluble fraction*)

NIOSH: 0.1 mg/m³, 10-hr TWA (as *Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction*)

ACGIH: Lowest level possible

IDLH: 80 mg/m³ (as *Coal Tar Pitch Volatiles*)

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	DuPont Tyvek®
Respirator:	>0.1 mg/m ³ - Supplied Air

HEALTH EFFECTS

Eyes:	No information available
Skin:	No information available
Inhalation:	No information available
Chronic:	Cancer (liver and lung) in animals

FIRST AID AND DECONTAMINATION

Remove	the person from exposure.
Flush	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove	contaminated clothing and wash contaminated skin with soap and water.
Transfer	to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P

Chemical Name: Benzo[a]pyrene

Date: July 1998 Revision: October 2007

CAS Number: 50-32-8

RTK Substance Number: 0207

DOT Number: UN 3077

Description and Use

Benzo(a)pyrene is a pale yellow, crystalline solid or powder with a faint aromatic odor. In its pure form it is used as a laboratory reagent. It also forms as a gaseous by-product when certain carbon substances burn, such as coal tar chemicals, and is found in cigarette smoke.

Reasons for Citation

- ▶ **Benzo(a)pyrene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Remove contaminated clothing. Wash contaminated skin with soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Benzo(a)pyrene** can affect you when inhaled and by passing through the skin.
- ▶ **Benzo(a)pyrene** is a CARCINOGEN. HANDLE WITH EXTREME CAUTION.
- ▶ **Benzo(a)pyrene** may damage the developing fetus.
- ▶ Contact can irritate and burn the eyes.
- ▶ **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact.
- ▶ Repeated exposure can cause thickening and darkening of the skin.
- ▶ Except in laboratories, **Benzo(a)pyrene** is usually found mixed with other "coal tar pitch" chemicals.
- ▶ For more information, consult the *Right to Know Hazardous Substance Fact Sheets on COAL TAR PITCH, CREOSOTE, CHRYSENE, and ANTHRACENE.*

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m³** (as *Coal Tar Pitch Volatiles*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m³** (as the *Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- ▶ **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(a)pyrene**:

- ▶ Contact can irritate and burn the eyes.
- ▶ **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact. Exposure to a combination of sunlight and this chemical can increase these effects.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(a)pyrene** and can last for months or years:

Cancer Hazard

- ▶ **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes stomach, skin, lung, blood, spleen, pancreas, and mammary cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ **Benzo(a)pyrene** may damage the developing fetus.
- ▶ There is limited evidence that **Benzo(a)pyrene** may damage the male and female reproductive systems.

Other Effects

- ▶ Repeated exposure can cause thickening and darkening of the skin and warts.

Medical

Medical Testing

There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Sunlight may cause a rash to develop in people exposed to **Benzo(a)pyrene** and increases the risk of skin cancer.
- ▶ Tobacco smoke also contains **Benzo(a)pyrene**. Smoking may increase the risk of lung cancer with exposure to **Benzo(a)pyrene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.

- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a Class I, Type B, biological safety hood when working with **Benzo(a)pyrene** in a laboratory.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Benzo(a)pyrene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend DuPont Tychem® CPF-2, SL, CPF-4 and Responder® as protective materials for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over 0.1 mg/m^3 , use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

- ▶ Exposure to 80 mg/m^3 (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above 80 mg/m^3 (as *Coal Tar Pitch Volatiles*) exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Benzo(a)pyrene** may burn, but does not readily ignite.
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benzo(a)pyrene** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first to reduce dust or use a HEPA-filter vacuum for clean-up.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ It may be necessary to contain and dispose of **Benzo(a)pyrene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP), Nuclear Regulatory Commission (NRC) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benzo(a)pyrene** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, or stored.
- ▶ **Benzo(a)pyrene** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Benzo(a)pyrene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

**Occupational Health Information
Resources**

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

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The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

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NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

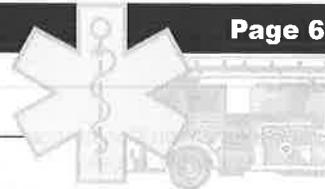
STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P

CAS No: 50-32-8

Molecular Formula: C₂₀ H₁₂

RTK Substance No: 0207

Description: Pale yellow, crystalline solid or powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 1 - Fire 0 - Reactivity DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	Benzo(a)pyrene may burn, but does not readily ignite. Use dry chemical, CO ₂ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE.	Benzo(a)pyrene reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.

SPILL/LEAKS

Isolation Distance: 50 meters (150 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold: Faint aromatic odor

Flash Point: No information

Specific Gravity: 1.35

Vapor Density: 8.7 (air = 1)

Vapor Pressure: 5.49 X 10⁹ mm Hg at 77°F (25°C)

Water Solubility: Insoluble

Boiling Point: 590° - 594°F (310° - 312°C)

Melting Point: 347° - 354 F (175° - 179°C)

EXPOSURE LIMITS

OSHA: 0.2 mg/m³, 8-hr TWA

NIOSH: 0.1 mg/m³, 10-hr TWA

ACGIH: lowest level possible

IDLH LEVEL: 80 mg/m³ (as *Coal Tar Pitch Volatiles*)

PROTECTIVE EQUIPMENT

Gloves: No information

Coveralls: DuPont Tychem®, CPF-2, SL, CPF-4, Responder® (all >8-hr permeation time)

Boots: No information

Respirator: >0.1 mg/m³ - Supplied air

HEALTH EFFECTS

Eyes: Irritation and burns

Skin: Irritation, rash and burning feeling

Chronic: Cancer (stomach, skin, lung, blood, spleen, pancreas, and mammary) in animals.
May affect the developing fetus
Thickening and darkening of the skin and warts

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Remove contaminated clothing and wash contaminated skin with soap and water.

Transfer to a medical facility.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(b)FLUORANTHENE**

CAS Number: 205-99-2

DOT Number: None

RTK Substance number: 0208

Date: September 1995 Revision: July 2001

HAZARD SUMMARY

- * **Benzo(b)fluoranthene** can affect you when breathed in and may be absorbed through the skin.
- * **Benzo(b)fluoranthene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- * Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.
- * Because the major hazards associated with **Benzo(b)fluoranthene** come from exposure to *Coal Tar Pitch*, CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEET ON COAL TAR PITCH.

IDENTIFICATION

Benzo(b)fluoranthene is a colorless, needle-shaped solid. It is used as a research chemical and is present in coal, and coke oven emissions, and petroleum products.

REASON FOR CITATION

- * **Benzo(b)fluoranthene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, NTP, IARC, HHAG and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for **Benzo(b)fluoranthene** (measured as *Coal Tar Pitch volatiles*):

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.2 mg/m³** averaged over an 8-hour workshift.

- * **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * A regulated, marked area should be established where **Benzo(b)fluoranthene** is handled, used, or stored.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Benzo(b)fluoranthene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(b)fluoranthene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(b)fluoranthene**:

- * Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(b)fluoranthene** and can last for months or years:

Cancer Hazard

- * **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. It has been shown to cause lung, liver and skin cancer in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Benzo(b)fluoranthene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * **Benzo(b)fluoranthene** has not been tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Examine your skin periodically for growths or changes in warts or moles. Skin cancers are usually easily curable when removed early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer **Benzo(b)fluoranthene** from drums or other storage containers to process containers.
- * A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Benzo(b)fluoranthene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Benzo(b)fluoranthene** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(b)fluoranthene**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Benzo(b)fluoranthene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(b)fluoranthene**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Benzo(b)fluoranthene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP**.
- * When vacuuming, a high efficiency particulate air (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Benzo(b)fluoranthene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * Where the potential exists for exposure over **0.1 mg/m³** (as *Coal Tar Pitch volatiles*), use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **80 mg/m³** (as *Coal Tar Pitch volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m³** (as *Coal Tar Pitch volatiles*) exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Don't all chemicals cause cancer?
- A: No. Most chemicals tested by scientists are not cancer-causing.
- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Benzo[ghi]perylene

Product Number : B9009
Brand : Aldrich

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

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Carcinogen

GHS Classification

Acute aquatic toxicity (Category 1)

Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)

H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273 : Avoid release to the environment.

P501 : Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard: 0

Chronic Health Hazard: *

Flammability: 0

Physical hazards: 0

NFPA Rating

Health hazard: 0

Fire: 0

Reactivity Hazard: 0

Potential Health Effects

Inhalation : May be harmful if inhaled. May cause respiratory tract irritation.

Skin : May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,12-Benzoperylene
Formula : C₂₂H₁₂
Molecular Weight : 276.33 g/mol

Component		Concentration
Benzo[ghi]perylene		
CAS-No.	191-24-2	-
EC-No.	205-883-8	-

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Suitable extinguishing media

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

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

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

Skin and body protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 277 - 279 °C (531 - 534 °F) - lit.
Boiling point	> 500 °C (> 932 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Auto-ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	insoluble
Partition coefficient: n-octanol/water	log Pow: 6.63
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available

Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50

no data available

Inhalation LC50

no data available

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Benzo[ghi]perylene)

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Benzo[ghi]perylene)

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

NTP: Reasonably anticipated to be a human carcinogen (Benzo[ghi]perylene)

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

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

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[ghi]perylene)
Marine pollutant: Marine pollutant

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[ghi]perylene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards

Carcinogen

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[ghi]perylene	191-24-2	1990-01-01

16. OTHER INFORMATION

Further information

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New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(k)FLUORANTHENE**

CAS Number: 207-08-9
DOT Number: None

RTK Substance number: 2969
Date: October 2002

HAZARD SUMMARY

- * **Benzo(k)Fluoranthene** can affect you when breathed in and may be absorbed through the skin.
- * **Benzo(k)Fluoranthene** should be handled as a **CARCINOGEN--WITH EXTREME CAUTION**.
- * Contact can irritate the skin and eyes.

IDENTIFICATION

Benzo(k)Fluoranthene is a pale yellow, needle-like solid. It is primarily found in smoke from tobacco and polluted air.

REASON FOR CITATION

- * **Benzo(k)Fluoranthene** is on the Hazardous Substance List because it is cited by NTP, IARC, HHAG and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for **Benzo(k)Fluoranthene**. This does not mean that this substance is not harmful. Safe work practices should always be followed.

- * **Benzo(k)Fluoranthene** may be a **CARCINOGEN** in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * It should be recognized that **Benzo(k)Fluoranthene** can be absorbed through your skin, thereby increasing your exposure.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Benzo(k)Fluoranthene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(k)Fluoranthene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(k)Fluoranthene**:

- * Contact can irritate the skin and eyes.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(k)Fluoranthene** and can last for months or years:

Cancer Hazard

- * **Benzo(k)Fluoranthene** may be a CARCINOGEN in humans since it has been shown to cause skin cancer in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Benzo(k)Fluoranthene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * **Benzo(k)Fluoranthene** has not been adequately tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Benzo(k)Fluoranthene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Benzo(k)Fluoranthene** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(k)Fluoranthene**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Benzo(k)Fluoranthene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(k)Fluoranthene**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Benzo(k)Fluoranthene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Benzo(k)Fluoranthene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Eye protection is included in the recommended respiratory protection.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * At any exposure level, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Material Safety Data Sheet

Cadmium metal, granular

ACC# 03720

Section 1 - Chemical Product and Company Identification

MSDS Name: Cadmium metal, granular**Catalog Numbers:** 61213-5000, C3-500**Synonyms:** None.**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
7440-43-9	Cadmium	100	231-152-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver white granules.

Danger! Flammable solid. May be fatal if inhaled. Harmful if swallowed. Causes eye, skin, and respiratory tract irritation. Contains cadmium. Cancer hazard. Avoid creating dust. Can cause lung and kidney disease. Inhalation of fumes may cause metal-fume fever. Air sensitive. May cause reproductive and fetal effects.

Target Organs: Blood, kidneys, liver, lungs, skeletal structures, prostate.

Potential Health Effects

Eye: Causes eye irritation.**Skin:** Causes skin irritation.**Ingestion:** Harmful if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion may produce fluid loss, acute renal failure, and cardiopulmonary depression.**Inhalation:** May be fatal if inhaled. 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. Damage may be delayed. May cause nausea, vomiting, abdominal pain, diarrhea, chest tightness, weakness, and delayed pulmonary edema. In humans inhalation causes proteinuria, an excess of protein in the urine.**Chronic:** May cause respiratory tract cancer. Repeated inhalation may cause chronic bronchitis. Chronic inhalation may cause nasal septum ulceration and perforation. Cadmium and compounds may cause lung, liver and kidney damage and lung and prostate cancer in humans. May cause loss of smell, emphysema, anemia, bone demineralization, and lung fibrosis. The primary target organ

for chronic cadmium disease is clearly the kidney.

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: POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself.

Notes to Physician: Administration of calcium disodium EDTA may be useful in acute poisoning with its use at the discretion of qualified medical personnel. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.

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. Material can spontaneously ignite (pyrophoric) when exposed to air at normal or slightly elevated temperatures. Dust can be an explosion hazard when exposed to heat or flame. Flammable solid. May burn rapidly with flare burning effect. May re-ignite after fire is extinguished. Dangerous fire hazard in the form of dust when exposed to heat or flame.

Extinguishing Media: Use dry sand, graphite powder, dry sodium chloride-based extinguishers.

Flash Point: Not available.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 4; Flammability: 2; Instability: 1

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. Use a spark-proof tool. Provide ventilation. Place under an inert atmosphere.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Use spark-proof tools

and explosion proof equipment. Avoid contact with skin and eyes. Do not breathe dust, mist, or vapor. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep away from heat, sparks and flame. Do not ingest or inhale. Handle under an inert atmosphere. Store protected from air. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not expose to air. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood. See 29CFR 1910.1027 for regulations applying to all occupational exposures to cadmium and cadmium compounds, in all forms.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cadmium	0.01 mg/m ³ TWA; 0.002 mg/m ³ TWA (respirable fraction)	9 mg/m ³ IDLH (dust)	5 æg/m ³ TWA; 0.1 mg/m ³ TWA (fume, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 0.2 mg/m ³ TWA (dust, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 0.3 mg/m ³ Ceiling (fume, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 0.6 mg/m ³ Ceiling (dust, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 2.5 æg/m ³ Action Level; 5 æg/m ³ TWA (Do not eat, drink or chew tobacco or gum or apply cosmetics in regulated areas. Carcinogen - dust can cause lung and kidney disease. See 29 CFR 1910.1027)

OSHA Vacated PELs: Cadmium: 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 respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Granules
Appearance: silver white
Odor: odorless
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate:Not applicable.
Viscosity: Not applicable.
Boiling Point: 765 deg C @ 760 mmHg
Freezing/Melting Point:321 deg C
Decomposition Temperature:Not available.
Solubility: Insoluble.
Specific Gravity/Density:8.64 @ 25°C
Molecular Formula:Cd
Molecular Weight:112.40

Section 10 - Stability and Reactivity

Chemical Stability: Oxidizes when exposed to air. Easily tarnishes in moist air. Powder or liquid is pyrophoric. Contact with acid liberates gas.

Conditions to Avoid: Ignition sources, dust generation, excess heat, prolonged exposure to air.

Incompatibilities with Other Materials: Strong oxidizing agents, acids, sulfur, zinc, selenium, tellurium.

Hazardous Decomposition Products: Toxic cadmium oxide fumes.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7440-43-9: EU9800000

LD50/LC50:

CAS# 7440-43-9:

Inhalation, rat: LC50 = 25 mg/m³/30M;

Oral, mouse: LD50 = 890 mg/kg;

Oral, rat: LD50 = 2330 mg/kg;

Carcinogenicity:

CAS# 7440-43-9:

- **ACGIH:** A2 - Suspected Human Carcinogen

- **California:** carcinogen, initial date 10/1/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

Epidemiology: Occupational exposure to cadmium has been implicated in a significant increase in prostate and respiratory tract cancer. There is evidence of a significant excess of respiratory cancer deaths among a cohort of cadmium production workers, and concluded that cadmium and its compounds are potential carcinogens.

Teratogenicity: Oral, rat: TDLo = 155 mg/kg (male 13 week(s) pre-mating and female 13 week (s) pre-mating - 3 week(s) after conception) Effects on Newborn - growth statistics (e.g.%, reduced weight gain) and Effects on Newborn - behavioral.; Oral, rat: TDLo = 23 mg/kg (female 1-22 day(s) after conception) Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).; Oral, mouse: TDLo = 1700 mg/kg (female 8-12 day(s) after conception) Effects on Newborn - viability index (e.g., # alive at day 4 per # born alive) and Effects on Newborn - growth statis

Reproductive Effects: Oral, rat: TDLo = 21500 ug/kg (multigenerations) Fertility - pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea).; Intraperitoneal, rat: TDLo = 1124 ug/kg (male 1 day(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).

Mutagenicity: Micronucleus Test: Mouse, Embryo = 6 umol/L.; Cytogenetic Analysis: Hamster, Ovary = 1 umol/L.

Neurotoxicity: No information found

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: TLm = 30 ppm; 24 Hr; Hard waterFish: Striped bass: LC50 = 0.001 ppm; 24-48 Hr; Static bioassayFish: Fathead Minnow: TL50 = 7.2 ppm; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LCO = 0.08 ppm; 96 Hr; Static bioassay (Hard water) No data available.

Environmental: Cadmium can enter the air from natural sources.

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: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.	Toxic Solid, Flammable, Organic, N.O.S. (CADMIUM METAL)

Hazard Class:	6.1	6.1
UN Number:	UN2930	UN2930
Packing Group:	I	I

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7440-43-9 is listed on the TSCA inventory.

Health & Safety Reporting List

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

Chemical Test Rules

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

Section 12b

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

TSCA Significant New Use Rule

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

CERCLA Hazardous Substances and corresponding RQs

CAS# 7440-43-9: 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 TPO.

SARA Codes

CAS # 7440-43-9: immediate, delayed, fire.

Section 313

This material contains Cadmium (CAS# 7440-43-9, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7440-43-9 (listed as Cadmium 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# 7440-43-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-43-9 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# 7440-43-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

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

WARNING: This product contains Cadmium, a chemical known to the state of California to cause cancer. WARNING: This product contains Cadmium, a chemical known to the state of California to cause male reproductive toxicity.

California No Significant Risk Level: CAS# 7440-43-9: 0.05 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T+ F

Risk Phrases:

R 11 Highly flammable.
R 25 Toxic if swallowed.
R 26 Very toxic by inhalation.
R 45 May cause cancer.

Safety Phrases:

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
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# 7440-43-9: No information available.

Canada - DSL/NDSL

CAS# 7440-43-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1A, B4.

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# 7440-43-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 6/28/1999**Revision #7 Date:** 2/13/2008

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.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CHLORDANE**

CAS Number: 57-74-9
DOT Number: UN 2762
DOT Hazard Class: 6.1 (Toxic)

RTK Substance number: 0361
Date: April 1998 Revision: June 2005

HAZARD SUMMARY

- * **Chlordane** can affect you when breathed in and by passing through your skin.
- * **Chlordane** should be handled as a CARCINOGEN-- WITH EXTREME CAUTION.
- * It may damage the developing fetus.
- * **Chlordane** can irritate the eyes and skin and can cause burns and rash on contact.
- * Exposure to the vapor can irritate the nose, mouth and throat.
- * **Chlordane** can cause nausea, vomiting, diarrhea, headache and abdominal pain.
- * Exposure to **Chlordane** can cause fatigue, confusion, dizziness, loss of muscle coordination, convulsions, unconsciousness and death.
- * Repeated exposure may cause personality changes of depression, anxiety or irritability.
- * **Chlordane** may damage the liver and kidneys.

IDENTIFICATION

Pure **Chlordane** is a colorless to amber, odorless, thick liquid. The commercial product has a *Chlorine*-like odor. It is used as an insecticide.

REASON FOR CITATION

- * **Chlordane** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

- OSHA: The legal airborne permissible exposure limit (PEL) is **0.5 mg/m³** averaged over an 8-hour workshift.
- NIOSH: The recommended airborne exposure limit is **0.5 mg/m³** averaged over a 10-hour workshift.
- ACGIH: The recommended airborne exposure limit is **0.5 mg/m³** averaged over an 8-hour workshift.

- * **Chlordane** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Chlordane** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Chlordane** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chlordane**:

- * **Chlordane** can irritate the eyes and skin and can cause burns and rash on contact.
- * Exposure to the vapor can irritate the nose, mouth and throat.
- * **Chlordane** can cause nausea, vomiting, diarrhea, headache and abdominal pain.
- * Exposure to **Chlordane** can cause fatigue, confusion, dizziness, loss of muscle coordination, convulsions, unconsciousness and death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chlordane** and can last for months or years:

Cancer Hazard

- * **Chlordane** may be a CARCINOGEN in humans since it has been shown to cause liver cancer in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- * **Chlordane** may damage the developing fetus.

Other Long-Term Effects

- * Repeated exposure may cause personality changes of depression, anxiety or irritability.
- * **Chlordane** may damage the liver and kidneys.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

- * Liver and kidney function tests.
- * Exam of the nervous system.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Chlordane**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically pump liquid **Chlordane** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Chlordane** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Chlordane**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Chlordane**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Chlordane**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Chlordane** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Chlordane**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * Safety equipment manufacturers recommend Tychem ® BR/LV, Tychem ® 10,000, and Tychem ® TK as protective materials.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * For field applications check with your supervisor and your safety equipment supplier regarding the appropriate respiratory equipment.
- * Where the potential exists for exposure over **0.5 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **100 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **100 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

HANDLING AND STORAGE

- * Prior to working with **Chlordane** you should be trained on its proper handling and storage.
- * **Chlordane** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).
- * Store in tightly closed containers in a cool, well-ventilated area away from HEAT; COMBUSTIBLES; IRON; ZINC; PLASTIC; RUBBER and COATINGS.
- * Sources of ignition, such as smoking and open flames, are prohibited where **Chlordane** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Don't all chemicals cause cancer?
- A: No. Most chemicals tested by scientists are not cancer-causing.

- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.
- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Right to Know Hazardous Substance Fact Sheet

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

Chemical Name: Chromium

Date: January 2000 Revision: March 2009

CAS Number: 7440-47-3

RTK Substance Number: 0432

DOT Number: UN 3089

Description and Use

Chromium is a hard, gray, odorless solid with a metallic luster. It is used in stainless and alloy steels, in making alloys, and as an isotope in medicine and research.

Reasons for Citation

- ▶ **Chromium** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	3	-
REACTIVITY	0	-

FLAMMABLE POWDER
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Chromium** can affect you when inhaled.
- ▶ Contact can irritate and burn the skin and eyes with possible eye damage.
- ▶ Inhaling **Chromium** can irritate the nose and throat.
- ▶ Exposure to **Chromium fumes** can cause a flu-like illness called *metal fume fever*.
- ▶ **Chromium** may cause a skin allergy and an asthma-like allergy
- ▶ Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- ▶ **Chromium** may affect the liver and kidneys.
- ▶ **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m³** averaged over a 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m³** averaged over an 8-hour workshift.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chromium**:

- ▶ Contact can irritate and burn the skin and eyes with possible eye damage.
- ▶ Inhaling **Chromium** can irritate the nose and throat causing coughing and wheezing.
- ▶ Exposure to **Chromium fumes** can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chromium** and can last for months or years:

Cancer Hazard

- ▶ While **Chromium** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

- ▶ There is no evidence that **Chromium** affects reproduction. This is based on test results presently available to the NJDHSS from published studies.

Other Effects

- ▶ Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- ▶ **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- ▶ **Chromium** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- ▶ Prolonged skin contact can cause burns, blisters and deep ulcers
- ▶ **Chromium** may affect the liver and kidneys.

Medical

Medical Testing

For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Lung function tests. The results may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Examine your skin periodically for little bumps or blisters, the first sign of "chrome ulcers." If not treated early, these can last for years after exposure.
- ▶ Evaluation by a qualified allergist can help diagnose skin allergy.
- ▶ Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Chromium**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Chromium powder** may be present, check to make sure that an explosive concentration does not exist.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Chromium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective material for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.5 mg/m³**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Chromium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **5 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **250 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **250 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn.
- ▶ **Chromium** in *powder* form is **FLAMMABLE** and a **DANGEROUS FIRE HAZARD**. It may also spontaneously explode in air.
- ▶ Use dry sand or dry chemical extinguishing agents to fight **Chromium powder** fires.
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE.**
- ▶ **CONTAINERS MAY EXPLODE IN FIRE.**
- ▶ **DO NOT** get water inside container.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chromium powder** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- ▶ Keep **Chromium powder** out of confined spaces, such as sewers, because of the possibility of an explosion.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Chromium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chromium** you should be trained on its proper handling and storage.

- ▶ **Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE.
- ▶ **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).
- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Chromium powder** is used, handled, or stored.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Right to Know Hazardous Substance Fact Sheet

Emergency
Responders
Quick Reference

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

CAS No: 7440-47-3

Molecular Formula: Cr

RTK Substance No: 0432

Description: Hard, gray, odorless solid with a metallic luster

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health 3 - Fire 0 - Reactivity DOT#: UN 3089 ERG Guide #: 170 Hazard Class: 4.1 (Flammable Solid)	Extinguish fire using an agent suitable for type of surrounding fire. Chromium itself does not burn. Chromium in powder form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air. Use dry sand or dry chemical extinguishing agents to fight Chromium powder fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water inside container.	Chromium may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE. Chromium is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Keep **Chromium** powder out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold: Odorless

Flash Point: Noncombustible solid, Flammable powder

Vapor Pressure: <0 mm Hg at 68°F (20°C) (approximate)

Specific Gravity: 7.2 (water = 1)

Water Solubility: Insoluble

Boiling Point: 4,788°F (2,642°C)

Melting Point: 3,452°F (1,900°C)

Molecular Weight: 52

EXPOSURE LIMITS

OSHA: 1 mg/m³, 8-hr TWA

NIOSH: 0.5 mg/m³, 8-hr TWA

ACGIH: 0.5 mg/m³, 8-hr TWA

IDLH: 250 mg/m³

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m³ PAC-3 = 250 mg/m³

PAC-2 = 2.5 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Nitrile or Natural Rubber

Coveralls: Tyvek®

Respirator: >0.5 mg/m³ - full facepiece APR with High efficiency filters
>1.5 mg/m³ - SCBA

HEALTH EFFECTS

Eyes: Irritation, burns and possible eye damage

Skin: Irritation, burns, itching, rash and skin ulcers

Inhalation: Nose and throat irritation with coughing and wheezing
Headache, fever and chills

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **CHRYSENE**

Synonyms: Benzo(a)phenanthrene

Chemical Name: Chrysene

Date: December 1999 Revision: June 2008

CAS Number: 218-01-9

RTK Substance Number: 0441

DOT Number: UN 3077

Description and Use

Chrysene is a colorless to white, crystalline solid which is used in research laboratories. It is most often found as the gaseous by-product from the incomplete combustion of fossil fuel, wood, *Coal Tar* and *Creosote*.

Reasons for Citation

- ▶ **Chrysene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	0	-
REACTIVITY	1	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE DOES NOT BURN		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Chrysene** can affect you when inhaled and by passing through the skin.
- ▶ **Chrysene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Chrysene** may irritate the nose and throat.
- ▶ If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect and permanent changes in skin pigment can occur
- ▶ **Chrysene** is almost always found in *Coal Tar Pitch*, *Creosote*, or other *Coal Tar Products*. If you work with *Coal, Tar, Soot, Pitch, Asphalt*, etc., you may be exposed to **Chrysene**.
- ▶ For more information, consult the *Right to Know Hazardous Substance Fact Sheets on COAL TAR PITCH, CREOSOTE and ANTHRACENE*.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m³** (as *Coal Tar Pitch Volatiles, Benzene-soluble fraction*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m³** (as *Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- ▶ **Chrysene** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chrysene**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Chrysene** may irritate the nose and throat causing coughing and wheezing.
- ▶ If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect can occur, sometimes with blisters.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chrysene** and can last for months or years:

Cancer Hazard

- ▶ **Chrysene** may be a CARCINOGEN in humans since it has been shown to cause skin, liver, and lung cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen. Such substance may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Chrysene** has not been tested for its ability to affect reproduction.

Other Effects

- ▶ Permanent changes in skin pigment can occur if contaminated skin is exposed to sunlight

Medical

Medical Testing

- ▶ There is no special test for this chemical. However, an exposed person should examine their skin periodically for growths, changes in warts or moles, and sores that do not heal. Skin cancer is easily cured when detected and treated early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Persons who smoke cigarettes and are exposed to **Chrysene** may be at increased risk for lung cancer. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a Class I, Type B, biological safety hood when mixing, handling, or preparing **Chrysene**.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Chrysene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile or Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as protective material for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.1 mg/m³** (as *Coal Tar Pitch Volatiles*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **80 mg/m³** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ DOES NOT BURN
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chrysene** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first or use a HEPA-filter vacuum for clean-up.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Chrysene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chrysene** you should be trained on its proper handling and storage.

- ▶ **Chrysene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Common Name: **CHRYSENE**

Synonyms: Benzo(a)phenanthrene

CAS No: 218-01-9

Molecular Formula: $C_{18}H_{12}$

RTK Substance No: 0441

Description: Colorless to white, crystalline solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 0 - Fire 1 - Reactivity DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	DOES NOT BURN Use dry chemical, CO ₂ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Chrysene is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

SPILL/LEAKS

Isolation Distance:
 Spill: 25 meters (75 feet)
 Fire: 800 meters (1/2 mile)
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up.
 DO NOT wash into sewer.
 May biodegrade in water.

PHYSICAL PROPERTIES

Odor Threshold: Unknown
Flash Point: Noncombustible
Vapor Pressure: 6.3 x 10.9 mm Hg at 68°F (20°C)
Specific Gravity: 1.27 (water = 1)
Water Solubility: Insoluble
Boiling Point: 838°F (448°C)
Melting Point: 491° to 493°F (255° to 256°C)
Ionization Potential: 7.59±0.2 eV
Molecular Weight: 228.3

EXPOSURE LIMITS

OSHA: 0.2 mg/m³, 8-hr TWA
NIOSH: 0.1 mg/m³, 10-hr TWA
ACGIH: Lowest level possible
IDLH: 80 mg/m³
 (All of the above as *Coal Tar Pitch Volatile*)

PROTECTIVE EQUIPMENT

Gloves: Nitrile or Natural Rubber
Coveralls: DuPont Tyvek®
Respirator: >0.1 mg/m³ - Supplied air
 >80 mg/m³ - SCBA

HEALTH EFFECTS

Eyes: Irritation
Skin: Irritation, rash or sunburn with blisters can occur if contaminated skin is exposed to sunlight
Inhalation: Nose and throat irritation with coughing and wheezing
Chronic: Cancer (skin, liver, lungs) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove contaminated clothing and wash contaminated skin with soap and water.
Transfer to a medical facility.

International Chemical Safety Cards

COPPER
ICSC: 0240

COPPER (powder) Cu Atomic mass: 63.5 CAS # 7440-50-8 RTECS # GL5325000 ICSC # 0240			
TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
• INHALATION	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from: see Chemical Dangers.		
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 0240		Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993	

International Chemical Safety Cards

COPPER
ICSC: 0240

	PHYSICAL STATE; APPEARANCE:		ROUTES OF EXPOSURE:
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I M P O R T A N T D A T A	<p>RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard.</p> <p>OCCUPATIONAL EXPOSURE LIMITS (OELs): TLV: ppm; 0.2 mg/m³ fume (ACGIH 1992-1993). TLV (as Cu, dusts & mists): ppm; 1 mg/m³ (ACGIH 1992-1993).</p>	<p>The substance can be absorbed into the body by inhalation and by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: Inhalation of fume may cause metal fever (see Notes).</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact may cause skin sensitization.</p>
PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C	Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA		
NOTES		
The symptoms of metal fume fever do not become manifest until several hours.		
ADDITIONAL INFORMATION		
ICSC: 0240	© IPCS, CEC, 1993	COPPER
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.	



Right to Know Hazardous Substance Fact Sheet

Common Name: **DIBENZ(a,h)ANTHRACENE**

Synonyms: 1,2,5,6-DBA; 1,2,5,6-Dibenzanthracene

Chemical Name: Dibenz[a,h]Anthracene

Date: August 2010

CAS Number: 53-70-3

RTK Substance Number: 0622

DOT Number: UN 3077

Description and Use

Dibenz(a,h)Anthracene is a colorless, white or light yellow, crystalline (sand-like) solid. It is used as a research chemical and is found bound to particulate matter in urban air, industrial emissions and cigarette smoke. **Dibenz(a,h)Anthracene** has not been produced in the United States since 1978.

Reasons for Citation

- ▶ **Dibenz(a,h)Anthracene** is on the Right to Know Hazardous Substance List because it is cited by DOT, NTP, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Dibenz(a,h)Anthracene** can affect you when inhaled.
- ▶ **Dibenz(a,h)Anthracene** should be handled as a CARCINOGEN and MUTAGEN--WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes. Prolonged or repeated contact can cause a skin rash, dryness and redness. Exposure to sunlight can greatly aggravate these effects.
- ▶ Exposure can irritate the nose and throat.
- ▶ Exposure to **Dibenz(a,h)Anthracene** can cause headache, dizziness, nausea and vomiting.
- ▶ **Dibenz(a,h)Anthracene** may affect the liver and kidneys.

Workplace Exposure Limits

No occupational exposure limits have been established for **Dibenz(a,h)Anthracene**. However, it may pose a health risk. Always follow safe work practices.

- ▶ **Dibenz(a,h)Anthracene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to

Dibenz(a,h)Anthracene:

- ▶ Contact can irritate the skin and eyes.
- ▶ Prolonged or repeated contact can cause a skin rash, dryness and redness. Exposure to sunlight can greatly aggravate these effects.
- ▶ Inhaling **Dibenz(a,h)Anthracene** can irritate the nose and throat causing coughing and wheezing.
- ▶ Exposure to **Dibenz(a,h)Anthracene** can cause headache, dizziness, nausea and vomiting.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Dibenz(a,h)Anthracene** and can last for months or years:

Cancer Hazard

- ▶ **Dibenz(a,h)Anthracene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes lung, skin, mammary, and other types of cancers.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ There is limited evidence that **Dibenz(a,h)Anthracene** may damage the developing fetus in animals.

Other Effects

- ▶ **Dibenz(a,h)Anthracene** may affect the liver and kidneys.

Medical

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Dibenz(a,h)Anthracene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a Class I, Type B, biological safety hood when mixing, handling, or preparing **Dibenz(a,h)Anthracene**.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Dibenz(a,h)Anthracene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective clothing material.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ At any detectable concentration, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P100 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Dibenz(a,h)Anthracene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Dibenz(a,h)Anthracene** may burn, but does not readily ignite.
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Dibenz(a,h)Anthracene** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Dibenz(a,h)Anthracene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Dibenz(a,h)Anthracene** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **Dibenz(a,h)Anthracene** is handled, used, or stored.
- ▶ **Dibenz(a,h)Anthracene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from SUNLIGHT.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Dibenz(a,h)Anthracene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **DIBENZ(a,h)ANTHRACENE**

Synonyms: 1,2,5,6-DBA; 1,2,5,6-Dibenzanthracene

CAS No: 53-70-3

Molecular Formula: C₂₂H₁₄

RTK Substance No: 0622

Description: Colorless, white or light yellow, crystalline solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 1 - Fire 0 - Reactivity DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	Dibenz(a,h)Anthracene may burn, but does not readily ignite. Use dry chemical, CO ₂ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Dibenz(a,h)Anthracene is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). Protect from SUNLIGHT.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

Dibenz(a,h)Anthracene may bioaccumulate in sea food.

PHYSICAL PROPERTIES

Vapor Pressure: 1 x 10⁻¹⁰ mm Hg at 68°F (20°C)

Specific Gravity: 1.28 (water = 1)

Water Solubility: Insoluble

Boiling Point: 975°F (524°C)

Melting Point: 511° to 513°F (266° to 267°C)

Molecular Weight: 278.36

EXPOSURE LIMITS

No occupational exposure limits have been established for **Dibenz(a,h)Anthracene**.

The Protective Action Criteria values are:

PAC-1 = 0.0025 mg/m³

PAC-2 = 0.015 mg/m³

PAC-3 = 15 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Nitrile and Natural Rubber

Coveralls: Tyvek®

Respirator: Full facepiece APR with P100 filters
>15 mg/m³ - SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation, skin rash, dryness and redness

Inhalation: Nose and throat irritation with coughing and wheezing

Headache, dizziness, nausea and vomiting

Chronic: Cancer (lung, skin, mammary) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ENDRIN**

CAS Number: 72-20-8
DOT Number: NA 2761

RTK Substance number: 0825
Date: August 1987 Revision: December 1998

HAZARD SUMMARY

- * **Endrin** can affect you when breathed in and by passing through your skin.
- * Contact can irritate the skin and eyes and may affect vision.
- * Breathing **Endrin** can irritate the nose and throat.
- * Exposure to **Endrin** can cause nausea, vomiting, diarrhea, loss of appetite, sweating and weakness.
- * Exposure can cause headache, lightheadedness, dizziness, convulsions (fits) and passing out. Lower exposure can affect concentration, memory and muscle coordination.
- * **Endrin** may damage the nervous system causing numbness, "pins and needles," and/or weakness in the hands and feet.
- * Repeated exposure may cause personality changes of depression, anxiety or irritability.
- * High or repeated exposure may damage the liver.

IDENTIFICATION

Endrin is a white, crystalline (sugar or sand-like), odorless solid. It is used as an insecticide and to kill rodents.

REASON FOR CITATION

- * **Endrin** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, HHAG and EPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **0.1 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over an 8-hour workshift.

- * **Endrin** may be a teratogen in humans. All contact with this chemical should be reduced to the lowest possible level.
- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Endrin** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Endrin** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Endrin**:

- * Contact can irritate the skin and eyes and may affect vision.
- * Breathing **Endrin** can irritate the nose and throat.
- * Exposure to **Endrin** can cause nausea, vomiting, diarrhea, loss of appetite, sweating and weakness.
- * Exposure can cause headache, lightheadedness, dizziness, convulsions (fits) and passing out. Lower exposure can affect concentration, memory and muscle coordination.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Endrin** and can last for months or years:

Cancer Hazard

- * There is no evidence that **Endrin** causes cancer in animals. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies.

Reproductive Hazard

- * **Endrin** may damage the developing fetus.

Other Long-Term Effects

- * **Endrin** may damage the nervous system causing numbness, "pins and needles," and/or weakness in the hands and feet.
- * Repeated exposure may cause personality changes of depression, anxiety or irritability.
- * High or repeated exposure may damage the liver.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

- * Exam of the nervous system.
- * Electroencephalogram (a test for abnormal seizure activity).
- * Blood **Endrin** level.
- * Liver function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Endrin** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Endrin** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Endrin**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Endrin**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Endrin**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Endrin** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Endrin**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * For field applications check with your supervisor and your safety equipment supplier regarding the appropriate respiratory equipment.
- * Where the potential exists for exposure over 0.1 mg/m^3 , use a MSHA/NIOSH approved full facepiece respirator with an organic vapor cartridge and particulate prefilters. Increased protection is obtained from full facepiece powered-air purifying respirators.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Endrin**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to 2 mg/m^3 is immediately dangerous to life and health. If the possibility of exposure above 2 mg/m^3 exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.
- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Disease and Injury Services
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Disease and Injury Services, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Material Safety Data Sheet

Ethyl Benzene

ACC# 08780

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethyl Benzene**Catalog Numbers:** O2751 1, O2751-1, O27511**Synonyms:** Ethylbenzol; Phenylethane**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
100-41-4	Ethylbenzene	100	202-849-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 21 deg C.

Warning! Causes eye irritation. **Flammable liquid and vapor.** Causes skin irritation. May be absorbed through intact skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Causes digestive and respiratory tract irritation. May cause central nervous system depression.

Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes moderate eye irritation. Vapors may cause eye irritation.

Skin: Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Contact with the liquid may cause erythema (redness), exfoliation and vesiculation (blistering).

Ingestion: May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.

Chronic: Chronic inhalation may cause effects similar to those of acute inhalation.

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. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and 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.

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: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. 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: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.

Flash Point: 21 deg C (69.80 deg F)

Autoignition Temperature: 810 deg F (432.22 deg C)

Explosion Limits, Lower:0.8

Upper: 6.7

NFPA Rating: (estimated) Health: 3; Flammability: 4; 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. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a

tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: 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
Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m ³ TWA 800 ppm IDLH	100 ppm TWA; 435 mg/m ³ TWA

OSHA Vacated PELs: Ethylbenzene: 100 ppm TWA; 435 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 and clothing to prevent skin exposure.

Clothing: Wear appropriate protective gloves and 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: Liquid

Appearance: clear, colorless

Odor: aromatic odor

pH: Not available.

Vapor Pressure: 7.1 mm Hg @ 20 C

Vapor Density: 3.7

Evaporation Rate: <1 (butyl acetate=1)

Viscosity: 0.63 mPa s 20 C

Boiling Point: 277 deg F

Freezing/Melting Point: -139 deg F

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: 0.9

Molecular Formula: C₈H₁₀

Molecular Weight: 106.07

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials: Oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 100-41-4: DA0700000

LD50/LC50:

CAS# 100-41-4:

Draize test, rabbit, eye: 500 mg Severe;
 Inhalation, mouse: LC50 = 35500 mg/m³/2H;
 Inhalation, rat: LC50 = 55000 mg/m³/2H;
 Oral, rat: LD50 = 3500 mg/kg;
 Oral, rat: LD50 = 3500 mg/kg;
 Skin, rabbit: LD50 = 17800 uL/kg;

Oral, rat: LD50 = 5.46

Carcinogenicity:

CAS# 100-41-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

Epidemiology: No information found**Teratogenicity:** No information found**Reproductive Effects:** No information found**Mutagenicity:** Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.**Neurotoxicity:** No information found**Other Studies:**

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: 14.0 mg/L; 96 Hr.; StaticFish: Fathead Minnow: 12.1 mg/L; 96 Hr.; Flow-throughFish: Bluegill/Sunfish: LC50 =150.0 mg/L; 96 Hr.; Flow-throughWater flea EC50 =2.1 mg/L; 48 Hr.; StaticBacteria: EC50 =9.8 mg/L; 30 minutes; Micotox TestWater flea EC50 =75.0 mg/L; 48 minutes; Static, pH6.7-8.1, 72.0 mg/L CaCO₃ Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.

Environmental: Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow= 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164

Physical: The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.

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: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ETHYLBENZENE	ETHYL BENZENE
Hazard Class:	3	3
UN Number:	UN1175	UN1175
Packing Group:	II	II
Additional Info:		FLASHPOINT 15C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 100-41-4 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97

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.

CERCLA Hazardous Substances and corresponding RQs

CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 100-41-4: immediate, delayed, fire.

Section 313

This material contains Ethylbenzene (CAS# 100-41-4, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 100-41-4 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:

CAS# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 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# 100-41-4 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 Ethylbenzene, a chemical known to the state of California to cause cancer.

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:

XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.

WGK (Water Danger/Protection)

CAS# 100-41-4: 1

Canada - DSL/NDSL

CAS# 100-41-4 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

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# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/28/1999

Revision #4 Date: 10/03/2005

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.

Material Safety Data Sheet

Fluoranthene, 93%

ACC# 01667

Section 1 - Chemical Product and Company Identification

MSDS Name: Fluoranthene, 93%**Catalog Numbers:** AC345980000, AC345980010, AC345982500**Synonyms:****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
206-44-0	Fluoranthene	93%	205-912-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Not available.

Target Organs: None known.

Potential Health Effects

Eye: May cause eye irritation.**Skin:** May cause skin irritation.**Ingestion:** Harmful if swallowed. May cause irritation of the digestive tract.**Inhalation:** May cause respiratory tract irritation.**Chronic:** Not available.

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. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.**Ingestion:** Get medical aid. Wash mouth out with water.**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: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.

Flash Point: > 100 deg C (> 212.00 deg F)

Autoignition Temperature: Not available.

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.

Section 7 - Handling and Storage

Handling: Avoid breathing dust, mist, or vapor. Avoid contact with skin and eyes.

Storage: Store in a cool, dry place. Store in a tightly closed container.

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
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs: Fluoranthene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Not available.

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

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Section 9 - Physical and Chemical Properties

Physical State: Crystalline powder

Appearance: yellow

Odor: odorless

pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 380 - 34.0 deg C @
Freezing/Melting Point: 109.00 - 111
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula: C₁₆H₁₀
Molecular Weight: 202.07

Section 10 - Stability and Reactivity

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

Section 11 - Toxicological Information

RTECS#:

CAS# 206-44-0: LL4025000

LD50/LC50:

CAS# 206-44-0:

Oral, rat: LD50 = 2 gm/kg;

Skin, rabbit: LD50 = 3180 mg/kg;

Carcinogenicity:

CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Mutagenicity: No data available.

Neurotoxicity: No data available.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.

Environmental: No information available.

Physical: No information available.

Other: Biodegradable.

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.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	No information available.
Hazard Class:	XCP	
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 206-44-0 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# 206-44-0: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 206-44-0: immediate.

Section 313

This material contains Fluoranthene (CAS# 206-44-0, 93%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

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

CAS# 206-44-0 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.

OSHA:

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

STATE

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

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:**

XN

Risk Phrases:

R 22 Harmful if swallowed.

Safety Phrases:**WGK (Water Danger/Protection)**

CAS# 206-44-0: No information available.

Canada - DSL/NDSL

CAS# 206-44-0 is listed on Canada's NDSL List.

Canada - WHMIS

WHMIS: Not available.

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# 206-44-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 10/27/1999

Revision #4 Date: 3/28/2008

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.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **FLUORENE**

CAS Number: 86-73-7
DOT Number: None

RTK Substance number: 2993
Date: May 1999

HAZARD SUMMARY

- * **Fluorene** can affect you when breathed in.
- * **Fluorene** can irritate and burn the eyes and skin.

IDENTIFICATION

Fluorene is white crystalline plates. It is used in resinous products, dyestuffs, and as a chemical intermediate.

REASON FOR CITATION

- * **Fluorene** is on the Hazardous Substance List because it is cited by HHAG and EPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for **Fluorene**. This does not mean that this substance is not harmful. Safe work practices should always be followed.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Fluorene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Fluorene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Fluorene**:

- * **Fluorene** can irritate and burn the eyes and skin.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Fluorene** and can last for months or years:

Cancer Hazard

- * **Fluorene** has been tested but further studies are required to determine its ability to cause cancer.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Fluorene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * No chronic (long-term) health effects are known at this time.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Fluorene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Fluorene** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Fluorene**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Fluorene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Fluorene**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Fluorene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Fluorene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Fluorene**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/coh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **HEXACHLOROBENZENE**

CAS Number: 118-74-1
DOT Number: UN 2729

RTK Substance number: 0978
Date: November 1988 Revision: July 2001

HAZARD SUMMARY

- * **Hexachlorobenzene** can affect you when breathed in and may be absorbed through the skin.
- * **Hexachlorobenzene** should be handled as a **CARCINOGEN--WITH EXTREME CAUTION**.
- * Contact can irritate the skin and eyes.
- * Breathing **Hexachlorobenzene** can irritate the nose and throat.
- * **Hexachlorobenzene** may damage the liver and kidneys and affect the thyroid.
- * High or repeated exposure may damage the nervous system and can cause irritability, muscle weakness, tremors, seizures and/or a feeling of "pins and needles" on the skin.
- * Repeated exposure can cause permanent skin changes, such as changes in pigment and skin thickening.

IDENTIFICATION

Hexachlorobenzene is a white, needle-like solid. It is used as a wood preservative and a fungicide for treating seeds.

REASON FOR CITATION

- * **Hexachlorobenzene** is on the Hazardous Substance List because it is cited by ACGIH, DOT, NTP, DEP, IARC, HHAG and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

ACGIH: The recommended airborne exposure limit is **0.002 mg/m³** averaged over an 8-hour workshift.

- * **Hexachlorobenzene** may be a **CARCINOGEN** in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * The above exposure limit is for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limit listed above.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Hexachlorobenzene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Hexachlorobenzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Hexachlorobenzene**:

- * Contact can irritate the skin and eyes.
- * Breathing **Hexachlorobenzene** can irritate the nose and throat.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Hexachlorobenzene** and can last for months or years:

Cancer Hazard

- * **Hexachlorobenzene** may be a CARCINOGEN in humans since it has been shown to cause liver and thyroid gland cancers in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- * **Hexachlorobenzene** may damage the developing fetus.

Other Long-Term Effects

- * **Hexachlorobenzene** may damage the liver and kidneys and affect the thyroid.
- * High or repeated exposure may damage the nervous system and can cause irritability, difficulty with walking and coordination, muscle weakness, tremors, seizures and/or a feeling of "pins and needles" on the skin.
- * Repeated exposure can cause permanent skin changes, such as changes in pigment, skin thickening, easy wrinkling, skin scarring, fragile skin, and increased hair growth.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

- * Liver and kidney function tests.
- * Thyroid function tests.
- * Exam of the nervous system.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * *Iron* as a dietary supplement could increase liver damage caused by **Hexachlorobenzene**. Consult your physician before taking *Iron* supplements.

Conditions Made Worse By Exposure

- * Sunlight will worsen the effects of **Hexachlorobenzene** on your skin.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Hexachlorobenzene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Hexachlorobenzene** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Hexachlorobenzene**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Hexachlorobenzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Hexachlorobenzene**, whether or not known skin contact has occurred.

- * Do not eat, smoke, or drink where **Hexachlorobenzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Hexachlorobenzene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * For field applications check with your supervisor and your safety equipment supplier regarding the appropriate respiratory equipment.
- * Where the potential exists for exposure over **0.002 mg/m³**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
 A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
 A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
 A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
 A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
 A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Don't all chemicals cause cancer?
 A: No. Most chemicals tested by scientists are not cancer-causing.
- Q: Should I be concerned if a chemical causes cancer in animals?
 A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
 A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.
- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **INDENO (1,2,3-cd) PYRENE**

CAS Number: 193-39-5

DOT Number: UN 3077

DOT Hazard Class: 9 (Environmentally Hazardous
Substance)

RTK Substance number: 3052

Date: May 2000 Revision: March 2007

HAZARD SUMMARY

- * **Indeno (1,2,3-cd) Pyrene** can affect you when breathed in and may be absorbed through the skin.
- * **Indeno (1,2,3-cd) Pyrene** is a **CARCINOGEN--HANDLE WITH EXTREME CAUTION.**
- * No acute (short-term) health effects are known at this time.

IDENTIFICATION

Indeno (1,2,3-cd) Pyrene is a yellow plate or needle-shaped solid. It is a research chemical and a component of gasoline engine exhaust and tobacco smoke. There is no commercial production or known use of this compound.

REASON FOR CITATION

- * **Indeno (1,2,3-cd) Pyrene** is on the Hazardous Substance List because it is cited by DOT, NTP, DEP, IARC, IRIS and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for **Indeno (1,2,3-cd) Pyrene**. This does not mean that this substance is not harmful. Safe work practices should always be followed.

- * **Indeno (1,2,3-cd) Pyrene** may be a **CARCINOGEN** in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * It should be recognized that **Indeno (1,2,3-cd) Pyrene** can be absorbed through your skin, thereby increasing your exposure.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Indeno (1,2,3-cd) Pyrene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Indeno (1,2,3-cd) Pyrene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Indeno (1,2,3-cd) Pyrene**:

- * No acute (short-term) health effects are known at this time.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Indeno (1,2,3-cd) Pyrene** and can last for months or years:

Cancer Hazard

- * **Indeno (1,2,3-cd) Pyrene** may be a CARCINOGEN in humans since it has been shown to cause skin and lung cancer in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Indeno (1,2,3-cd) Pyrene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * **Indeno (1,2,3-cd) Pyrene** has not been tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer **Indeno (1,2,3-cd) Pyrene** from drums or other storage containers to process containers.
- * A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Indeno (1,2,3-cd) Pyrene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Indeno (1,2,3-cd) Pyrene** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Indeno (1,2,3-cd) Pyrene**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Indeno (1,2,3-cd) Pyrene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Indeno (1,2,3-cd) Pyrene**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Indeno (1,2,3-cd) Pyrene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP**.
- * When vacuuming, a high efficiency particulate air (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Indeno (1,2,3-cd) Pyrene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Eye protection is included in the recommended respiratory protection.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- * At any exposure level, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **IRON OXIDE**

CAS Number: 1309-37-1

DOT Number: None

DOT Hazard Class: None

RTK Substance number: 1036

Date: August 1998 Revision: May 2007

HAZARD SUMMARY

- * **Iron Oxide** can affect you when breathed in.
- * Exposure to **Iron Oxide fumes** can cause metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough.
- * Prolonged or repeated contact can discolor the eyes causing permanent *Iron* staining.
- * Repeated exposure to **Iron Oxide fume** or *dust* can cause pneumoconiosis (*Siderosis*) with cough, shortness of breath and changes on chest x-ray.
- * **Iron Oxide** as *Ferric Oxide* (Fe_2O_3) is not combustible, unless finely powdered. However, *Ferrous Oxide* (FeO) is extremely flammable and reactive, and may ignite spontaneously in air.

IDENTIFICATION

Iron Oxide is a black crystal or a reddish-brown powder. It is used in polishing compounds, pigments, and metallurgy. **Iron Oxide fume** is produced when materials containing *Iron* are heated, as in arc welding. DOT number UN 1376 refers to *Ferrous Oxide* (FeO), *Iron Oxide (Spent)* or *Iron Sponge*. *Ferrous Oxide* (FeO) may be formed in *Oxygen*-limited atmospheres, in flue gas, and from coal gas purification. *Iron Oxide (Spent)* or *Iron Sponge* is produced when *Iron Ore* is heated below the melting point of *Iron*. With further processing, they become *Wrought Iron*.

REASON FOR CITATION

- * **Iron Oxide** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH and IARC.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for **Iron Oxide** (measured as *Iron*):

- OSHA: The legal airborne permissible exposure limit (PEL) is **10 mg/m³** averaged over an 8-hour workshift.
- NIOSH: The recommended airborne exposure limit is **5 mg/m³** averaged over a 10-hour workshift.
- ACGIH: The recommended airborne exposure limit is **5 mg/m³** (as the *respirable fraction*) averaged over an 8-hour workshift.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Iron Oxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. Consult the appropriate New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheets.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Iron Oxide**:

- * Exposure to **Iron Oxide fumes** can cause metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Iron Oxide** and can last for months or years:

Cancer Hazard

- * While **Iron Oxide** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Iron Oxide** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * Prolonged or repeated contact can discolor the eyes, causing permanent *Iron* staining.
- * Repeated exposure to **Iron Oxide fume** or *dust* can cause pneumoconiosis (*Siderosis*) with cough, shortness of breath and changes on chest x-ray.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- * Lung function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- * Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer **Iron Oxide** from drums or other storage containers to process containers.
- * Before entering a confined space where *Ferrous Oxide* (FeO) may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Iron Oxide** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Iron Oxide**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Iron Oxide**, immediately wash or shower to remove the chemical.

- * Do not eat, smoke, or drink where **Iron Oxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Iron Oxide**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- * Where the potential exists for exposure over **5 mg/m³** (as *Iron*), use a NIOSH approved air-purifying particulate filter respirator with a N95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Iron Oxide**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential exists for exposure over **50 mg/m³** (as *Iron*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **2,500 mg/m³** (as *Iron*) is immediately dangerous to life and health. If the possibility of exposure above **2,500 mg/m³** (as *Iron*) exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Material Safety Data Sheet

p-Cymene, 98%

ACC# 95901

Section 1 - Chemical Product and Company Identification

MSDS Name: p-Cymene, 98%**Catalog Numbers:** AC111760000, AC111760010, AC111760025, AC111762500**Synonyms:** Dolcymene; p-isopropyltoluene; isopropyl methylbenzene**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
99-87-6	P-CYMENE	98	202-796-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 47 deg C.

Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. May be absorbed through intact skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system effects.

Target Organs: Central nervous system.

Potential Health Effects

Eye: May cause eye irritation.**Skin:** Causes skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May be absorbed through the skin.**Ingestion:** May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.**Inhalation:** Causes respiratory tract irritation. May cause narcotic effects in high concentration. May cause drowsiness, unconsciousness, and central nervous system depression.**Chronic:** Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis.

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: 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: 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. Possible aspiration hazard. Get medical aid immediately.

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. Vapors can travel to a source of ignition and flash back. Containers may explode in the heat of a fire. Flammable liquid and vapor.

Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be ineffective. Use water spray, dry chemical, carbon dioxide, or chemical foam.

Flash Point: 47 deg C (116.60 deg F)

Autoignition Temperature: 435 deg C (815.00 deg F)

Explosion Limits, Lower: .70 vol %

Upper: 5.60 vol %

NFPA Rating: 1 - health, 2 - flammability, 0 - instability

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. Remove all sources of ignition.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

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
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P-CYMENE

none listed

none listed

none listed

OSHA Vacated PELs: P-CYMENE: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

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

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

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

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear, colorless

Odor: Lemon-type

pH: Not available.

Vapor Pressure: 1 mm Hg @17.3C

Vapor Density: 4.62 (air=1)

Evaporation Rate:Not available.

Viscosity: Not available.

Boiling Point: 176 - 178 deg C @ 760.00mm Hg

Freezing/Melting Point:-68 deg C

Decomposition Temperature:Not available.

Solubility: practically insoluble in water

Specific Gravity/Density:.8600g/cm³

Molecular Formula:C₁₀H₁₄

Molecular Weight:134.22

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials: Strong oxidizing agents

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 99-87-6: GZ5950000

LD50/LC50:

CAS# 99-87-6:

Draize test, rabbit, skin: 500 mg/24H Moderate;

Inhalation, mouse: LC50 = 19500 mg/m³;

Oral, mouse: LD50 = 1695 mg/kg;

Oral, rat: LD50 = 4750 mg/kg;

Oral, rat: LD50 = 3669 mg/kg;

Carcinogenicity:

CAS# 99-87-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Mutagenicity: Genotoxicity: see The Dictionary of Substances and their Effects, 1992

Neurotoxicity: No information available.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Bioaccumulation: Readily biodegradable Abiotic removal: Evaporation rate relative to n-butyl-acetate which has been assigned a value of 1 at 25°C is 0.14 (The Dictionary of Substances and their Effects, 1992)

Environmental: No information available.

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: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CYMENES	No information available.
Hazard Class:	3	
UN Number:	UN2046	
Packing Group:	III	

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 99-87-6 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

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 99-87-6: immediate, fire.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

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

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

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

STATE

CAS# 99-87-6 can be found on the following state right to know lists: Pennsylvania, Massachusetts.

California Prop 65

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:**

XI F

Risk Phrases:

R 10 Flammable.

R 37/38 Irritating to respiratory system and skin.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

WGK (Water Danger/Protection)

CAS# 99-87-6: No information available.

Canada - DSL/NDSL

CAS# 99-87-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.

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

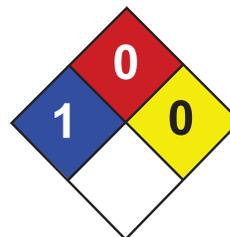
CAS# 99-87-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997

Revision #4 Date: 11/20/2008

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.



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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

Serious Skin Contact: Not available.

Inhalation:

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

Serious Inhalation: Not available.

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.05 (mg/m³) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m³) from OSHA (PEL) [United States] TWA: 0.03 (mg/m³) from NIOSH [United States] TWA: 0.05 (mg/m³) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:

Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungs by mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually absorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, delirium, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead colic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:

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

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 06/09/2012 12:00 PM

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Right to Know Hazardous Substance Fact Sheet

Common Name: **MAGNESIUM**

Synonyms: None

Chemical Name: Magnesium

Date: September 1999 Revision: June 2008

CAS Number: 7439-95-4

RTK Substance Number: 1136

DOT Number: UN 1869
UN 1418 (Powder)

Description and Use

Magnesium is a light, silvery-white metal which can be in the form of a gray powder, thin sheet or chip. It is used in making structural metals, die-cast auto parts, missiles, precision instruments and optical mirrors, flashbulbs, flares, pyrotechnics, and batteries.

Reasons for Citation

- ▶ **Magnesium** is on the Right to Know Hazardous Substance List because it is cited by DOT and NFPA.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	1	0
FLAMMABILITY	-	1
REACTIVITY	-	1

MAY SPONTANEOUSLY IGNITE
POISONOUS GASES ARE PRODUCED IN FIRE
DO NOT USE WATER, CO₂, FOAM OR HALOGENATED AGENTS

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Magnesium dust or fume** can affect you when inhaled.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Magnesium** can irritate the nose, throat and lungs.
- ▶ Exposure to **Magnesium** may cause a flu-like illness called "metal fume fever."
- ▶ Repeated exposure to the *dust* can cause **Magnesium** to accumulate in the body. This will cause an upset stomach.
- ▶ **Magnesium POWDER, SHEETS and CHIPS** may SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.

Workplace Exposure Limits

The following exposure limits are for *Magnesium Oxide*:

OSHA: The legal airborne permissible exposure limit (PEL) is **15 mg/m³** (as *total particulate*) averaged over an 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **10 mg/m³** (as the *inhalable fraction*) averaged over an 8-hour workshift.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Magnesium**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Magnesium** can irritate the nose, throat and lungs causing tightness in the chest and/or difficulty in breathing.
- ▶ Exposure to **Magnesium** may cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Magnesium** and can last for months or years:

Cancer Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Magnesium** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Magnesium** has not been tested for its ability to affect reproduction.

Other Effects

- ▶ Repeated exposure to the *dust* can cause **Magnesium** to accumulate in the body. This will cause an upset stomach.

Medical

Medical Testing

There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Magnesium powder** may be present, check to make sure that an explosive concentration does not exist.
- ▶ Use a vacuum for **Magnesium powder** to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Magnesium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **10 mg/m³** (as *Magnesium Oxide*), use a NIOSH approved air-purifying, particulate filter respirator with an N95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Magnesium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **100 mg/m³** (as *Magnesium Oxide*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **750 mg/m³** (as *Magnesium Oxide*) is immediately dangerous to life and health. If the possibility of exposure above **750 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Magnesium POWDER, SHEETS and CHIPS** may SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.
- ▶ Use Class D fire extinguishers or dry sand, clay, graphite, or limestone to fight fires.
- ▶ DO NOT USE WATER, CO₂, foam or halogenated extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.
- ▶ CONTAINERS MAY EXPLODE IN FIRE.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Magnesium** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum, and deposit in sealed containers.
- ▶ DO NOT USE WATER OR WET METHOD.
- ▶ Ventilate area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Magnesium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Magnesium** you should be trained on its proper handling and storage.

- ▶ *Finely divided Magnesium* reacts with WATER, MOISTURE, STEAM and ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable and explosive *Hydrogen gas*.
- ▶ *Finely divided Magnesium* ignites on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and AMMONIA; and reacts vigorously or explosively (and may form explosive compounds) with ACETYLENIC COMPOUNDS (such as ACETYLENE and ETHYLENE OXIDE); HALOCARBONS (such as CHLOROFORM and CHLOROMETHANE); AMMONIA NITRATE; CARBONATES; ARSENIC; METAL OXIDES; METAL SULFATES; OXYGEN; METAL CYANIDES; PHOSPHATES, and many other substances.
- ▶ **Magnesium** is AIR and MOISTURE sensitive.
- ▶ Store in tightly closed containers in a cool, well-ventilated area and protect from SHOCK and FRICTION.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Magnesium** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.
- ▶ Use explosion-proof electrical equipment and fittings wherever **Magnesium** is used, handled, manufactured, or stored.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **Magnesium**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

The Right to Know Hazardous Substance Fact Sheets are not intended to be copied and sold for commercial purposes.

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Common Name: **MAGNESIUM**

Synonyms: None
 CAS No: 7439-95-4
 Molecular Formula: Mg
 RTK Substance No: 1136

Description: Light, silvery-white metal which can be in the form of a gray powder, thin sheet or chip

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
1 - Health 1 - Fire 1 - Reactivity DOT#: UN 1869 UN 1418 (powder) ERG Guide #: 138 Hazard Class: 4.1 and 4.3 UN 1869 (Flammable) UN 1418 (Water Reactive)	<p>Magnesium POWDER, SHEETS and CHIPS MAY SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.</p> <p>Use Class D fire extinguishers or dry sand, clay, graphite, or limestone to fight fires.</p> <p>DO NOT USE WATER, CO₂, foam or halogenated extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.</p>	<p><i>Finely divided Magnesium</i> reacts with WATER, MOISTURE, STEAM and ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable and explosive <i>Hydrogen gas</i>.</p> <p><i>Finely divided Magnesium</i> ignites on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and AMMONIA; and reacts vigorously or explosively (and may form explosive compounds) with ACETYLENIC COMPOUNDS (such as ACETYLENE and ETHYLENE OXIDE); HALOCARBONS (such as CHLOROFORM and CHLOROMETHANE); AMMONIA NITRATE; CARBONATES; ARSENIC; METAL OXIDES; METAL SULFATES; OXYGEN; METAL CYANIDES; PHOSPHATES, and many other substances.</p> <p>Magnesium is AIR and MOISTURE sensitive.</p>

SPILL/LEAKS

Isolation Distance:
 Spills: 25 meters (75 feet)
 Fires: 800 meters (1/2 mile)
 Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum, and deposit in sealed containers.
 DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold: Odorless
Flash Point: Flammable powder
Auto Ignition Temp: 883°F (473°C)
Vapor Density: 1.7 (air = 1)
Vapor Pressure: 1 mm Hg at 1,149°F (621°C)
Specific Gravity: 1.74 (water = 1)
Water Solubility: Insoluble, Reactive
Boiling Point: 2,012°F (1,100°C)
Molecular Weight: 24.3

EXPOSURE LIMITS

OSHA: 15 mg/m³, 8-hr TWA
NIOSH: None
ACGIH: 10 mg/m³, 8-hr TWA
IDLH: 750 mg/m³
 All of the above are for *Magnesium Oxide*

PROTECTIVE EQUIPMENT

Gloves: Nitrile and Natural Rubber
Coveralls: DuPont Tyvek®
Respirator: >10 mg/m³ - APR with High efficiency filter
 >100 mg/m³ - Supplied air

HEALTH EFFECTS

Eyes: Irritation
Skin: Irritation
Inhalation: Nose, throat and lung irritation with coughing and difficulty in breathing
 Headache, fever and chills, chest tightness

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove contaminated clothing and wash contaminated skin with soap and water.
Transfer to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **MANGANESE**

Synonyms: Colloidal Manganese

Chemical Name: Manganese

Date: January 2007 Revision: January 2012

CAS Number: 7439-96-5

RTK Substance Number: 1155

DOT Number: UN 3089

Description and Use

Manganese is a naturally occurring metal found in rocks. Pure **Manganese** is a silver or grey-white, brittle solid. It is used in making steel and alloying metals, and as a catalyst, gasoline additive, animal feed supplement and component of some fertilizers.

Reasons for Citation

- ▶ **Manganese** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	3 (powder)	-
REACTIVITY	1	-
FLAMMABLE POWDER OR DUST POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Manganese** can affect you when inhaled.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Manganese** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure to **Manganese** can cause a flu-like illness called "metal fume fever."
- ▶ Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance, mood and personality, loss of facial expressions, poor muscle coordination, muscle cramps, twitching and tremors. The later symptoms are identical to Parkinson's disease.
- ▶ Prolonged or repeated exposure can lead to permanent lung damage.
- ▶ **Manganese** may affect the liver and may cause anemia.
- ▶ **Manganese powder** and **dust** are FLAMMABLE and DANGEROUS FIRE HAZARDS.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **5 mg/m³**, not to be exceeded at any time.

NIOSH: The recommended airborne exposure limit (REL) is **1 mg/m³** averaged over a 10-hour workshift and **3 mg/m³**, not to be exceeded during any 5-minute work period.

ACGIH: The threshold limit value (TLV) is **0.2 mg/m³** (as the *inhalable fraction*) and **0.02 mg/m³** (as the *respirable fraction*) averaged over an 8-hour workshift.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Manganese**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Manganese** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure to **Manganese** can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Manganese** and can last for months or years:

Cancer Hazard

- ▶ While **Manganese** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

- ▶ **Manganese** may damage the testes (male reproductive glands) and may decrease fertility in males.

Other Effects

- ▶ Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance, mood and personality, loss of facial expressions, poor muscle coordination, muscle cramps, twitching and tremors. The later symptoms are identical to Parkinson's disease.
- ▶ Prolonged or repeated exposure can lead to permanent lung damage.
- ▶ **Manganese** may affect the liver and may cause anemia.

Medical

Medical Testing

For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Exam of the nervous system
- ▶ Chest x-ray and lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Liver function tests
- ▶ Complete blood count
- ▶ Evaluate for brain effects such as changes in memory, concentration, sleeping patterns and mood (especially irritability and social withdrawal), as well as for headaches and fatigue. Consider evaluations of the cerebellar, autonomic and peripheral nervous systems. Positive and borderline individuals should be referred for neuropsychological testing.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Manganese**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Manganese powder** and *dust* may be present, check to make sure that an explosive concentration does not exist.
- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Manganese**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ The recommended glove materials for **Manganese** are Nitrile and Neoprene.
- ▶ The recommended protective clothing material for **Manganese** is Tyvek®, or the equivalent.

- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear direct vent goggles when airborne particles or dust are present.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- ▶ Where the potential exists for exposure over **0.02 mg/m³** (as the *respirable fraction*) or **0.2 mg/m³** (as the *inhalable fraction*), use a negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Manganese**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential for high exposure exists, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- ▶ Exposure to **500 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **500 mg/m³** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Manganese powder** and *dust* are FLAMMABLE and DANGEROUS FIRE HAZARDS.
- ▶ Use sand or dry chemicals appropriate for extinguishing metal fires.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Manganese Oxides*.
- ▶ **Manganese powder** and *dust* may form an ignitable vapor/air mixture in closed tanks or containers.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Manganese** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Manganese** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Manganese** you should be trained on its proper handling and storage.

- ▶ *Finely divided Manganese dust* can ignite spontaneously in AIR.
- ▶ **Manganese** reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and slowly with WATER or STEAM, to produce flammable and explosive *Hydrogen gas*.
- ▶ **Manganese** may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN DIOXIDE; PHOSPHORUS; and SULFUR DIOXIDE to cause ignition and/or violent decomposition.
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from WATER and MOISTURE.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Manganese powder** is used, handled, or stored.
- ▶ Ground and bond containers when transferring **Manganese powder**.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **Manganese powder**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
 are not intended to be copied and sold
 for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **MANGANESE**

Synonyms: Colloidal Manganese

CAS No: 7439-96-5

Molecular Formula: Mn

RTK Substance No: 1155

Description: Pure **Manganese** is a silver or grey-white, brittle solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p>2- Health</p> <p>3 (powder)- Fire</p> <p>1- Reactivity</p> <p>DOT#: UN 3089</p> <p>ERG Guide #: 170</p> <p>Hazard Class: 4.1 (Flammable solid)</p>	<p>Manganese powder and dust are FLAMMABLE and DANGEROUS FIRE HAZARDS.</p> <p>Use sand or dry chemicals appropriate for extinguishing metal fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Manganese Oxides</i>.</p> <p>Manganese powder and dust may form an ignitable vapor/air mixture in closed tanks or containers.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><i>Finely divided Manganese dust</i> can ignite spontaneously in AIR.</p> <p>Manganese reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and slowly with WATER or STEAM, to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p>Manganese may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN DIOXIDE; PHOSPHORUS; and SULFUR DIOXIDE to cause ignition and/or violent decomposition.</p>

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Ground and bond containers when transferring **Manganese powder**.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

Manganese may be hazardous to the environment, especially to aquatic organisms.

PHYSICAL PROPERTIES

Flash Point: Flammable *powder and dust*

Auto Ignition Temp: 842°F (450°C) (*Dust*)

Vapor Pressure: 0 mm Hg at 68°F (20°C)

Specific Gravity: 7.2 (water = 1)

Water Solubility: Insoluble

Boiling Point: 3,564°F (1,962°C)

Melting Point: 2,271°F (1,244°C)

Molecular Weight: 54.9

EXPOSURE LIMITS

OSHA: 5 mg/m³, Ceiling

NIOSH: 1 mg/m³, 8-hr TWA; 3 mg/m³, STEL

ACGIH: 0.2 mg/m³ (*inhalable*); 0.02 mg/m³ (*respirable*), 8-hr TWA

IDLH: 500 mg/m³

The Protective Action Criteria values are:

PAC-1 = 3 mg/m³ PAC-2 = 5 mg/m³ PAC-3 = 500 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Nitrile and Neoprene

Coveralls: Tyvek®

Use turn out gear or flash protection if ignition/fire is the greatest hazard.

Respirator: Spill - full facepiece APR with *P100 filters*
Fire - SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation

Inhalation: Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, fever and chills, aches, chest tightness and cough ("*metal fume fever*")

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary. Transfer promptly to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS**

Synonyms: Colloidal Mercury; Quicksilver

Chemical Name: Mercury

Date: May 2009

Revision: November 2009

CAS Number: 7439-97-6

RTK Substance Number: 1183

DOT Number: UN 2809

Description and Use

Mercury is a heavy, silvery, liquid metal. It is used for gold recovery and in dental amalgams, thermometers, barometers and other gauges, and in dry cell batteries.

Reasons for Citation

- ▶ **Mercury** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	0	-
REACTIVITY	0	-
CORROSIVE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Mercury** can affect you when inhaled and may be absorbed through the skin.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Mercury** can irritate the nose, throat and lungs.
- ▶ Exposure can cause metallic taste in the mouth, nausea and vomiting, and abdominal pain.
- ▶ **Mercury** may cause a skin allergy and make the skin turn gray.
- ▶ Repeated exposure can cause *Mercury poisoning* with tremors, personality changes, trouble remembering and concentrating, and gum problems.
- ▶ **Mercury** may damage the kidneys.
- ▶ **Mercury** is a DOT CORROSIVE material.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.1 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.05 mg/m³** (as **Mercury vapor**) averaged over a 10-hour workshift and **0.1 mg/m³** (as **Mercury**), not to be exceeded at any time.

ACGIH: The threshold limit value (TLV) is **0.025 mg/m³** averaged over an 8-hour workshift.

- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Mercury**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Mercury** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure can cause metallic taste in the mouth, nausea and vomiting, and abdominal pain.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Mercury** and can last for months or years:

Cancer Hazard

- ▶ While **Mercury** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

- ▶ There is limited evidence that **Mercury** may cause an increase in spontaneous abortions and menstrual disorders in exposed women.
- ▶ There is limited evidence that **Mercury** may affect male fertility.

- ▶ **Mercury** may also damage the developing fetus in animals.

Other Effects

- ▶ **Mercury** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- ▶ **Mercury** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- ▶ Long-term contact can cause the skin to turn gray, brown staining in the eyes, and may affect peripheral vision (ability to see to the sides).
- ▶ Repeated exposure or a very high single exposure can cause *Mercury poisoning*. Symptoms include tremors (shaking), trouble remembering and concentrating, gum problems, increased salivation, loss of appetite and weight, and changes in mood and personality. These can be severe and cause hallucinating and psychosis.
- ▶ **Mercury** may damage the kidneys.

Medical

Medical Testing

For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Exam of the nervous system (including handwriting test to detect early hand tremor)
- ▶ Urine *Mercury* level (usually less than **0.02 mg/liter**)
- ▶ Kidney function tests

If symptoms develop or overexposure is suspected, the following is recommended:

- ▶ Lung function tests
- ▶ Exam of the eyes and vision
- ▶ Evaluation by a qualified allergist can help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ Creams to whiten or bleach skin may contain *Mercury*. If you use them, you may be at increased risk of *Mercury* poisoning. A high fish diet, especially of marine predatory fish (fish-eating fish), also may increase your blood *Mercury* levels.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ For clean-up, use a specialized charcoal-filtered vacuum or suction pump to avoid generating *Mercury vapor*. Do not disturb spilled material.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Mercury**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton for gloves, and Tychem® fabrics, or the equivalent, as protective materials for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.05 mg/m³** (as **Mercury vapor**), or over **0.1 mg/m³** but less than **1 mg/m³** (as **Mercury**), use a NIOSH approved half-mask respirator with cartridges specific for **Mercury vapor**. These cartridges have end of service life indicators (ESLI) which visually indicate when filters must be changed.
- ▶ If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Mercury**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **0.5 mg/m³** (as **Mercury vapor**) or over **1 mg/m³** (as **Mercury**), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **10 mg/m³** (as **Mercury**) is immediately dangerous to life and health. If the possibility of exposure above **10 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Mercury** itself does not burn.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Mercury** is spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Cover with a *Sulfur compound* to keep from vaporizing and collect with a charcoal filter vacuum. Kits specific for the clean-up of *Mercury* spills are available. **DO NOT USE** a regular or shop vacuum.
- ▶ Use *Zinc* or *Copper flakes* and a flashlight to check for remaining **Mercury** after clean-up.
- ▶ Ventilate and wash area of spill or leak.
- ▶ **DO NOT** wash into sewer.
- ▶ It may be necessary to contain and dispose of **Mercury** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Mercury** you should be trained on its proper handling and storage.

- ▶ **Mercury** reacts with ACETYLENE to form explosive *Acetylide*.
- ▶ **Mercury** can form explosive compounds with AMMONIA and will explode when mixed with CHLORINE DIOXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METHYL AZIDE.
- ▶ **Mercury** is not compatible with COMBUSTIBLE MATERIALS; METALS (such as ALUMINUM and COPPER); CALCIUM; SODIUM CARBIDE; AMINES; LITHIUM; and RUBIDIUM.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
 are not intended to be copied and sold
 for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Right to Know Hazardous Substance Fact Sheet

Emergency
Responders
Quick Reference

Common Name: **MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS**

Synonyms: Colloidal Mercury; Quicksilver

CAS No: 7439-97-6

Molecular Formula: Hg

RTK Substance No: 1183

Description: Heavy, silvery, liquid metal

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 0 - Fire 0 - Reactivity DOT#: UN 2809 ERG Guide #: 172 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. Mercury itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Mercury reacts with ACETYLENE to form explosive <i>Acetylides</i> . Mercury can form explosive compounds with AMMONIA and will explode when mixed with CHLORINE DIOXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METHYL AZIDE. Mercury is not compatible with COMBUSTIBLE MATERIALS; METALS (such as ALUMINUM and COPPER); CALCIUM; SODIUM CARBIDE; AMINES; LITHIUM; and RUBIDIUM.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 500 meters (1/3 mile)

Cover spill with a *Sulfur compound* to prevent vaporization and collect with a charcoal filter vacuum.

Use *Zinc* or *Copper flakes* and a flashlight to check for remaining **Mercury** after clean-up.

Mercury is very toxic to aquatic life and bioaccumulates.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Nonflammable
Vapor Density:	6.9 (air = 1)
Vapor Pressure:	0.002 mm Hg at 77°F (25°C)
Specific Gravity:	13.6 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	674°F (357°C)
Melting Point:	-38°F (-39°C)
Ionization Potential:	10.4 eV
Molecular Weight:	200.6

EXPOSURE LIMITS

NIOSH: 0.05 mg/m³, 10-hr TWA (as **Mercury vapor**)
0.1 mg/m³, Ceiling (as **Mercury**)

ACGIH: 0.025 mg/m³, 8-hr TWA (as **Mercury**)

IDLH: 10 mg/m³ (as **Mercury**)

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m³

PAC-2 = 2.05 mg/m³

PAC-3 = 4.1 mg/m³

PROTECTIVE EQUIPMENT

Gloves:	Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>8-hr breakthrough)
Coveralls:	Tychem® fabrics (>8-hr breakthrough)
Respirator:	>0.025 mg/m ³ - full facepiece APR with cartridges specific for Mercury >0.3 mg/m ³ - SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Nausea, vomiting and abdominal pain

FIRST AID AND DECONTAMINATION

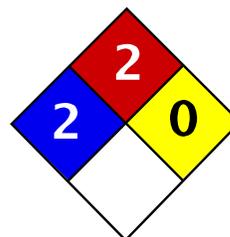
Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C₁₀H₈

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].

The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact: Not available.

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

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

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable solid.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid.

Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

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

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Israel: TWA: 10 (ppm)
TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995]
TWA: 52 STEL: 79 (mg/m³) from ACGIH [1995]
Australia: STEL: 15 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

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

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:

Partially dispersed in hot water, methanol, n-octanol.

Very slightly dispersed in cold water.

See solubility in methanol, n-octanol.

Solubility:

Partially soluble in methanol, n-octanol.

Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 490 mg/kg [Rat].

Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].

The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of ingestion.

Hazardous in case of inhalation.

Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Rhode Island RTK hazardous substances: Naphthalene

Pennsylvania RTK: Naphthalene

Florida: Naphthalene

Minnesota: Naphthalene

Massachusetts RTK: Naphthalene

TSCA 8(b) inventory: Naphthalene

TSCA 8(a) PAIR: Naphthalene

TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87

SARA 313 toxic chemical notification and release reporting: Naphthalene: 1%

CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:

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

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-4: Flammable solid.

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R36- Irritating to eyes.

R40- Possible risks of irreversible effects.

R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed.

R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation.

R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:30 PM

Last Updated: 10/11/2005 01:30 PM

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Material Safety Data Sheet

Nickel Metal

ACC# 16240

Section 1 - Chemical Product and Company Identification

MSDS Name: Nickel Metal**Catalog Numbers:** N40-500**Synonyms:****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
7440-02-0	NICKEL	100.0	231-111-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white to gray white solid.

Caution! May cause allergic skin reaction. May cause eye irritation. May cause respiratory tract irritation. May cause cancer in humans. May cause liver and kidney damage.

Target Organs: Kidneys, liver, respiratory system.

Potential Health Effects

Eye: May cause eye irritation.

Skin: May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May cause severe irritation and possible burns. May cause dermatitis.

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation: 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. Inhalation of a mist of this material may cause respiratory tract irritation. Breathing Nickel (Dust and Fume) can cause a sore or hole in the "bone" (septum) dividing the inner nose.

Chronic: Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration. May cause respiratory tract cancer.

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 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 immediately.

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 if cough or other symptoms appear.

Notes to Physician: Treat symptomatically and supportively.

Antidote: There exists several chelation agents. The determination of their use should be made only 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. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dust can be an explosion hazard when exposed to heat or flame.

Extinguishing Media: Confining and smothering is preferable to applying water. DO NOT USE WATER, CO₂, OR FOAM DIRECTLY ON FIRE ITSELF. Use DRY sand, sodium chloride powder, graphite powder, copper powder or Lith-X powder. Dousing metallic fires with water may generate hydrogen gas, an extremely dangerous explosion hazard, particularly if fire is in a confined environment.

Flash Point: Not applicable.

Autoignition Temperature: Not applicable.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Very fine particles can cause a fire or explosion. Eliminate all ignition sources. Reduce airborne dust and prevent scattering by moistening with water. Sweep up, then place into a suitable container for disposal. Carefully scoop up and place into appropriate disposal container. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with skin and eyes. Avoid ingestion and inhalation.

Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep containers tightly closed.

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
NICKEL	1.5 mg/m ³ TWA (inhalable fraction)	0.015 mg/m ³ TWA 10 mg/m ³ IDLH	1 mg/m ³ TWA

OSHA Vacated PELs: NICKEL: 1 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 gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

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: white to gray white

Odor: none reported

pH: Not available.

Vapor Pressure: 1 mm Hg @ 1810 C

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not applicable.

Boiling Point: 2730 deg C

Freezing/Melting Point: 1455 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble in water.

Specific Gravity/Density: 8.90

Molecular Formula: Ni

Molecular Weight: 58.69

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, dust generation.

Incompatibilities with Other Materials: Acids, aluminum, ammonia, ammonium nitrate, bromine pentafluoride, ethylene + aluminum, dioxane, fluorine, hydrazine, hydrazoic acid, hydrogen, methanol, nitric acid, nitryl fluoride, organic solvents, oxidants, phosphorus, potassium perchlorate, selenium, sulfur and compounds.

Hazardous Decomposition Products: Toxic and highly flammable nickel carbonyl.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7440-02-0: QR5950000; QR6126100; QR6555000; QR7120000

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 7440-02-0:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 10/1/89
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Nickel compounds).

Epidemiology: Epidemiological studies have shown an increased incidence of cancers among nickel refinery workers.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Mutagenicity: No information available.

Neurotoxicity: No information available.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.

Environmental: No information reported.

Physical: No information available.

Other: None.

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: None listed.

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

CAS# 7440-02-0 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# 7440-02-0: 100 lb final RQ (no reporting of releases of this hazardous substance is require

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 7440-02-0: immediate, delayed, fire.

Section 313

This material contains NICKEL (CAS# 7440-02-0, 100.0%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7440-02-0 (listed as Nickel 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# 7440-02-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-02-0 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# 7440-02-0 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 NICKEL, a chemical known to the state of California to cause cancer.

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:

XN

Risk Phrases:

R 40 Limited evidence of a carcinogenic effect.

R 43 May cause sensitization by skin contact.

Safety Phrases:

- S 22 Do not breathe dust.
- S 36 Wear suitable protective clothing.

WGK (Water Danger/Protection)

CAS# 7440-02-0: No information available.

Canada - DSL/NDSL

CAS# 7440-02-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

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

Canadian Ingredient Disclosure List

CAS# 7440-02-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information
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MSDS Creation Date: 3/19/1998

Revision #5 Date: 10/28/2008

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.



Right to Know Hazardous Substance Fact Sheet

Common Name: **PHENANTHRENE**

Synonyms: Phenantrin; Coal Tar Pitch Volatiles

Chemical Name: Phenanthrene

Date: August 1999 Revision: November 2010

CAS Number: 85-01-8

RTK Substance Number: 3004

DOT Number: UN 3077

Description and Use

Phenanthrene is a colorless to white, crystalline (sand-like) solid with a faint odor. It is used in dyestuffs, explosives, research, and in making drugs. It is also a product of the incomplete combustion of wood and fossil fuels, and is found in polluted air and water.

Reasons for Citation

► **Phenanthrene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	1	-
REACTIVITY	0	-
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Phenanthrene** can affect you when inhaled.
- Contact can irritate the skin and eyes. If skin contaminated with **Phenanthrene** is exposed to sunlight a rash or skin burn may occur, sometimes with blisters.
- Inhaling **Phenanthrene** can irritate the nose and throat.
- **Phenanthrene** may cause a skin allergy.
- For more information, consult the Right to Know Hazardous Substance Fact Sheet on COAL TAR PITCH.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

The following exposure limits are for *Coal Tar Pitch Volatiles*:

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m³** (as the *Benzene soluble fraction*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m³** (as the *Cylohexane extractable fraction*) averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.2 mg/m³** (as the *Benzene soluble aerosol*) averaged over an 8-hour workshift.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Phenanthrene**:

- ▶ Contact can irritate the skin and eyes. If skin contaminated with **Phenanthrene** is exposed to sunlight a rash or skin burn may occur, sometimes with blisters.
- ▶ Inhaling **Phenanthrene** can irritate the nose and throat.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Phenanthrene** and can last for months or years:

Cancer Hazard

- ▶ While **Phenanthrene** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Phenanthrene** has not been tested for its ability to affect reproduction.

Other Effects

- ▶ **Phenanthrene** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.

Medical

Medical Testing

If symptoms develop or overexposure is suspected, the following is are recommended:

- ▶ Evaluation by a qualified allergist can help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Phenanthrene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ The recommended glove materials are Nitrile, Neoprene and Barrier® for *Coal Tar Extract*.
- ▶ The recommended protective clothing material for *solid Phenanthrene* is Tyvek®, or the equivalent.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.1 mg/m³**, use a NIOSH approved respirator with an organic vapor cartridge and particulate N, R or P100 prefilters. Increased protection is obtained from full facepiece powered-air purifying respirators.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Phenanthrene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **1 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Phenanthrene** may burn, but does not readily ignite.
- ▶ Use dry chemical, CO₂ or water as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Phenanthrene** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Phenanthrene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Phenanthrene** you should be trained on its proper handling and storage.

- ▶ **Phenanthrene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from HEAT and LIGHT.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Phenanthrene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

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are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **PHENANTHRENE**

Synonyms: Phenantrin; Coal Tar Pitch Volatiles

CAS No: 85-01-8

Molecular Formula: C₁₄H₁₀

RTK Substance No: 3004

Description: Colorless to white, crystalline solid with a faint odor, also present as a by-product of incomplete combustion of wood and fossil fuels

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health 1 - Fire 0 - Reactivity DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	Phenanthrene may burn, but does not readily ignite. Use dry chemical, CO ₂ or water as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Phenanthrene is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

Phenanthrene is an environmental hazard and very toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	Aromatic odor
Flash Point:	340°F (171°C)
Vapor Density:	6.14 (air = 1)
Vapor Pressure:	1 mm Hg at 245°F (118.3°C)
Specific Gravity:	1.1 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	642°F (339°C)
Melting Point:	212°F (100°C)
Molecular Weight:	178.23

EXPOSURE LIMITS

OSHA: 0.2 mg/m³, 8-hr TWA

NIOSH: 0.1 mg/m³, 10-hr TWA

ACGIH: 0.2 mg/m³, 8-hr TWA

IDLH: 80 mg/m³

(All the above are for *Coal Tar Pitch Volatiles*)

The Protective Action Criteria values are:

PAC-1 = 6 mg/m³ PAC-2 = 40 mg/m³

PAC-3 = 500 mg/m³

PROTECTIVE EQUIPMENT

Gloves:	Nitrile, Neoprene and Barrier® (>1-hr breakthrough for <i>Coal Tar Extract</i>)
Coveralls:	Tyvek®
Respirator:	>0.1 mg/m ³ - full facepiece APR with <i>Organic vapor and P100 cartridges</i> >1 mg/m ³ - SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation

Inhalation: Nose and throat irritation

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Right to Know Hazardous Substance Fact Sheet

Common Name: **PHENOL**

Synonyms: Carboic Acid; Hydroxybenzene

Chemical Name: Phenol

Date: June 2001 Revision: January 2010

CAS Number: 108-95-2

RTK Substance Number: 1487

DOT Number: UN 1671

Description and Use

Phenol is a colorless or white, crystalline (sand-like) solid that is usually sold or used in solution. It is used to produce phenolic resins for the construction, automotive and appliance industries, as a disinfectant, and in medicines.

- ▶ **ODOR THRESHOLD = 0.4 ppm**
- ▶ Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- ▶ **Phenol** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS, NFPA and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water. Seek medical attention.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.
- ▶ Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	-	4
FLAMMABILITY	-	2
REACTIVITY	-	0
MUTAGEN COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Phenol** can affect you when inhaled and may be absorbed through the skin.
- ▶ Because this is a **MUTAGEN**, handle it as a possible carcinogen--**WITH EXTREME CAUTION**.
- ▶ Contact can severely irritate and burn the skin and eyes leading to eye damage.
- ▶ Inhaling **Phenol** can irritate the nose and throat.
- ▶ Inhaling **Phenol** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- ▶ High levels of this substance may reduce the blood's ability to transport *Oxygen*, causing headache, fatigue, dizziness, and a blue color to the skin and lips (*methemoglobinemia*).
- ▶ Exposure can cause headache, dizziness, lightheadedness, and passing out.
- ▶ High or repeated exposure can damage the liver, kidneys and nervous system.
- ▶ **Phenol** can cause irregular heartbeat (arrhythmia).

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **5 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **5 ppm** averaged over a 10-hour workshift and **15.6 ppm**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **5 ppm** averaged over an 8-hour workshift.

- ▶ **Phenol** is a **MUTAGEN**. Mutagens may have a cancer risk. All contact with this chemical should be reduced to the lowest possible level.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Phenol**:

- ▶ Contact can severely irritate and burn the skin and eyes leading to eye damage.
- ▶ Inhaling **Phenol** can irritate the nose and throat.
- ▶ Inhaling **Phenol** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- ▶ High levels of this substance may reduce the blood's ability to transport *Oxygen*, causing headache, fatigue, dizziness, and a blue color to the skin and lips (*methemoglobinemia*). Exposure to very high levels may cause trouble breathing, collapse and even death.
- ▶ Exposure can cause headache, fatigue, weakness, nausea and vomiting, dizziness, lightheadedness and passing out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Phenol** and can last for months or years:

Cancer Hazard

- ▶ While **Phenol** has been tested, it is not classifiable as to its potential to cause cancer.
- ▶ **Phenol** is a MUTAGEN. It may cause genetic changes.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ There is limited evidence that **Phenol** may damage the developing fetus in animals.

Other Effects

- ▶ **Phenol** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- ▶ High or repeated exposure can damage the liver, kidneys and nervous system.
- ▶ **Phenol** can cause irregular heartbeat (arrhythmia).

Medical

Medical Testing

For frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Consider chest x-ray after acute overexposure
- ▶ Blood methemoglobin level
- ▶ Liver and kidney function tests
- ▶ Special 24-48 hours EKG (Holter monitor) to observe and record abnormal heart rhythms
- ▶ Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Phenol**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ For *solid Phenol*, use a vacuum to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Phenol**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Butyl, Silver Shield®/4H®, Viton and Barrier® for gloves, and Tychem® SL, BR, Responder®, and TK; and Trelchem® HPS and VPS, or the equivalent, as protective clothing materials.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- ▶ For *solid Phenol* wear eye protection with side shields or goggles.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **5 ppm**, use a NIOSH approved full facepiece respirator with an organic vapor cartridge and particulate prefilters. Increased protection is obtained from full facepiece powered-air purifying respirators.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Phenol**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **50 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- ▶ Exposure to **250 ppm** is immediately dangerous to life and health. If the possibility of exposure above **250 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Phenol** is a COMBUSTIBLE SOLID.
- ▶ Use dry chemical, CO₂, water spray or alcohol-resistant foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Phenol** is spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ For **Phenol** in *solution*, cover with sand and place into sealed containers for disposal.
- ▶ Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Phenol** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Phenol** you should be trained on its proper handling and storage.

- ▶ **Phenol** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALUMINUM CHLORIDE; CALCIUM HYPOCHLORITE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); FORMALDEHYDE; ISOCYANATES; BUTADIENE; SODIUM NITRITE; and many other materials.
- ▶ **Phenol** is corrosive to COPPER, BRASS and STAINLESS STEELS.
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from LIGHT and AIR.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Phenol** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
 are not intended to be copied and sold
 for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Right to Know Hazardous Substance Fact Sheet

Emergency
Responders
Quick Reference

Common Name: **PHENOL**

Synonyms: Carboic Acid; Hydroxybenzene

CAS No: 108-95-2

Molecular Formula: C₆H₅OH

RTK Substance No: 1487

Description: Colorless or white, crystalline solid that is usually sold or used in solution

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
4 - Health 2 - Fire 0 - Reactivity DOT#: UN 1671 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	Phenol is a COMBUSTIBLE SOLID. Use dry chemical, CO ₂ , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Phenol is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALUMINUM CHLORIDE; CALCIUM HYPOCHLORITE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); FORMALDEHYDE; ISOCYANATES; BUTADIENE; SODIUM NITRITE; and many other materials. Phenol is corrosive to COPPER, BRASS and STAINLESS STEELS.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet) (Solid)
50 meters (150 feet) (Liquid)

Fire: 800 meters (1/2 mile)

For **Phenol** in *solution*, cover with sand and place into sealed containers for disposal.

Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

Neutralize water spills with dry lime or soda ash.

Phenol is harmful to aquatic life at very low concentrations.

PHYSICAL PROPERTIES

Odor Threshold:	0.4 ppm
Flash Point:	175°F (79.4°C)
LEL:	1.3%
UEL:	8.6%
Auto Ignition Temp:	1,319°F (715°C)
Vapor Density:	3.2 (air = 1)
Vapor Pressure:	0.4 mm Hg at 68°F (20°C)
Specific Gravity:	1.1 (water = 1)
Water Solubility:	Soluble
Boiling Point:	358°F (181°C)
Melting Point:	106°F (41°C)
Ionization Potential:	8.5 eV
Molecular Weight:	94.1
pH:	6 (aqueous solution)

EXPOSURE LIMITS

OSHA: 5 ppm, 8-hr TWA

NIOSH: 5 ppm, 10-hr TWA; 15.6 ppm, 15-min Ceiling

ACGIH: 5 ppm, 8-hr TWA

IDLH: 250 ppm

The Protective Action Criteria values are:

PAC-1 = 15 ppm PAC-2 = 23 ppm PAC-3 = 200 ppm

PROTECTIVE EQUIPMENT

Gloves:	Butyl, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® BR, Responder®, and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
Respirator:	>5 ppm - full facepiece APR with <i>Organic vapor cartridges</i> and <i>High efficiency prefilters</i> >50 ppm - SCBA

HEALTH EFFECTS

Eyes: Irritation and burns

Skin: Irritation and burns

Inhalation: Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Methemoglobinemia with headache, dizziness, lightheadedness and passing out

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Medical observation is recommended as symptoms may be delayed.



Right to Know Hazardous Substance Fact Sheet

Common Name: **POLYCHLORINATED BIPHENYLS**

Synonyms: Aroclor; Chlorodiphenyls; PCBs

Chemical Name: 1,1'-Biphenyl, Chloro Derivs.

Date: April 2002

Revision: November 2008

CAS Number: 1336-36-3

RTK Substance Number: 1554

DOT Number: UN 2315

Description and Use

Polychlorinated Biphenyls are light yellow or colorless, thick, oily liquids. They are used in hydraulic and heat transfer liquids. They were formally used in electrical capacitors and transformers.

Reasons for Citation

- ▶ **Polychlorinated Biphenyls** are on the Right to Know Hazardous Substance List because they are cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	2
FLAMMABILITY	-	1
REACTIVITY	-	0
CARCINOGEN TERATOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Polychlorinated Biphenyls** can affect you when inhaled and by passing through the skin.
- ▶ **Polychlorinated Biphenyls** should be handled as CARCINOGENS and may be TERATOGENS. HANDLE WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes.
- ▶ **Polychlorinated Biphenyls** may cause brownish pigmentation of the skin, eyes and fingernails.
- ▶ Skin contact may cause an acne-like rash (chloracne).
- ▶ Inhaling the vapors can irritate the nose, throat and lungs.
- ▶ Exposure to **Polychlorinated Biphenyls** can cause headache, nausea, vomiting, loss of weight and abdominal pain.
- ▶ High exposure can damage the nervous system causing headache, numbness, weakness, and tingling ("pins and needles) in the arms and legs.
- ▶ **Polychlorinated Biphenyls** may damage the liver.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m³** (42% Chlorine) and **0.5 mg/m³** (54% Chlorine) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.001 mg/m³** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **1 mg/m³** (42% Chlorine) and **0.5 mg/m³** (54% Chlorine) averaged over an 8-hour workshift.

- ▶ **Polychlorinated Biphenyls** are PROBABLE CARCINOGENS and TERATOGENS in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Polychlorinated Biphenyls**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling the vapors can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- ▶ Exposure to **Polychlorinated Biphenyls** can cause headache, nausea, vomiting, loss of weight and abdominal pain.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Polychlorinated Biphenyls** and can last for months or years:

Cancer Hazard

- ▶ **Polychlorinated Biphenyls** are PROBABLE CARCINOGENS in humans. There is evidence that they cause cancer of the skin, brain, and pancreas in humans and have been shown to cause liver and pituitary cancer, and leukemia, in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ **Polychlorinated Biphenyls** may be TERATOGENS in humans since they are teratogens in animals.
- ▶ There is limited evidence that **Polychlorinated Biphenyls** may affect male and female fertility.

Other Effects

- ▶ **Polychlorinated Biphenyls** may cause brownish pigmentation of the skin, eyes and fingernails.
- ▶ Skin contact may cause an acne-like rash (chloracne).
- ▶ High exposure can damage the nervous system causing headache, numbness, weakness, and tingling ("pins and needles") in the arms and legs.
- ▶ **Polychlorinated Biphenyls** may damage the liver.

Medical

Medical Testing

Before beginning employment and at regular times after that, for frequent or potentially high exposures, the following are recommended:

- ▶ Liver function tests
- ▶ Exam of the skin and fingernails

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Blood PCB levels
- ▶ Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Polychlorinated Biphenyls**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Where possible, transfer **Polychlorinated Biphenyls** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Polychlorinated Biphenyls**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Butyl, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton for gloves, and Tychem® CPF 2, SL, CPF 4 and Responder®, or the equivalent, as protective materials for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **0.001 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **5 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Polychlorinated Biphenyls** may burn, but do not readily ignite.
- ▶ Use dry chemical, CO₂, water spray or alcohol-resistant foam as extinguishing agents.
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE**, including *Polychlorinated Dibenzofurans* and *Chlorinated Dibenzo-p-dioxins*.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Polychlorinated Biphenyls** are spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Polychlorinated Biphenyls** as HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Polychlorinated Biphenyls** you should be trained on its proper handling and storage.

- ▶ **Polychlorinated Biphenyls** are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from STRONG ULTRAVIOLET LIGHT and SUNLIGHT.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **POLYCHLORINATED BIPHENYLS**

Synonyms: Aroclor; Chlorodiphenyls; PCBs

CAS No: 1336-36-3

Molecular Formula: $C_{12}H_{10-n}Cl_n$

RTK Substance No: 1554

Description: Light yellow or colorless, thick, oily liquids

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 1 - Fire 0 - Reactivity DOT#: UN 2315 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	Polychlorinated Biphenyls may burn, but do not readily ignite. Use dry chemical, CO ₂ , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Polychlorinated Dibenzofurans</i> and <i>Chlorinated Dibenzo-p-dioxins</i> . Use water spray to keep fire-exposed containers cool.	Polychlorinated Biphenyls are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

SPILL/LEAKS

Isolation Distance:

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

Polychlorinated Biphenyls bioaccumulate and are hazardous to the environment.

PHYSICAL PROPERTIES

Flash Point: 286° to 385°F (141° to 196°C)

Auto Ignition Temp: 464°F (240°C)

Vapor Pressure: 0.001 mm Hg at 68°F (20°C)

Specific Gravity: 1.3 (water = 1)

Water Solubility: Insoluble

Boiling Point: 617° to 734°F (325° to 390°C)

Melting Point: -2° to 50°F (-19° to 10°C)

Molecular Weight: 258 to 326

EXPOSURE LIMITS

OSHA: 1 mg/m³, 8-hr TWA (42% Chlorine) and 0.5 mg/m³, 8-hr TWA (54% Chlorine)

NIOSH: 0.001 mg/m³, 10-hr TWA

ACGIH: 1 mg/m³, 8-hr TWA (42% Chlorine) and 0.5 mg/m³, 8-hr TWA (54% Chlorine)

IDLH: 5 mg/m³

PROTECTIVE EQUIPMENT

Gloves: Butyl, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>4-hr breakthrough)

Coveralls: Tychem® CPF 2, SL, CPF 4 and Responder® (>8-hr breakthrough)

Respirator: >0.001 mg/m³ - Supplied air or SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation

Inhalation: Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, vomiting, and abdominal pain

Chronic: Cancer (skin, brain, pancreas) in humans

FIRST AID AND DECONTAMINATION

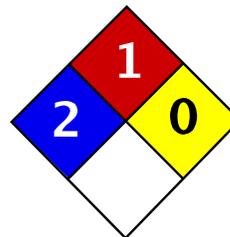
Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility



Health	2
Fire	1
Reactivity	0
Personal Protection	C

Material Safety Data Sheet Pyrene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Pyrene

Catalog Codes: SLP3868

CAS#: 129-00-00

RTECS: UR2450000

TSCA: TSCA 8(b) inventory: Pyrene

CI#: Not available.

Synonym: Benzo(D,E,F)phenanthrene

Chemical Name: Pyrene

Chemical Formula: C₁₆H₁₀

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pyrene	129-00-00	100

Toxicological Data on Ingredients: Pyrene: ORAL (LD50): Acute: 2700 mg/kg [Rat]. 800 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact: Not available.

Inhalation:

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

Serious Inhalation: Not available.

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

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

Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of heat, of combustible materials.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.
Slightly explosive in presence of heat.
Non-explosive in presence of open flames and sparks.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F). Preferably refrigerate.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid. Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 202.26 g/mole

Color: Yellow.

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

Boiling Point: 404°C (759.2°F)

Melting Point: 151.2°C (304.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.271 @ 23 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 4.9$

Ionicity (in Water): Not available.

Dispersion Properties:

Is not dispersed in cold water, hot water.
See solubility in diethyl ether.

Solubility:

Soluble in diethyl ether.
Insoluble in cold water, hot water.
Pyrene is fairly soluble in organic solvents.
It is soluble in alcohol, benzene, carbon disulfide, ether, petroleum ether, and toluene

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 800 mg/kg [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation.

Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic).

May cause cancer (tumorigenic) according to animal data.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation. May be absorbed through skin.

Eyes: May cause eye irritation. Conjunctival irritation may be noted.

Inhalation: May cause respiratory tract irritation.

Ingestion: May cause gastrointestinal tract irritation. May affect behavior/Central Nervous System (excitation and muscel spasicity), liver and urinary system, and immune system, and blood.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 1.8 mg/l 48 hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut carcinogen reporting list.: Pyrene
Illinois chemical safety act: Pyrene
New York release reporting list: Pyrene
Pennsylvania RTK: Pyrene
Massachusetts RTK: Pyrene
Massachusetts spill list: Pyrene
New Jersey: Pyrene
New Jersey spill list: Pyrene
Louisiana RTK reporting list: Pyrene
Louisiana spill reporting: Pyrene
California Director's list of Hazardous Substances: Pyrene
TSCA 8(b) inventory: Pyrene
TSCA 8(a) CAIR: Pyrene
TSCA 8(d) H and S data reporting: Pyrene: June 1, 1987-June1, 1997
SARA 302/304/311/312 extremely hazardous substances: Pyrene
CERCLA: Hazardous substances.: Pyrene: 5000 lbs. (2268 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R20/21/22- Harmful by inhalation, in contact with skin and if swallowed.

S2- Keep out of the reach of children.

S36/37- Wear suitable protective clothing and gloves.

S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves (impervious).

Synthetic apron.

Not applicable.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **SILVER**

CAS Number: 7440-22-4

DOT Number: None

RTK Substance number: 1669

Date: January 1986 Revision: October 2002

HAZARD SUMMARY

- * **Silver dust** can affect you when breathed in.
- * Contact can irritate the skin and eyes.
- * Breathing **Silver dust** can irritate the nose and throat.
- * Repeated exposures to **Silver dust** can cause blue-gray discoloration (argyria) of the eyes, skin, nose, mouth, throat and internal body organs. This may take years to develop but is permanent.
- * **Silver** may affect the kidneys.

IDENTIFICATION

Silver is a brilliant white metal. It is used in making jewelry, silverware and mirrors, and in photography, solders and electroplating.

REASON FOR CITATION

- * **Silver** is on the Hazardous Substance List because it is regulated by OSHA cited by ACGIH, NIOSH, DEP, HHAG and EPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **0.01 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.01 mg/m³** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over an 8-hour workshift.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Silver dust** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Silver** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Silver dust**:

- * Contact can irritate the skin and eyes.
- * Breathing **Silver dust** can irritate the nose and throat.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Silver dust** and can last for months or years:

Cancer Hazard

- * There is no evidence that **Silver dust** causes cancer in animals. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Silver dust** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * Repeated exposures to **Silver dust** can cause blue-gray discoloration (argyria) of the eyes, skin, nose, mouth, throat and internal body organs. This may take years to develop but is permanent.
- * **Silver dust** may affect the kidneys.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following are recommended:

- * Careful, periodic exams of the eyes, inner nose, throat and skin are useful.
- * Kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * A few medications contain **Silver**. Caution is advised in the use of these medications for persons exposed to **Silver**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer **Silver dust** or *powder* from drums or other storage containers to process containers.
- * Before entering a confined space where **Silver dust** or *powder* may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Silver dust** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Silver dust**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Silver dust**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Silver dust**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Silver dust** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Silver dust**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- * Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Silver dust**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential exists for exposure over **0.25 mg/m³**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **10 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **10 mg/m³** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- * Prior to working with **Silver** you should be trained on its proper handling and storage.
- * **Silver dust** or *powder* is not compatible with OXYGEN; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; AMMONIA; HYDROGEN PEROXIDE; ETHYLENEIMINE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) BROMOAZIDE; CHLORINE TRIFLUORIDE; OXALIC; ACID; and TARTARIC ACID.
- * Store in tightly closed containers in a cool, well-ventilated area away from LIGHT and AIR.
- * Sources of ignition, such as smoking and open flames, are prohibited where **Silver dust** or *powder* is used, handled, or stored.
- * Metal containers involving the transfer of **Silver dust** or *powder* should be grounded and bonded.
- * Use only non-sparking tools and equipment, especially when opening and closing containers of **Silver dust** or *powder*.
- * Wherever **Silver dust** or *powder* is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Right to Know Hazardous Substance Fact Sheet

Common Name: **SODIUM**

Synonyms: Natrium

Chemical Name: Sodium

Date: April 2001

Revision: April 2010

CAS Number: 7440-23-5

RTK Substance Number: 1674

DOT Number: UN 1428

Description and Use

Sodium is an odorless, soft, silvery-white metal. It is used as a laboratory reagent, to make other chemicals and *Sodium compounds*, in non-glare lighting on highways, and as a heat transfer agent.

Reasons for Citation

- ▶ **Sodium** is on the Right to Know Hazardous Substance List because it is cited by DOT, NFPA, and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

[SEE GLOSSARY ON PAGE 5.](#)

FIRST AID

Eye Contact

- ▶ Quickly brush off excess chemical from the face. Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately blot or brush off excess chemical and wash gently with large amounts of water for at least 30 minutes. Seek medical attention immediately.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.
- ▶ Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	-	3
FLAMMABILITY	-	3
REACTIVITY	-	2
FLAMMABLE WATER AND AIR REACTIVE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Sodium** can affect you when inhaled.
- ▶ Contact can severely irritate and burn the skin and eyes with possible eye damage.
- ▶ Exposure can irritate the nose and throat.
- ▶ Inhaling **Sodium** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- ▶ **Sodium** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- ▶ When **Sodium** combines with moisture from the air or skin it becomes corrosive *Sodium Hydroxide*. For more information, consult the *Right to Know Hazardous Substance Fact Sheet on SODIUM HYDROXIDE*.
- ▶ **Sodium** is FLAMMABLE and REACTIVE and a DANGEROUS FIRE and EXPLOSION HAZARD when exposed to WATER, STEAM, AIR or MOIST AIR.

Workplace Exposure Limits

No occupational exposure limits have been established for **Sodium**. However, it may pose a health risk. Always follow safe work practices.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Sodium**:

- ▶ Contact can severely irritate and burn the skin and eyes with possible eye damage.
- ▶ Exposure can irritate the nose and throat.
- ▶ Inhaling **Sodium** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- ▶ **Sodium** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- ▶ When **Sodium** combines with moisture from the air or skin, it becomes corrosive *Sodium Hydroxide*.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Sodium** and can last for months or years:

Cancer Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Sodium** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health and Senior Services, **Sodium** has not been tested for its ability to affect reproduction.

Other Effects

- ▶ **Sodium** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.

Medical

Medical Testing

If symptoms develop or overexposure is suspected, the following is recommended:

- ▶ Consider chest x-ray after acute overexposure

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Sodium** may be present, check to make sure that an explosive concentration does not exist.
- ▶ Always keep **Sodium** dry and store under a liquid such as *Kerosene*.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Sodium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile gloves, and flame-retardant protective clothing for **Sodium**.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for overexposure to **Sodium**, use a NIOSH approved full facepiece negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Sodium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Sodium** is a FLAMMABLE SOLID which will ignite spontaneously in AIR or MOIST AIR and reacts violently with WATER or STEAM to produce flammable and explosive *Hydrogen gas*.
- ▶ Use dry chemicals appropriate for extinguishing metal fires such as graphite, soda ash or powdered sodium chloride.
- ▶ DO NOT USE WATER, CO₂ or halogenated extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Sodium Oxides*.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Sodium** is spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ DO NOT sweep up dry material, keep dry, cover with dry sand, limestone or clay, and place quickly into a dry container of *Kerosene*, *Naphtha*, *Light Oil* or similar material.
- ▶ DO NOT USE WATER OR WET METHOD.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ Keep **Sodium** out of confined spaces, such as sewers, because of the possibility of an explosion.
- ▶ It may be necessary to contain and dispose of **Sodium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Sodium** you should be trained on its proper handling and storage.

- ▶ **Sodium** reacts violently with WATER, STEAM, AIR and MOIST AIR to produce corrosive *Sodium Hydroxide* and flammable and explosive *Hydrogen gas*.
- ▶ **Sodium** can react explosively or violently with a broad range of chemicals including METALS (such as ALUMINUM, ARSENIC and ZINC); METAL COMPOUNDS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); CARBON DIOXIDE; AZIDES; and MALEIC ANHYDRIDE.
- ▶ Store under *Kerosene*, *Naphtha* or other *Light Oil* and in tightly closed containers in a cool, well-ventilated area away from ORGANICS and all forms of MOISTURE.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Sodium** is used, handled, or stored.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

The Right to Know Hazardous Substance Fact Sheets are not intended to be copied and sold for commercial purposes.

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **SODIUM**

Synonyms: Natrium

CAS No: 7440-23-5

Molecular Formula: Na

RTK Substance No: 1674

Description: Odorless, soft, silvery-white metal

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 3 - Fire 2 - Reactivity DOT#: UN 1428 ERG Guide #: 138 Hazard Class: 4.3 (Dangerous when wet)	<p>Sodium is a FLAMMABLE SOLID which will ignite spontaneously in AIR or MOIST AIR and reacts violently with WATER or STEAM to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p>Use dry chemicals appropriate for extinguishing metal fires such as graphite, soda ash or powdered sodium chloride. DO NOT USE WATER, CO₂ or halogenated extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including (<i>Sodium Oxides</i>).</p>	<p>Sodium reacts violently with WATER, STEAM, AIR and MOIST AIR to produce corrosive <i>Sodium Hydroxide</i> and flammable and explosive <i>Hydrogen gas</i>.</p> <p>Sodium can react explosively or violently with a broad range of chemicals including METALS (such as ALUMINUM, ARSENIC and ZINC); METAL COMPOUNDS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); CARBON DIOXIDE; AZIDES; and MALEIC ANHYDRIDE.</p>

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

DO NOT sweep up dry material, keep dry, cover with dry sand, limestone or clay, and place quickly into a container of *Kerosene, Naphtha, Light Oil* or similar material.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium**.

DO NOT wash into sewer.

Keep **Sodium** out of confined spaces, such as sewers, because of the possibility of an explosion.

Sodium is dangerous to aquatic life at high concentrations.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Flammable solid
Auto Ignition Temp:	>239°F (115°C)
Vapor Density:	0.003 (air = 1)
Vapor Pressure:	1.2 mm Hg at 752°F (400°C)
Specific Gravity:	0.97 (water = 1)
Water Solubility:	Decomposes (violently)
Boiling Point:	1,619°F (882°C)
Melting Point:	208°F (98°C)
Molecular Weight:	22.49

EXPOSURE LIMITS

No occupational exposure limits have been established for **Sodium**.

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m³ PAC-2 = 5 mg/m³

PAC-3 = 50 mg/m³

PROTECTIVE EQUIPMENT

Gloves:	Nitrile (>8-hr breakthrough for <i>Kerosene</i> and <i>Naphtha</i>)
Coveralls:	Turn out gear or flash protection
Respirator:	>0.5 mg/m ³ -full facepiece APR with High efficiency filters >5 mg/m ³ - SCBA

HEALTH EFFECTS

Eyes: Irritation and burns

Skin: Irritation and burns

Inhalation: Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

Headache, dizziness, nausea and vomiting

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Quickly brush off excess chemical from the face. Flush with large amounts of water for at least 30 minutes. Remove contact lenses, if worn. Seek medical attention immediately.

Quickly remove contaminated clothing. Immediately blot or brush off excess chemical and wash with large amounts of water for at least 30 minutes. Seek medical attention immediately.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Medical observation is recommended as symptoms may be delayed.



Right to Know Hazardous Substance Fact Sheet

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethylene Tetrachloride; Perchloroethylene

Chemical Name: Ethene, Tetrachloro-

Date: March 2002 Revision: October 2011

CAS Number: 127-18-4

RTK Substance Number: 1810

DOT Number: UN 1897

Description and Use

Tetrachloroethylene is a clear, colorless liquid with a sweet *Ether*-like odor. It is used as a dry cleaning solvent, heat transfer medium, degreaser, solvent, and drying agent for metals.

- ▶ **ODOR THRESHOLD = 5 to 50 ppm**
- ▶ Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- ▶ **Tetrachloroethylene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.
- ▶ Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	2
FLAMMABILITY	-	0
REACTIVITY	-	0
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE DOES NOT BURN		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Tetrachloroethylene** can affect you when inhaled and by passing through the skin.
- ▶ **Tetrachloroethylene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- ▶ **Tetrachloroethylene** can cause reproductive damage.
- ▶ Contact can irritate and burn the skin and eyes. Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- ▶ Exposure can irritate the eyes, nose and throat.
- ▶ Inhaling **Tetrachloroethylene** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- ▶ Exposure can cause headache, dizziness, lightheadedness, nausea, vomiting, and passing out.
- ▶ **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, **200 ppm**, not to be exceeded during any 15-minute work period, and **300 ppm** as a maximum peak for 5-minutes during any 3-hour period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **25 ppm** averaged over an 8-hour workshift and **100 ppm** as a STEL (short-term exposure limit).

- ▶ **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Tetrachloroethylene**:

- ▶ Contact can irritate and burn the skin and eyes.
- ▶ Exposure can irritate the eyes, nose and throat.
- ▶ Inhaling **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- ▶ Exposure can cause headache, dizziness, lightheadedness, incoordination, nausea, vomiting, and passing out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Tetrachloroethylene** and can last for months or years:

Cancer Hazard

- ▶ **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes cancer of the liver, esophagus, bladder, and other types of cancer in humans. It has also been shown to cause cancer of the liver and leukemia in animals.

- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ **Tetrachloroethylene** may damage the developing fetus.
- ▶ **Tetrachloroethylene** may decrease fertility in males and females and may damage the male (testes) and female (ovaries) reproductive systems in animals.
- ▶ There is limited evidence that **Tetrachloroethylene** causes spontaneous abortions.

Other Effects

- ▶ Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- ▶ **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart

Medical

Medical Testing

For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Consider chest x-ray after acute overexposure
- ▶ Exam of the nervous system
- ▶ EKG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Tetrachloroethylene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Where possible, transfer **Tetrachloroethylene** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Tetrachloroethylene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ The recommended glove materials for **Tetrachloroethylene** are Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier®.
- ▶ The recommended protective clothing materials for **Tetrachloroethylene** are Tychem® F, CPF3, BR, CSM and TK; and Trelchem® HPS and VPS, or the equivalent.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure to **Tetrachloroethylene**, use a NIOSH approved respirator with an organic vapor cartridge. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Tetrachloroethylene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **25 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- ▶ Exposure to **150 ppm** is immediately dangerous to life and health. If the possibility of exposure above **150 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- ▶ Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Tetrachloroethylene** is spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.
- ▶ Ventilate area of spill or leak.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Tetrachloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Tetrachloroethylene** you should be trained on its proper handling and storage.

- ▶ **Tetrachloroethylene** reacts violently with *finely dispersed or finely divided* METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC).
- ▶ **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE.
- ▶ **Tetrachloroethylene** slowly decomposes in WATER to form acids such as *Hydrogen Chloride*.
- ▶ **Tetrachloroethylene** decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic *Hydrogen Chloride* and *Phosgene gases*.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
 Right to Know Program
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

The Right to Know Hazardous Substance Fact Sheets are not intended to be copied and sold for commercial purposes.

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethene, Tetrachloro-; Ethylene Tetrachloride; Perchloroethylene

CAS No: 127-18-4

Molecular Formula: $Cl_2C=CCl_2$

RTK Substance No: 1810

Description: Clear, colorless liquid with a sweet *Ether*-like odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 0 - Fire 0 - Reactivity DOT#: UN 1897 ERG Guide #: 160 Hazard Class: 6.1 (Toxic)	Extinguish fire using an agent suitable for type of surrounding fire. Tetrachloroethylene itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . Use water spray to keep fire-exposed containers cool.	Tetrachloroethylene reacts violently with <i>finely dispersed</i> or <i>finely divided</i> METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC). Tetrachloroethylene is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE. Tetrachloroethylene slowly decomposes in WATER to form acids such as <i>Hydrogen Chloride</i> . Tetrachloroethylene decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic <i>Hydrogen Chloride</i> and <i>Phosgene</i> gases.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

Tetrachloroethylene is toxic to aquatic organisms and may cause long term effects on the aquatic environment.

PHYSICAL PROPERTIES

Odor Threshold:	5 to 50 ppm
Flash Point:	Noncombustible
Vapor Density:	5.8 (air = 1)
Vapor Pressure:	14 mm Hg at 68°F (20°C)
Specific Gravity:	1.62 (water = 1)
Water Solubility:	Very slightly soluble
Boiling Point:	250°F (121°C)
Freezing Point:	-2°F (-19°C)
Ionization Potential:	9.32 eV
Molecular Weight:	165.8

EXPOSURE LIMITS

OSHA: 100 ppm, 8-hr TWA; 200 ppm, Ceiling; 300 ppm, Peak

NIOSH: Lowest feasible concentration

ACGIH: 25 ppm, 8-hr TWA; 100 ppm, STEL

IDLH: 150 ppm

The Protective Action Criteria values are:

PAC-1 = 35 ppm PAC-2 = 230 ppm

PAC-3 = 1,200 ppm

PROTECTIVE EQUIPMENT

Gloves:	Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® F, CPF3, BR and CSM; Trelchem® HPS and VPS (>8-hr breakthrough)
Respirator:	<25 ppm - full facepiece APR with <i>Organic vapor filters</i> Spills or Fire - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns (skin absorbable)
Inhalation:	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema) Headache, dizziness, lightheadedness, and passing out
Chronic:	Cancer (liver, esophagus and bladder)

FIRST AID AND DECONTAMINATION

Remove	the person from exposure.
Flush	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Quickly	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
Begin	artificial respiration if breathing has stopped and CPR if necessary.
Transfer	promptly to a medical facility.
Medical	observation is recommended as symptoms may be delayed.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **THALLIUM**

CAS Number: 7440-28-0

DOT Number: UN 1707

RTK Substance number: 1840

Date: March 1998 Revision: November 2004

HAZARD SUMMARY

- * **Thallium** can affect you when breathed in and by passing through your skin.
- * **Thallium** can irritate and burn the skin and eyes.
- * Prolonged contact can cause blurred vision and/or loss of vision, nail changes, skin rash and dryness, and hair loss.
- * Exposure can cause fatigue, poor appetite, nausea, vomiting, metallic taste, insomnia, confusion and mood changes.
- * **Thallium** can damage the nervous system causing headache, weakness, irritability, pain, and "pins and needles" in the arms and legs.
- * Repeated exposures can cause tremor, convulsions, hallucinations, coma and death.
- * **Thallium** may damage the liver and kidneys.

IDENTIFICATION

Thallium is a solid, bluish-white metal. It is used in rodenticides for the control of vermin, and in the production of semi-conductors, photoelectric equipment, lenses and thermometers. **Thallium** is contained in flue dusts from *Lead* and *Zinc* smelters.

REASON FOR CITATION

- * **Thallium** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP and EPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **0.1 mg/m³** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.1 mg/m³** averaged over an 8-hour workshift.

- * The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Thallium** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Thallium** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Thallium**:

- * **Thallium** can irritate and burn the skin and eyes.
- * Exposure can cause fatigue, poor appetite, nausea, vomiting, metallic taste, insomnia, confusion and mood changes.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Thallium** and can last for months or years:

Cancer Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Thallium** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- * While **Thallium** has not been identified as a reproductive hazard, it should be HANDLED WITH CAUTION since several related *Thallium compounds* are teratogens in animals.

Other Long-Term Effects

- * Prolonged contact can cause blurred vision and/or loss of vision, nail changes, skin rash and dryness, and hair loss.
- * **Thallium** can damage the nervous system causing headache, weakness, irritability, pain, and "pins and needles" in the arms and legs.
- * Repeated exposures can cause tremor, convulsions, hallucinations, coma and death.
- * **Thallium** may damage the liver and kidneys.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the PEL or greater), the following is recommended before beginning work and at regular times after that:

- * Complete exam of the nervous system.

If symptoms develop or overexposure is suspected, the following are recommended:

- * Complete visual exam.
- * Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Thallium**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Thallium** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Thallium** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Thallium**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Thallium**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Thallium**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Thallium** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Thallium**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear impact resistant eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Thallium**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential exists for exposure over **1 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **15 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **15 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.
- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.
- Q: Should I be concerned if a chemical is a teratogen in animals?
- A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

 The following information is available from:

New Jersey Department of Health and Senior Services
 Occupational Health Service
 PO Box 360
 Trenton, NJ 08625-0360
 (609) 984-1863
 (609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Material Safety Data Sheet

Toluene, 99%

ACC# 96584

Section 1 - Chemical Product and Company Identification

MSDS Name: Toluene, 99%**Catalog Numbers:** AC177160000, AC177160010, AC177160025, AC177160200, AC177160250**Synonyms:** Methacide; Methylbenzene; Methylbenzol; Phenylmethane; Toluol.**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
108-88-3	Benzene, methyl-	>99.0	203-625-9

Hazard Symbols: XN F**Risk Phrases:** 11 20

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 40 deg F. **Flammable liquid and vapor.** May cause central nervous system depression. May cause liver and kidney damage. This substance has caused adverse reproductive and fetal effects in animals. Causes digestive and respiratory tract irritation. May cause skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage.

Danger! Harmful or fatal if swallowed. Causes eye irritation and possible transient injury. Poison! May be absorbed through intact skin. Vapor harmful. Call physician immediately.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes eye irritation. May result in corneal injury. Vapors may cause eye irritation.

Skin: May cause skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin.

Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Inhalation of vapor may cause respiratory tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Overexposure may cause dizziness, tremors, restlessness, rapid heart beat, increased blood pressure, hallucinations, acidosis, kidney failure.

Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause cardiac sensitization and severe heart abnormalities. May cause liver and kidney damage.

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: 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: 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. Possible aspiration hazard. 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 catecholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. 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. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. 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 water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out. For large fires, use water spray, fog or regular foam.

Flash Point: 40e deg F (4.44 deg C)

Autoignition Temperature: 896 deg F (480.00 deg C)

Explosion Limits, Lower: 1.1

Upper: 7.1

NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. 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 general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene, methyl-	50 ppm TWA; skin - potential for cutaneous absorption	100 ppm TWA; 375 mg/m ³ TWA 500 ppm IDLH	200 ppm TWA; 300 ppm Ceiling

OSHA Vacated PELs: Benzene, methyl-: 100 ppm TWA; 375 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: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless

Odor: sweetish odor - pleasant odor

pH: Not available.

Vapor Pressure: 36.7 mm Hg @ 30C

Vapor Density: 3.1 (Air=1)

Evaporation Rate:2.4 (Butyl acetate=1)

Viscosity: 0.59 cP @ 20C

Boiling Point: 232 deg F

Freezing/Melting Point:-139 deg F

Decomposition Temperature:Not available.

Solubility: Insoluble.

Specific Gravity/Density:0.9 (Water=1)

Molecular Formula:C6H5CH3

Molecular Weight:92.056

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials: Nitrogen tetroxide, nitric acid + sulfuric acid, silver perchlorate, strong oxidizers, sodium difluoride, .

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 108-88-3: XS5250000

LD50/LC50:

CAS# 108-88-3:

Draize test, rabbit, eye: 870 ug Mild;

Draize test, rabbit, eye: 2 mg/24H Severe;

Draize test, rabbit, skin: 435 mg Mild;

Draize test, rabbit, skin: 500 mg Moderate;

Draize test, rabbit, skin: 20 mg/24H Moderate;

Inhalation, mouse: LC50 = 400 ppm/24H;

Inhalation, rat: LC50 = 49 gm/m³/4H;

Oral, rat: LD50 = 636 mg/kg;

Skin, rabbit: LD50 = 14100 uL/kg;

Carcinogenicity:

CAS# 108-88-3:

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: IARC Group 3 - not classifiable

Epidemiology: No information available.

Teratogenicity: Specific developmental abnormalities included craniofacial effects involving the nose and tongue, musculoskeletal effects, urogenital and metabolic effects in studies on mice and rats by the inhalation and oral routes of exposure. Some evidence of fetotoxicity with reduced fetal weight and retarded skeletal development has been reported in mice and rats.

Reproductive Effects: Effects on fertility such as abortion were reported in rabbits by inhalation. Paternal effects were noted in rats by inhalation. These effects involved the testes, sperm duct and epididymis.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96H Fathead minnow LC50=36.2 mg/L/96H Sunfish (fresh water) TLm=1180 mg/L/96H

Environmental: From soil, substance evaporates and is microbially biodegraded. In water,

substance volatilizes and biodegrades.

Physical: Photochemically produced hydroxyl radicals degrade substance.

Other: None.

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# 108-88-3: waste number U220.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TOLUENE				No information available.
Hazard Class:	3				
UN Number:	UN1294				
Packing Group:	II				

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 108-88-3 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 108-88-3: Effective Date: 10/4/82; Sunset Date: 10/4/92

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# 108-88-3: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 108-88-3: acute, flammable.

Section 313

This material contains Benzene, methyl- (CAS# 108-88-3, 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# 108-88-3 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# 108-88-3 is listed as a Hazardous Substance under the CWA. CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 108-88-3 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# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

WARNING: This product contains Benzene, methyl-, a chemical known to the state of California to cause birth defects or other reproductive harm. 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:

XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 25 Avoid contact with eyes.

S 29 Do not empty into drains.

S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection)

CAS# 108-88-3: 2

Canada - DSL/NDSL

CAS# 108-88-3 is listed on Canada's DSL List.

Canada - WHMIS

This product does not have a WHMIS classification.

Canadian Ingredient Disclosure List

CAS# 108-88-3 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 108-88-3: OEL-AUSTRALIA: TWA 100 ppm (375 mg/m³); STEL 150 ppm (560 mg/m³) OEL-BELGIUM: TWA 100 ppm (377 mg/m³); STEL 150 ppm (565 mg/m³) OEL-CZECHOSLOVAKIA: TWA 200 mg/m³; STEL 1000 mg/m³ OEL-DENMARK: TWA 50 ppm (190 mg/m³); Skin OEL-FINLAND: TWA 100 ppm (375 mg/m³); STEL 150 ppm; Skin OEL-FRANCE: TWA 100 ppm (375 mg/m³); STEL 150 ppm (560 mg/m³) OEL-GERMANY: TWA 100 ppm (380 mg/m³) OEL-HUNGARY: TWA 100 mg/m³; STEL 300 mg/m³; Skin OEL-JAPAN: TWA 100 ppm (380 mg/m³) OEL-THE NETHERLANDS: TWA 100 ppm (375 mg/m³); Skin OEL-THE PHILIPPINES: TWA 100 ppm (375 mg/m³) OEL-POLAND: TWA 100 mg/m³ OEL-RUSSIA: TWA 100 ppm; STEL 50 mg/m³ OEL-SWEDEN: TWA 50 ppm (200 mg/m³); STEL 100 ppm (400 mg/m³); Skin OEL-SWITZERLAND: TWA 100 ppm (380 mg/m³); STEL 500 ppm OEL-THAILAND: TWA 200 ppm; STEL 300 ppm OEL-TURKEY: TWA 200 ppm (750 mg/m³) OEL-UNITED KINGDOM: TWA 100 ppm (375 mg/m³); STEL 150 ppm; Skin 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: 6/01/1999

Revision #5 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.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TRIMETHYL BENZENE**
(mixed isomers)

CAS Number: 25551-13-7
DOT Number: UN 2325

RTK Substance number: 1929
Date: January 1997 Revision: May 2003

HAZARD SUMMARY

- * **Trimethyl Benzene** can affect you when breathed in.
- * Contact can irritate the skin and eyes.
- * Exposure can cause you to feel dizzy, lightheaded, and to pass out.
- * Repeated exposure can cause headaches, and cause you to feel nervous, tense, tired and sleepy.
- * **Trimethyl Benzene** may cause changes in the blood cells and affect the blood's clotting ability.
- * **Trimethyl Benzene** can irritate the lungs. Repeated exposure may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.
- * *CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEET ON PSEUDOCUMENE.*

IDENTIFICATION

Trimethyl Benzene is a colorless liquid with a distinct odor. It is used in making dyes, pharmaceuticals and antioxidants, and as a solvent.

REASON FOR CITATION

- * **Trimethyl Benzene** is on the Hazardous Substance List because it is cited by ACGIH, DOT, NIOSH, DEP and NFPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- * **ODOR THRESHOLD = 2.4 ppm.**
- * The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

- NIOSH: The recommended airborne exposure limit is **25 ppm** averaged over a 10-hour workshift.
- ACGIH: The recommended airborne exposure limit is **25 ppm** averaged over an 8-hour workshift.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Trimethyl Benzene** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Trimethyl Benzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Trimethyl Benzene**:

- * Contact can irritate the skin and eyes.
- * Exposure can cause you to feel dizzy, lightheaded, and to pass out.
- * Repeated exposure can cause headaches, and cause you to feel nervous, tense, tired and sleepy.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Trimethyl Benzene** and can last for months or years:

Cancer Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Trimethyl Benzene** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Trimethyl Benzene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * **Trimethyl Benzene** may cause changes in the blood cells and affect the blood's clotting ability.
- * **Trimethyl Benzene** can irritate the lungs. Repeated exposure may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

- * Lung function tests.
- * Complete blood count and platelet count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically pump liquid **Trimethyl Benzene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Trimethyl Benzene** should change into clean clothing promptly.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Trimethyl Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Trimethyl Benzene**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Trimethyl Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and

to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Trimethyl Benzene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * Where the potential exists for exposure over **25 ppm**, use a NIOSH approved full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Trimethyl Benzene**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.



Right to Know Hazardous Substance Fact Sheet

Common Name: **XYLENES**

Synonyms: Methyl Toluene (mixed isomers); Xylol

Chemical Name: Benzene, Dimethyl-

Date: August 2006 Revision: October 2011

CAS Number: 1330-20-7

RTK Substance Number: 2014

DOT Number: UN 1307

Description and Use

Xylenes are colorless liquids with a faint, sweet odor. They are used as solvents and in making paints, adhesives and other chemicals.

- ▶ **ODOR THRESHOLD = 0.07 to 40 ppm**
- ▶ Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

This fact sheet can be used for:

m-Xylene CAS#: 108-38-3
o-Xylene CAS#: 95-47-6
p-Xylene CAS#: 106-42-3

Reasons for Citation

- ▶ **Xylenes** are on the Right to Know Hazardous Substance List because they are cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS, NFPA and EPA.

[SEE GLOSSARY ON PAGE 5.](#)

FIRST AID

Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	-	2
FLAMMABILITY	-	3
REACTIVITY	-	0
FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Xylenes** can affect you when inhaled and by passing through the skin.
- ▶ Contact can irritate the skin and eyes. Prolonged or repeated contact can cause a skin rash, dryness and redness.
- ▶ Inhaling **Xylenes** can irritate the nose and throat causing coughing and wheezing.
- ▶ Exposure can cause headache, dizziness, lightheadedness and passing out. Repeated exposure can affect concentration, memory, vision, and muscle coordination. Higher levels can cause coma and death.
- ▶ **Xylenes** may damage the liver and kidneys.
- ▶ **Xylenes** are FLAMMABLE LIQUIDS and DANGEROUS FIRE HAZARDS.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **100 ppm** averaged over a 10-hour workshift and **150 ppm**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **100 ppm** averaged over an 8-hour workshift and **150 ppm** as a STEL (short-term exposure limit).

- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Xylenes**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Xylenes** can irritate the nose and throat causing coughing and wheezing.
- ▶ Exposure can cause headache, nausea and vomiting, dizziness, lightheadedness and passing out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Xylenes** and can last for months or years:

Cancer Hazard

- ▶ While **Xylenes** have been tested, they are not classifiable as to their potential to cause cancer.

Reproductive Hazard

- ▶ **Xylenes** may damage the developing fetus.

Other Effects

- ▶ Repeated exposure can affect concentration, memory, vision, and muscle coordination. Higher levels can cause coma and death.
- ▶ Prolonged or repeated contact can cause a skin rash, dryness and redness.
- ▶ **Xylenes** may damage the liver and kidneys.

Medical

Medical Testing

For frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Exam of the eyes and vision
- ▶ Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Xylenes**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Xylenes** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **Xylenes**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ The recommended glove materials for **Xylenes** are Viton/Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier®.
- ▶ The recommended protective clothing materials for **Xylenes** are Tychem® BR, CSM and TK, or the equivalent.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- ▶ Where the potential exists for exposure over **100 ppm**, use a full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Xylenes**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential for high exposure exists, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- ▶ Exposure to **900 ppm** is immediately dangerous to life and health. If the possibility of exposure above **900 ppm** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Xylenes** are FLAMMABLE LIQUIDS.
- ▶ Use dry chemical, CO₂, water spray or foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ CONTAINERS MAY EXPLODE IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.
- ▶ Vapors are heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.
- ▶ Flow or agitation may generate electrostatic charges.
- ▶ **Xylenes** may form an ignitable vapor/air mixture in closed tanks or containers.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Xylenes** are spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.
- ▶ Keep **Xylenes** out of confined spaces, such as sewers, because of the possibility of an explosion.
- ▶ Ventilate area of spill or leak.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Xylenes** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Xylenes** you should be trained on its proper handling and storage.

- ▶ **Xylenes** react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Xylenes** are used, handled, or stored.
- ▶ Metal containers involving the transfer of **Xylenes** should be grounded and bonded.
- ▶ Use explosion-proof electrical equipment and fittings wherever **Xylenes** are used, handled, manufactured, or stored.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **Xylenes**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: <http://www.nj.gov/health/eoh/rtkweb>

***The Right to Know Hazardous Substance Fact Sheets
are not intended to be copied and sold
for commercial purposes.***

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is a unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.



Common Name: **XYLENES**

Synonyms: Dimethylbenzene; Methyl Toluene (mixed isomers); Xylol

CAS No: 1330-20-7

Molecular Formula: C₆H₄(CH₃)₂

RTK Substance No: 2014

Description: Colorless liquids with a faint, sweet odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health 3 - Fire 0 - Reactivity DOT#: UN 2014 ERG Guide #: 130 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUIDS Use dry chemical, CO ₂ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors are heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back. Flow or agitation may generate electrostatic charges. Xylenes may form an ignitable vapor/air mixture in closed tanks or containers.	Xylenes react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Ground and bond containers when transferring **Xylenes**.

Use only non-sparking tools and equipment.

Keep **Xylenes** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Xylenes are toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	0.07 to 40 ppm
Flash Point:	63° to 77°F (17° to 25°C)
LEL:	0.9 to 1.1%
UEL:	6.7 to 7%
Auto Ignition Temp:	867° to 984°F (464° to 529°C)
Vapor Density:	3.7 (air = 1)
Vapor Pressure:	7 to 9 mm Hg at 68°F (20°C)
Specific Gravity:	0.86 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	279° to 291°F (137° to 144°C)
Freezing Point:	-53°F (-47°C) to 55.4°F (13°C)
Ionization Potential:	8.44 to 8.56 eV
Molecular Weight:	106.2

EXPOSURE LIMITS

OSHA: 100 ppm, 8-hr TWA

NIOSH: 100 ppm, 10-hr TWA; 150 ppm, STEL

ACGIH: 100 ppm, 8-hr TWA; 150 ppm, STEL

IDLH: 900 ppm

The Protective Action Criteria values are:

PAC-1 = 130 ppm PAC-2 = 920 ppm PAC-3 = 2,500 ppm

PROTECTIVE EQUIPMENT

Gloves:	Vinton/Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® BR, CSM and TK (>8-hr breakthrough) Use turnout gear or flash protection if ignition/fire is the greatest hazard
Respirator:	>100 ppm - full facepiece APR with <i>Organic vapor cartridge</i> >900 ppm - SCBA

HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation (skin absorbable)

Inhalation: Nose and throat irritation with coughing and wheezing

Headache, dizziness, lightheadedness, and passing out

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ZINC OXIDE**

CAS Number: 1314-13-2
DOT Number: UN 3077
DOT Hazard Class: 9 (Miscellaneous Hazardous Material)

RTK Substance number: 2037
Date: February 2000 Revision: January 2007

HAZARD SUMMARY

- * **Zinc Oxide** can affect you when breathed in.
- * Exposure to **Zinc Oxide** can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.
- * **Zinc Oxide** may be released when welding galvanized metal.

IDENTIFICATION

Zinc Oxide is a white or yellowish-white, odorless powder which is used in pigments, rubber, paints, ceramics, plastics, cosmetics and pharmaceuticals. **Zinc Oxide fumes** are fine, white, odorless particles which are formed when **Zinc** or **Zinc alloys** are heated to high temperatures (such as in welding, galvanizing and smelting).

REASON FOR CITATION

- * **Zinc Oxide** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP and EPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **5 mg/m³** (for **Zinc Oxide fume**), **15 mg/m³** (for **total dust**), and **5 mg/m³** (for **respirable dust**) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **5 mg/m³** (for **Zinc Oxide fume and dust**) averaged over a 10-hour workshift, **10 mg/m³** as a short-term exposure limit (for **Zinc Oxide fume**), and **15 mg/m³** (for **Zinc Oxide dust**), not to be exceeded at any time.

ACGIH: The recommended airborne exposure limit is **2 mg/m³** averaged over an 8-hour workshift and **10 mg/m³** as a STEL (short-term exposure limit) for the *respirable fraction*.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Zinc Oxide** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Zinc Oxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. Consult the appropriate New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Zinc Oxide**:

- * Exposure to **Zinc Oxide** can cause "metal fume fever." This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Zinc Oxide** and can last for months or years:

Cancer Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Zinc Oxide** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- * **Zinc Oxide** may damage the developing fetus.

Other Long-Term Effects

- * **Zinc Oxide** has not been tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically transfer **Zinc Oxide** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Zinc Oxide** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Zinc Oxide**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Zinc Oxide**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Zinc Oxide**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Zinc Oxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.
- * Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Zinc Oxide**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear eye protection with side shields or goggles.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- * NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- * If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Zinc Oxide**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.

- * Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- * Where the potential exists for exposure over **20 mg/m³**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **500 mg/m³** is immediately dangerous to life and health. If the possibility of exposure above **500 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.
- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

APPENDIX D

HEAT AND COLD STRESS FACT SHEETS

Fast Facts

Protecting Yourself from Heat Stress

Heat stress, from exertion or hot environments, places workers at risk for illnesses such as heat stroke, heat exhaustion, or heat cramps.

Heat Stroke

A condition that occurs when the body becomes unable to control its temperature, and can cause death or permanent disability.

Symptoms

- High body temperature
- Confusion
- Loss of coordination
- Hot, dry skin or profuse sweating
- Throbbing headache
- Seizures, coma

First Aid

- Request immediate medical assistance.
- Move the worker to a cool, shaded area.
- Remove excess clothing and apply cool water to their body.

Heat Exhaustion

The body's response to an excessive loss of water and salt, usually through sweating.

Symptoms

- Rapid heart beat
- Heavy sweating
- Extreme weakness or fatigue
- Dizziness
- Nausea, vomiting
- Irritability
- Fast, shallow breathing
- Slightly elevated body temperature

First Aid

- Rest in a cool area.
- Drink plenty of water or other cool beverages.
- Take a cool shower, bath, or sponge bath.

Heat Cramps

Affect workers who sweat a lot during strenuous activity. Sweating depletes the body's salt and moisture levels.

Symptoms

- Muscle cramps, pain, or spasms in the abdomen, arms or legs

First Aid

- Stop all activity, and sit in a cool place.
- Drink clear juice or a sports beverage, or drink water with food.
 - Avoid salt tablets.
- Do not return to strenuous work for a few hours after the cramps subside.
- Seek medical attention if you have the following: heart problems, are on a low-sodium diet, or if the cramps do not subside within one hour.

Protect Yourself

Avoid heavy exertion, extreme heat, sun exposure, and high humidity when possible. When these cannot be avoided, take the following preventative steps:

- Monitor your physical condition and that of your coworkers for signs or symptoms of heat illnesses.
- Wear light-colored, loose-fitting, breathable clothing such as cotton.
 - Avoid non-breathable synthetic clothing.
- Gradually build up to heavy work.
- Schedule heavy work during the coolest parts of day.
- Take more breaks when doing heavier work, and in high heat and humidity.
 - Take breaks in the shade or a cool area.
- Drink water frequently. Drink enough water that you never become thirsty.
- Be aware that protective clothing or personal protective equipment may increase the risk of heat-related illnesses.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

www.cdc.gov/niosh/topics/outdoor/

DHHS (NIOSH) Publication No. 2010-114

Telephone: 1-800-CDC-INFO

TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov



Fast Facts

Protecting Yourself from Cold Stress

Workers who are exposed to extreme cold or work in cold environments may be at risk of cold stress. Extremely cold or wet weather is a dangerous situation that can cause occupational illness and injuries such as hypothermia, frostbite, trench foot, and chilblains.

Hypothermia

A condition in which the body uses up its stored energy and can no longer produce heat. Often occurs after prolonged exposure to cold temperature.

Early symptoms

- Shivering
- Fatigue
- Loss of coordination
- Confusion and disorientation

Late symptoms

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

First Aid

- Request immediate medical assistance.
- Move the victim into a warm room or shelter.
- Remove wet clothing.
- Warm the center of their body first—chest, neck, head, and groin—using an electric blanket; or use skin-to-skin contact under loose, dry layers of blankets, clothing, or towels.
- If conscious, warm beverages may help increase the body temperature. Do not give alcohol.
- Once temperature has increased keep them dry and wrapped in a warm blanket, including the head and neck.
- If no pulse, begin CPR.

Frostbite

An injury to the body that is caused by freezing, which most often affects the nose, ears, cheeks, chin, fingers, or toes.

Symptoms

- Reduced blood flow to hands and feet
- Numbness
- Aching
- Tingling or stinging
- Bluish or pale, waxy skin

First Aid

- Get into a warm room as soon as possible.
- Unless necessary, do not walk on frostbitten feet or toes.
- Immerse the affected area in warm (not hot) water, or warm the affected area using body heat. Do not use a heating pad, fireplace, or radiator for warming.
- Do not massage the frostbitten area; doing so may cause more damage.

Trench Foot

An injury of the feet resulting from prolonged exposure to wet and cold conditions that can occur at temperatures as high as 60 °F if the feet are constantly wet.

Symptoms

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (foot may turn dark purple, blue, or gray)

First Aid

- Remove shoes/boots and wet socks.
- Dry feet.
- Avoid walking on feet, as this may cause tissue damage.

Chilblains

Ulcers formed by damaged small blood vessels in the skin, caused by the repeated exposure of skin to temperatures just above freezing to as high as 60 °F.

Symptoms

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

First Aid

- Avoid scratching.
- Slowly warm the skin.
- Use corticosteroid creams to relieve itching and swelling
- Keep blisters and ulcers clean and covered.

Protect Yourself

- Monitor your physical condition and that of your coworkers.
- Wear appropriate clothing.
 - Wear several layers of loose clothing for insulation.
 - Tight clothing reduces blood circulation to the extremities.
- Be aware that some clothing may restrict movement resulting in a hazardous situation.
- Protect the ears, face, hands and feet in extremely cold or wet weather.
 - Boots should be waterproof and insulated.
 - Wear a hat to reduce the loss of body heat from your head.
- Move into warm locations during breaks; limit the amount of time outside.
- Carry extra socks, gloves, hats, jacket, blankets, a change of clothes and a thermos of hot liquid.
- Include chemical hot packs in your first aid kit.
- Avoid touching cold metal surfaces with bare skin.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

www.cdc.gov/niosh/topics/outdoor/

DHHS (NIOSH) Publication No. 2010-115

Telephone: 1-800-CDC-INFO

TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov



APPENDIX E

JOBSITE SAFETY INSPECTION FORM



Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Project Number: _____

Check one of the following: **A:** Acceptable **NA:** Not Applicable **D:** Deficiency

	A	NA	D	Remarks
1. HASP available on site for inspection?				
2. Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8. Appropriate PPE being worn by Langan employees and subcontractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Markouts of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in HASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				
23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead powerlines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layed back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				

28. Ladders in trench (25-foot spacing)?				
29. Excavated material placed more than 2 feet away from excavation edge?				
30. Public protected from exposure to open excavation?				
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
32. Confined space entry permit is completed and posted?				
33. All persons knowledgeable about the conditions and characteristics of the confined space?				
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
36. Attendant and/or supervisor certified in basic first aid and CPR?				
37. Confined space atmosphere checked before entry and continuously while the work is going on?				
38. Results of confined space atmosphere testing recorded?				
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
40. Are extension cords rated for this work being used and are they properly maintained?				
41. Are GFCIs provided and being used?				

Unsafe acts observed? _____

Additional remarks _____

Distribution: Project Manager (for information and follow-up) Name: _____
 Health & Safety Officer (for corrective action) Name: _____
 Health & Safety Coordinator (resource for corrective action and follow-up)

APPENDIX F

SITE SAFETY MEETING FORM

SAFETY BRIEFING

Date: _____ Time: _____ Leader: _____ Location: _____

Work Task: _____

SAFETY TOPICS *(provide some detail of discussion points)*

Chemical Exposure Hazards and Control _____

Physical Hazards and Control _____

Air Monitoring _____

PPE _____

Communications _____

Safe Work Practices _____

Emergency Response _____

Hospital/Medical Center Location _____

Phone Nos. _____

Other _____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.)

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

Briefing Conducted By: _____

APPENDIX G

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL A DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and fully-encapsulating suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, fully-encapsulating suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Facepiece Removal	6. Facepiece is removed (avoid touching face with fingers). Facepiece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.

APPENDIX H
STANDING ORDERS

STANDING ORDERS

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

APPENDIX D

SOIL/MATERIALS MANAGEMENT PLAN

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1.0 PREAMBLE

The Professional Engineer responsible for oversight during implementation and completion of the Parcel G1 (37 Blue Slip, Brooklyn, NY) (OER Project #15EH-N082K) remediation in accordance with the requirements of the Remedial Action Plan (RAP)¹ is Jason J. Hayes (NYS PE License Number 089491). At the completion of the implementation of the remedy, Mr. Hayes will certify that the site remedy (as defined in the RAP) was implemented in accordance with the RAP and that all requirements in the RAP have been complied with.

2.0 SOIL SCREENING METHODS

Soil/fill material will be screened and assessed for visual, olfactory and photoionization detector (PID) evidence of contamination by a field engineer/scientist under the supervision of a Qualified Environmental Professional (QEP) during invasive work performed during the remedy and development phases. Any pertinent observations or results will be reported in the Remedial Closure Report (RCR). Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Satisfaction.

3.0 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before 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 OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with

¹ The remedial action plan for Parcel G1.

applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

4.0 CHARACTERIZATION OF EXCAVATED MATERIALS

Soil/fill material or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Any soils proposed at a future date for reuse on-Site will be managed as defined in this plan, including any modifications for such reuse, and in accordance with all applicable regulations.

5.0 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE

The PE/QEP overseeing the remedial action will observe the remedial work and the excavation and load-out of excavated material. The PE/QEP will certify at the completion of the remedy that the following requirements were implemented and conducted under the direct oversight of individuals reporting to the PE/QEP:

- Inspecting loaded outbound trucks for cleanliness and cleaning of trucks before they leave the Site. Daily inspections of the locations where vehicles exit the Site for evidence of soil tracking off the premises;
- Designating a party responsible for the safe execution of invasive and other work performed under this work plan;
- Site development activities and development-related grading cuts did not interfere with, or otherwise impair or compromise, the remedial activities proposed in the RAP;
- Investigating the presence of utilities and easements on the Site and having any identified risks from work proposed under this plan properly addressed by the appropriate party(ies);
- Keeping egress points for truck and equipment transport from the Site clean of Site-derived materials during Site remediation;
- Cleaning of the adjacent streets as needed to maintain a clean condition with respect to Site-derived materials; and

- No open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site without implementing appropriate dust control measures and OER approval.

6.0 OFF-SITE MATERIALS TRANSPORT

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are in Section 3.8 of the RAP. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing 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. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

7.0 MATERIALS DISPOSAL OFF-SITE

The redevelopment of Parcel G1 is expected to be a net fill project. This RAP proposes that all excavated material generated will be shipped off-site for disposal and will be managed in accordance with the protocols described in this section. Proposals for re-use of site soils, where appropriate, may be submitted at a later date.

The following documentation will be established and reported by the PE/QEP for each receiving facility to document that the disposal of regulated material exported from the Site conforms with laws, regulations, and permit conditions applicable to each receiving facility:

1. A letter from the PE/QEP or Applicant to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an

environmental remediation Site in New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Applicant. The letter will include as an attachment a summary of relevant chemical data for the material being transported; and

2. A letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material.

These documents will be included in the RCR.

The RCR will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RCR.

All impacted soil/fill or other waste excavated and removed from the Site for disposal will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RCR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RCR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

8.0 MATERIALS REUSE ON-SITE

No soil/fill material derived from Parcel G1 is expected to be reused on-Site. However, if development plans change and soil/fill material derived from Parcel G1 will be reused on-Site, on-Site reuse will be conducted in accordance with the revised, the OER-approved RAP, the Soil and Materials Management Plan (SMMP), NYSDEC laws and regulations, and other applicable agency requirements to be determined in coordination

with respective agencies. Proposals for re-use of Site soils, where appropriate, may be submitted at a later date.

The soil cleanup objectives for the Site are listed in the RAP. "Reuse on-Site" means material that is excavated during the remedy or development, does not leave Parcel G1, and is relocated within the same property (Parcel G1) and is installed on soil/fill material of comparable quality and level of contamination, and addressed pursuant to Engineering Controls. Reused materials will be segregated from other materials to be exported from Parcel G1 and that procedures defined for material reuse in this RAP will be followed.

Composite soil sampling of stockpiled excavated soil/fill material will be performed before reuse. A maximum five-part composite sample will be collected from the stockpile at a frequency in accordance with CP-51 Soil Cleanup Guidance Table 4 and analyzed for the following parameters:

- USEPA Method 8260A for VOCs;
- USEPA Method 8270D for SVOCs;
- USEPA Method 8082A for PCBs
- USEPA Method 8081B for organochlorine pesticides
- USEPA Method 8151A for herbicides;
- USEPA Method 6010C/7471B for metals;
- USEPA Method 7196A for hexavalent chromium; and
- USEPA Method 9010C/9012A for total cyanide.

Please see Figure 14 for an illustration of the proposed excavation and fill areas and anticipated movement of excavated soil/fill material.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of Parcel G1 will be removed from the Site for disposal. Soil or fill excavated from Parcel G1 for grading or other purposes will not be reused as cover material or within landscaping berms unless a written approval is obtained from the OER and other agencies that have jurisdiction, and the soil or fill meets the lower of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Use Restricted-Residential and Protection of Groundwater SCOs.

9.0 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, residual (existing) soil and fill material outside of the new building footprint will be demarcated as described below. The top of the residual (existing) soil and fill material will be defined by one of three methods:

- (1) Placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual (existing) soil/fill material to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the RCR;
- (2) A land survey of the top elevation of residual soil/fill material before the placement of clean cover soil or fill material; or
- (3) All materials beneath the composite cover system in non-landscaped areas will be considered impacted and subject to site management after the remedy is complete.

Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RCR. This demarcation will constitute the top of the site management horizon for those areas outside of the building footprint.

10.0 IMPORT OF BACKFILL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below permanent structures, impervious surfaces (e.g., roadways, sidewalks, and walkways), and the clean cover layer as well as within the clean soil cover layer. All imported soil/fill material will meet the OER-approved backfill and cover soil quality objectives for Parcel G1. The backfill and cover soil quality objectives are listed in the RAP.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill

sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives with OER approval:

- Sand, gravel, rock or stone, consisting of virgin material from a -permitted mine or quarry;
- Clean soil from within the Greenpoint Landing development property pending approval from the NYSDEC, OER, and other agencies, if required;
- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations; and
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYSDEC.

All materials received for import to Parcel G1 will be certified by a PE/QEP to be in compliance with provisions in this RAP. The RCR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP will certify that every truck load of imported material was inspected for evidence of contamination and oversee individuals conducting respective inspections; and

- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a frequency in accordance with CP-51 Soil Cleanup Guidance Table 4, or at a lesser frequency negotiated with the OER, depending on the proposed source material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to Parcel G1.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RCR. A PE/QEP will certify that the facilities are compliant with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities and virgin sand, gravel, rock or stone from mines, quarries or facilities permitted or registered by the NYSDEC or the applicable state of origin will not require additional testing unless required by NYSDEC under its terms for operation of the facility. RCA imported to Parcel G1 must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

11.0 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYCDEP). The NYCDEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYCDEP discharge criteria.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) or to groundwater is prohibited without a State Pollutant Discharge

Elimination System (SPDES) permit or a non-jurisdictional determination issued by the NYSDEC.

Dewatering fluids may also be containerized and disposed of off-site at a permitted receiving facility.

12.0 STORMWATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

13.0 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to the OER's Project Manager. Petroleum spills will be reported to the NYSDEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contamination sources are found during on-site remedial excavation or development-related excavation, sampling and analysis will be performed on contaminated source material and reported to the OER. Samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and target analyte list (TAL) metals, as appropriate.

14.0 ODOR, DUST AND NUISANCE CONTROL

Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, 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. The OER will be notified of all odor complaint events. The PE/QEP will certify at the completion of the project that odor monitoring controls, including halting of work, were implemented in accordance with this plan and will oversee the individuals responsible for monitoring for odors.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. The OER will be notified of all dust complaint events. The PE/QEP will certify at the completion of the project that dust monitoring controls, including halt of work,

were implemented in accordance with this plan and will oversee the individuals responsible for monitoring for dust.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

15.0 IMPORT OF CLEAN COVER SOIL

Up to 1,500 tons (1,000 cubic yards) of soil is anticipated to be imported to Parcel G1 for use as clean cover in landscaped areas. All imported soil will be uncontaminated, clean soil that meets the lower of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Use Restricted-Residential Use and Protection of Groundwater SCOs.

The imported uncontaminated, clean soil cover will be from an approved source/facility and will be evaluated by the PE/QEP to ensure that the following has been accomplished. Imported uncontaminated, clean soil cover will conform to the following, as evaluated by individuals reporting to the PE/QEP:

- 1) A segregated stockpile for up to 1,500 tons (1,000 cubic yards) will be properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at Parcel G1;
- 2) The material will not include any solid waste, including construction and demolition material, as it is prohibited;
- 3) Screening for evidence of contamination by visual, olfactory and PID screening practices will occur prior to testing at the source as well as upon importing to Parcel G1 for grading is completed; and
- 4) A maximum five-part composite sample will be collected from the segregated stockpile at the source at a frequency in accordance with CP-51 Soil Cleanup Guidance Table 4 or at a frequency negotiated with the OER, depending on the proposed source material and analyzed for the following parameters:

- VOCs by EPA Method 8260C

- SVOCs by EPA Method 8270D
- Pesticides by EPA Method 8081B
- PCBs by EPA Method 8082A
- TAL Metals by EPA Method 6010C/7471B

Upon receipt of the segregated stockpile analytical results collected at the source, a Clean Soil Sampling Report will be submitted to the OER for review/approval prior to importing. The report will include the following:

- 1) Summary of number of samples collected and analyzed, tabulated data and comparison to Site-specific SCOs;
- 2) Analytical data sheets and chain of custody documentation;
- 3) Summary of up to 1,500 tons (1,000 cubic yards);
- 4) Photographs from the segregated stockpile at the source with sample point locations identified;
- 5) An affidavit from the source/facility on company letterhead stating that the segregated stockpile for up to 1,500 tons (1,000 cubic yards) has been properly maintained at the source and complies with the requirements listed above; and
- 6) A copy of source/facility permit;

Demarcation as described above will be complete prior to installation of the clean soil/fill surface cover. Upon importing and grading the OER-approved clean soil cover for up to 1,500 tons (1,000 cubic yards), the following documentation will be presented in the Final Remedial Closure Report:

- 1) Copies of purchase invoices;
- 2) Truck transportation slips from the source to the Site;
- 3) Confirmation of up to 1,500 tons (1,000 cubic yards) of the OER-approved clean soil cover material was imported and graded at the Site;
- 4) Site plan depicting all areas where the OER-approved clean soil cover was placed;
- 5) Documentation of demarcation method; and
- 6) Photographs documenting the importing and grading of the OER-approved clean soil cover across the Site, and where applicable, the demarcation layer.

APPENDIX E

SAMPLE NON-HAZARDOUS AND HAZARDOUS WASTE MANIFEST

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number	
5. Generator's Name and Mailing Address			Generator's Site Address (if different than mailing address)			
Generator's Phone:						
6. Transporter 1 Company Name				U.S. EPA ID Number		
7. Transporter 2 Company Name				U.S. EPA ID Number		
8. Designated Facility Name and Site Address				U.S. EPA ID Number		
Facility's Phone:						
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
		No.	Type			
1.						
2.						
3.						
4.						
14. Special Handling Instructions and Additional Information						
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.						
Generator's/Offelor's Printed/Typed Name				Signature		Month Day Year
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____						
17. Transporter Acknowledgment of Receipt of Materials						
Transporter 1 Printed/Typed Name				Signature		Month Day Year
Transporter 2 Printed/Typed Name				Signature		Month Day Year
18. Discrepancy						
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection						
Manifest Reference Number: _____						
18b. Alternate Facility (or Generator)				U.S. EPA ID Number		
Facility's Phone:						
18c. Signature of Alternate Facility (or Generator)				Month Day Year		
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)						
1.	2.	3.	4.			
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a						
Printed/Typed Name				Signature		Month Day Year

GENERATOR

TRANSPORTER INT'L

DESIGNATED FACILITY

GENERATOR	NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Waste Tracking Number	
	5. Generator's Name and Mailing Address			Generator's Site Address (if different than mailing address)		
	Generator's Phone:					
	6. Transporter 1 Company Name			U.S. EPA ID Number		
	7. Transporter 2 Company Name			U.S. EPA ID Number		
	8. Designated Facility Name and Site Address			U.S. EPA ID Number		
	Facility's Phone:					
	9. Waste Shipping Name and Description		10. Containers		11. Total Quantity	12. Unit Wt./Vol.
			No.	Type		
	1.					
2.						
3.						
4.						
13. Special Handling Instructions and Additional Information						
14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.						
Generator's/Offeror's Printed/Typed Name			Signature		Month Day Year	
15. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____						
16. Transporter Acknowledgment of Receipt of Materials						
Transporter 1 Printed/Typed Name			Signature		Month Day Year	
Transporter 2 Printed/Typed Name			Signature		Month Day Year	
17. Discrepancy						
17a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection						
Manifest Reference Number: _____						
17b. Alternate Facility (or Generator)			U.S. EPA ID Number			
Facility's Phone:						
17c. Signature of Alternate Facility (or Generator)			Signature		Month Day Year	
18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a						
Printed/Typed Name			Signature		Month Day Year	

APPENDIX F

WATERPROOFING/VAPOR BARRIER PRODUCT SPECIFICATIONS

P R O D U C T I N F O R M A T I O N

Preprufe® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites.

Advantages

- Forms a unique continuous adhesive bond to concrete poured against it – prevents water migration and makes it unaffected by ground settlement beneath slabs
- Fully-adhered watertight laps and detailing
- Provides a barrier to water, moisture and gas – physically isolates the structure from the surrounding ground
- BBA Certified for basement Grades 2, 3, & 4 to BS 8102:1990
- Zero permeance to moisture
- Solar reflective – reduced temperature gain
- Simple and quick to install – requiring no priming or fillets
- Can be applied to permanent formwork – allows maximum use of confined sites
- Self protecting – can be trafficked immediately after application and ready for immediate placing of reinforcement
- Unaffected by wet conditions – cannot activate prematurely
- Inherently waterproof, non-reactive system:
 - not reliant on confining pressures or hydration
 - unaffected by freeze/thaw, wet/dry cycling
- Chemical resistant – effective in most types of soils and waters, protects structure from salt or sulphate attack

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

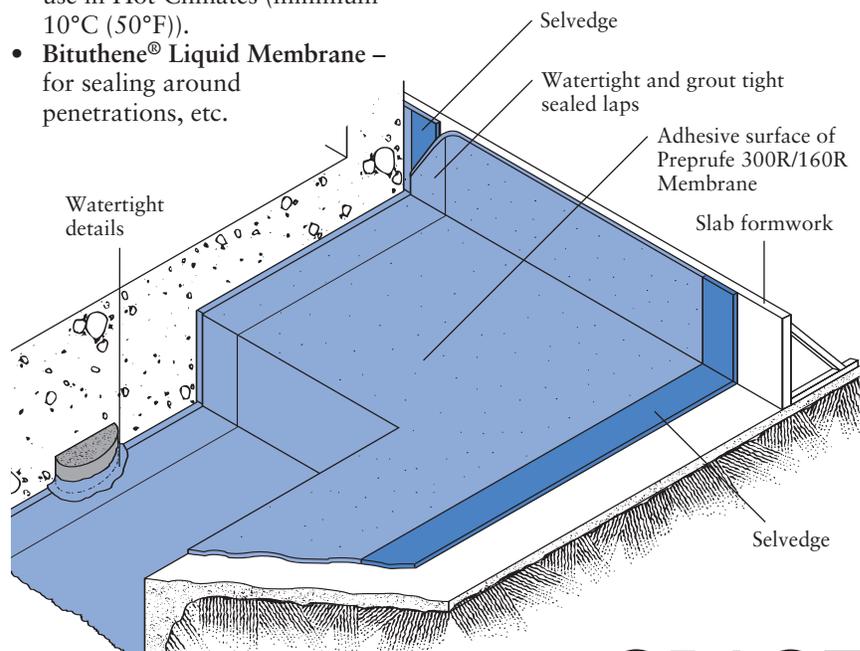
Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

- **Preprufe 300R** – heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R** – thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT** – for covering cut edges, roll ends, penetrations and detailing (temperatures between -4°C (25°F) and +30°C (86°F)).
- **Preprufe Tape HC** – as above for use in Hot Climates (minimum 10°C (50°F)).
- **Bituthene® Liquid Membrane** – for sealing around penetrations, etc.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted sand or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.



Installation

The most current application instructions, detail drawings and technical letters can be viewed at www.graceconstruction.com. Technical letters are provided for the following subjects to assist in the installation of Preprufe:

- Chemical Resistance
- Minimizing Concrete Shrinkage and Curling
- Rebar Chairs on Preprufe 300R Membrane
- Removal of Formwork Placed Against Preprufe Membranes
- Winter Lap Sealing and the use of Preprufe Tape LT

For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 1.2 m (4 ft) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

All surfaces – It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12 mm (0.5 in.). Grout around all penetrations such as utility conduits, etc. for stability.

Horizontal – The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. The surface does not need to be dry, but standing water must be removed.

Vertical – Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 12 mm (0.5 in.) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of -4°C (25°F) or above. When installing Preprufe in cold or marginal weather conditions <13°C (55°F) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application.

Horizontal substrates –

Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 75 mm (3 in.) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letters for information on suitable rebar chairs for Preprufe.

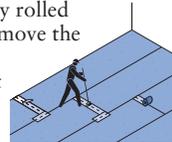
Vertical substrates –

Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour.

The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 50 mm (2 in.) below the top edge. Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges – Overlap all roll ends and cut edges by a minimum 75 mm (3 in.) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap and roll firmly. Immediately remove printed plastic release liner from the tape.



Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit www.graceconstruction.com. This Manual gives comprehensive guidance and standard details for:

- internal and external corners
- penetrations
- tiebacks
- columns
- grade beam pilecaps
- tie-ins
- terminations

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (12 mm (0.5 in.) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 150 mm (6 in.) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

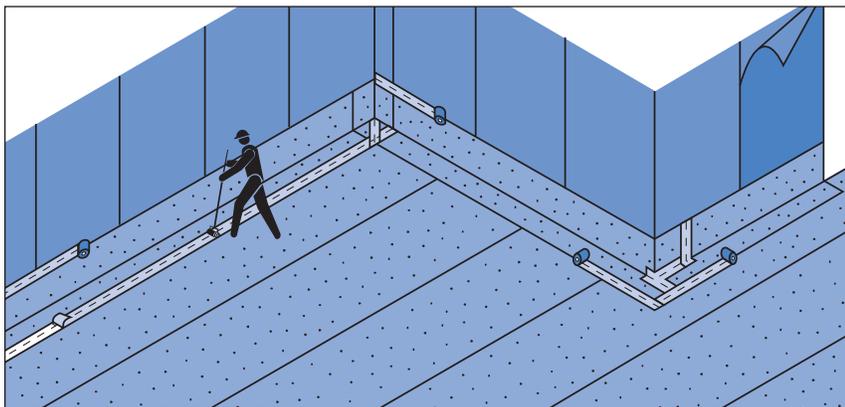
It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 10 N/mm² (1500 psi) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

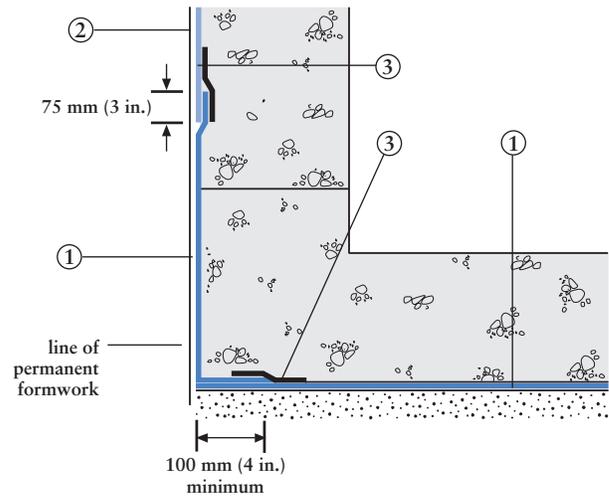
As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 40 N/mm² (6000 psi) will typically require a cure time of approximately 6 days at an average ambient temperature of -4°C (25°F), or 2 days at 21°C (70°F).



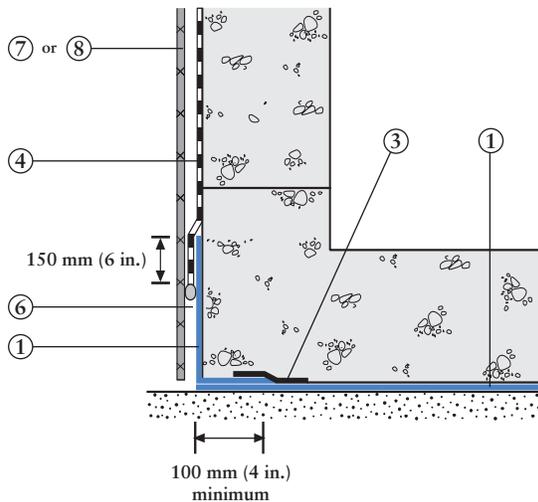
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at www.graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

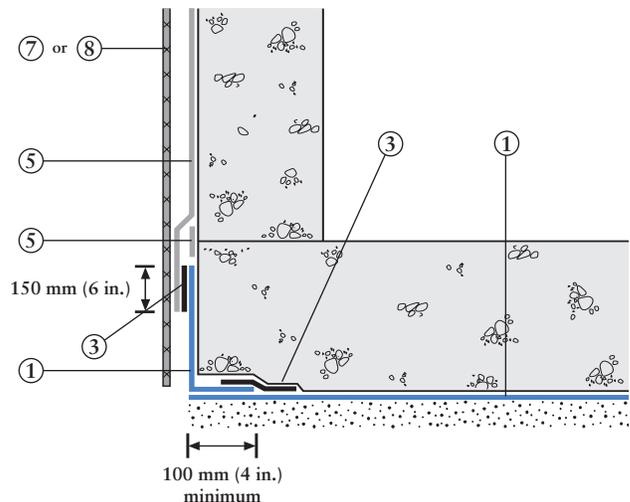
Wall base detail against permanent shutter



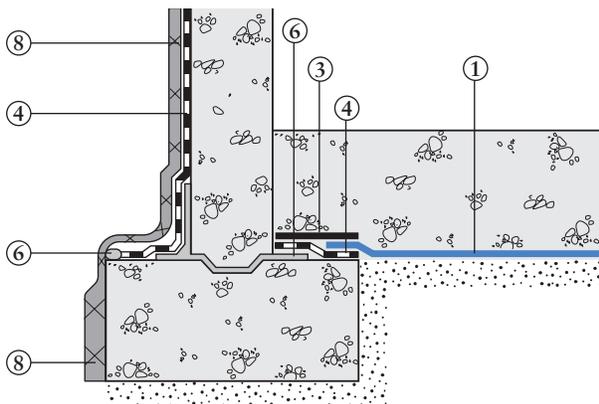
Bituthene wall base detail (Option 1)



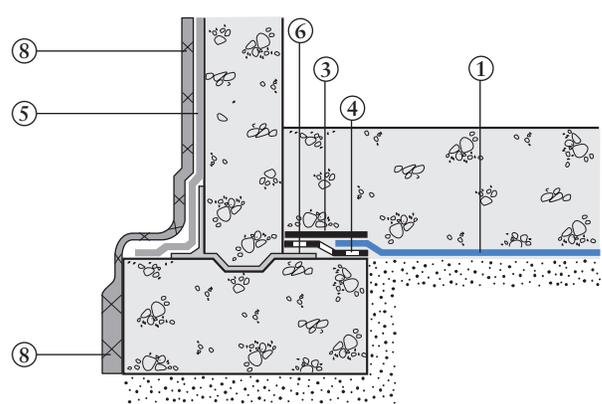
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



- 1 Preprufe 300R
- 2 Preprufe 160R

- 3 Preprufe Tape
- 4 Bituthene

- 5 Procor
- 6 Bituthene Liquid Membrane

- 7 Protection
- 8 Hydroduct®

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	1.2 mm (0.046 in.)	0.8 mm (0.032 in.)	
Roll size	1.2 m x 30 m (4 ft x 98 ft)	1.2 m x 35 m (4 ft x 115 ft)	100 mm x 15 m (4 in. x 49 ft)
Roll area	36 m ² (392 ft ²)	42 m ² (460 ft ²)	
Roll weight	50 kg (108 lbs)	42 kg (92 lbs)	2 kg (4.3 lbs)
Minimum side/end laps	75 mm (3 in.)	75 mm (3 in.)	75 mm (3 in.)

*LT denotes Low Temperature (between -4°C (25°F) and +30°C (86°F))
 HC denotes Hot Climate (>+10°C (50°F))

Ancillary Products

Bituthene Liquid Membrane – 5.7 liter (1.5 US gal) or 15.1 liter (4 US gal)

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	1.2 mm (0.046 in.) nominal	0.8 mm (0.032 in.) nominal	ASTM D3767
Low temperature flexibility	Unaffected at -23°C (-10°F)	Unaffected at -23°C (-10°F)	ASTM D1970
Resistance to hydrostatic head, minimum	70 m (231 ft)	70 m (231 ft)	ASTM D5385, modified ¹
Elongation, minimum	300%	300%	ASTM D412, modified ²
Tensile strength, film, minimum	27.6 MPa (4000 psi)	27.6 MPa (4000 psi)	ASTM D412
Crack cycling at -23°C (-10°F), 100 cycles	Unaffected	Unaffected	ASTM C836
Puncture resistance, minimum	990 N (221 lbs)	445 N (100 lbs)	ASTM E154
Peel adhesion to concrete, minimum	880 N/m (5.0 lbs/in.) width	880 N/m (5.0 lbs/in.) width	ASTM D903, modified ³
Lap peel adhesion	440 N/m (2.5 lbs/in.) width	440 N/m (2.5 lbs/in.) width	ASTM D1876, modified ⁴
Permeance to water vapor Transmission, maximum	0.01 perms (0.6 ng/(Pa × s × m ²))	0.01 perms (0.6 ng/(Pa × s × m ²))	ASTM E96, method B
Water absorption, maximum	0.5%	0.5%	ASTM D570
Methane permeability	9.1 mls/m ² /day	N/A	University of London, QMW College ³
Permeability ⁵ (hydraulic conductivity)	K=<1.4 × 10 ⁻¹¹ cm.s ⁻¹	K=<1.4 × 10 ⁻¹¹ cm.s ⁻¹	ASTM D5084-90

Footnotes:

- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 50 mm (2 in.) per minute.
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).
- Result is lower limit of apparatus. Membrane therefore considered impermeable.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to

Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

For Technical Assistance call toll free at 866-333-3SBM (3726).

 Visit our web site at www.graceconstruction.com

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W. R. Grace & Co.-Conn. 62 Whittemore Avenue Cambridge, MA 02140

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We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.-Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

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GRACE
Construction Products

Grace Above Grade Waterproofing

BITUTHENE® SYSTEM 4000

Self-adhesive HDPE waterproofing membrane with super tacky compound for use with patented, water-based Bituthene® System 4000 Surface Conditioner

Description

Bituthene® System 4000 WaterProofing Membrane is a 1/16 in. (1.5 mm) flexible, pre-formed membrane which combines a high performance, cross laminated, HDPE carrier film with a unique, super tacky, self-adhesive rubberized asphalt compound.

Bituthene® System 4000 Surface Conditioner is a unique, water-based, latex surface treatment which imparts an aggressive, high tack finish to the treated substrate. It is specifically formulated to bind site dust and concrete efflorescence, thereby providing a suitable surface for the Bituthene® System 4000 Waterproofing Membrane.

Conveniently packaged in each roll of membrane, System 4000 Surface Conditioner promotes good initial adhesion and, more importantly, excellent permanent adhesion of the Bituthene® System 4000 Waterproofing Membrane. The VOC (Volatile Organic Compound) content of this product is 91 g/L.

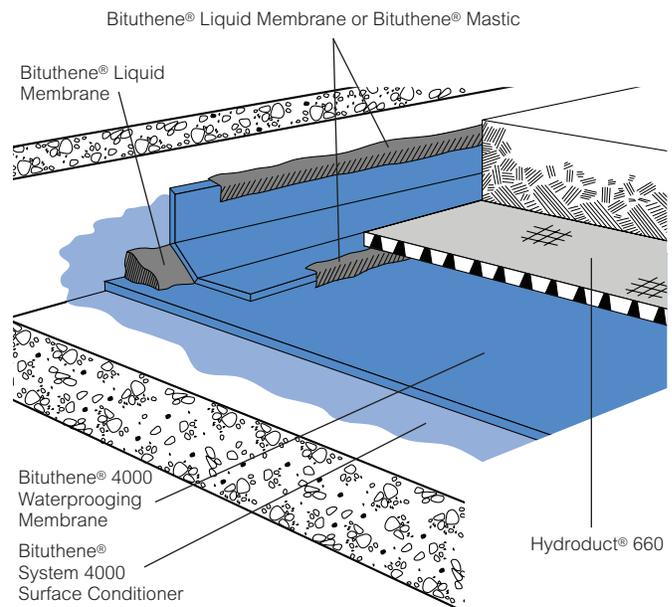
Architectural and Industrial Maintenance Regulations limit the VOC content in products classified as Architectural Coatings. Refer to Technical Letters at graceconstruction.com for most current list of allowable limits.

Advantages

- **Excellent adhesion**—special adhesive compound engineered to work with high tack System 4000 Surface Conditioner
- **Cold applied**—simple application to substrates, especially at low temperatures
- **Reduced inventory and handling costs**—Bituthene® System 4000 Surface Conditioner is included with each roll of membrane
- **Wide application temperature range**—excellent bond to self and substrate from 25°F (-4°C) and above
- **Overlap security**—minimizes margin for error under site conditions

Product Advantages

- Excellent adhesion
- Cold applied
- Reduced inventory and handling costs
- Wide application temperature range
- Overlap security
- Cross laminated, high density polyethylene carrier film
- Flexible
- UL approval Class A Fire Rating
- Ripcord®



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

- **Cross laminated, high density polyethylene carrier film**—provides high tear strength, puncture and impact resistance
- **Flexible**—accommodates minor structural movements and will bridge shrinkage cracks
- **UL approval Class A Fire Rating**—see approvals section inside for details
- **Ripcord®**—this split release on demand feature allows the splitting of the membrane into two (2) pieces for ease of installation in detailed areas

Use

Bituthene® membrane is ideal for waterproofing concrete decks where in-service temperatures will not exceed 130°F (54°C). It can be applied to split slab construction such as in plaza areas and parking decks. Interior uses may include mechanical rooms, laboratories, kitchens and bathrooms. (For below grade applications, see *Below Grade Waterproofing Bituthene® System 4000*.)

Bituthene® waterproofing membrane is 1/16 in. (1.5 mm) thick, 3 ft (0.9 m) wide and 66.7 ft (20 m) long and is supplied in rolls. It is unrolled adhesive side down onto concrete slabs primed with Bituthene® System 4000 Surface Conditioner. Continuity is achieved by overlapping a minimum 2 in. (50 mm) and firmly rolling the joint.

Bituthene® membrane is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene® products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable.

For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete). **If time is critical, Bituthene® Primer B2 or Bituthene® Primer B2 LVC may be used to allow priming and installation of membrane on damp surfaces or green**

concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity.

Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Bituthene® Primer B2 or Bituthene® Primer B2 LVC, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. For rough or uneven surfaces use Bituthene® Deck Prep® waterproofing membrane as a repair and leveling agent. See *Bituthene® Deck Prep®* waterproofing membrane product information sheet for details. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene® System 4000 Membrane and Conditioner only in dry weather and when air and surface temperatures are 25°F (-4°C) or above.
- Apply Bituthene® Primer B2 in dry weather above 25°F (-4°C). (See separate product information sheet.)

Conditioning

Bituthene® System 4000 Surface Conditioner is ready to use and can be applied by spray or roller. For best results, use a pump-type air sprayer with fan tip nozzle, like the Bituthene® System 4000 Surface Conditioner Sprayer, to apply the surface conditioner.

Apply Bituthene® System 4000 Surface Conditioner to clean, dry, frost-free surfaces at a coverage rate of 300 ft²/gal (7.4 m²/L). Coverage should be uniform. Surface conditioner should not be applied so heavily that it puddles or runs. **Do not apply conditioner to Bituthene® membrane.**

Allow Bituthene® System 4000 Surface Conditioner to dry one hour or until substrate returns to its original color. At low temperatures or in high humidity conditions, dry time may be longer.

Bituthene® System 4000 Surface Conditioner is clear when dry and may be slightly tacky. In general, conditioning should be limited to what can be covered within 24 hours. In situations where long dry times may prevail, substrates may be conditioned in advance. Substrates should be reconditioned if significant dirt or dust accumulates.

Before surface conditioner dries, tools should be cleaned with water. After surface conditioner dries, tools should be cleaned with mineral spirits. Mineral spirits is a combustible liquid which should be used only in accordance with manufacturer's recommendations. **Do not use solvents to clean hands or skin.**

Bituthene® System 4000 Surface Conditioner Sprayer

The Bituthene® System 4000 Surface Conditioner Sprayer is a professional grade, polyethylene, pump-type, compressed air sprayer with a brass fan tip nozzle. It has a 2 gal (7.6 L) capacity. The nozzle orifice and spray pattern have been specifically engineered for the optimum application of Bituthene® System 4000 Surface Conditioner.

Hold nozzle 18 in. (450 mm) from substrate and squeeze handle to spray. Spray in a sweeping motion until substrate is uniformly covered.

Sprayer should be repressurized by pumping as needed. For best results, sprayer should be maintained at high pressure during spraying.

To release pressure, invert the sprayer and spray until all compressed air is released.



Maintenance

The Bituthene® System 4000 Surface Conditioner Sprayer should perform without trouble for an extended period if maintained properly.

Sprayer should not be used to store Bituthene® System 4000 Surface Conditioner. The sprayer should be flushed with clean water immediately after spraying. For breaks in the spray operation of one hour or less, invert the sprayer and squeeze the spray handle until only air comes from the nozzle. This will avoid clogging.

Should the sprayer need repairs or parts, call the maintenance telephone number on the sprayer tank (800-323-0620).

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene® Liquid Membrane, see separate product information sheet.

- At plaza deck to wall inside corners—

Option 1: Apply membrane on wall and deck to within 1 in. (25 mm) of corner. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Extend Bituthene® Liquid Membrane at least 2½ in. (65 mm) onto deck membrane, and 2½ in. (65 mm) onto wall membrane. Terminate top of wall flashing with Bituthene® Mastic, Bituthene® Liquid Membrane or termination bar.

Option 2: Apply membrane on deck to within 1 in. (25 mm) of corner. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Extend Bituthene® Liquid Membrane at least 2½ in. (65 mm) onto wall.

Option 3: Apply membrane on deck to within 1 in. (25 mm) of corner. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Apply membrane flashing sheet on wall, over fillet and 6 in. (150 mm) onto deck membrane.

Apply 1 in. (25 mm) wide troweling of Bituthene® Mastic or Bituthene® Liquid Membrane over all terminations and seams within 12 in. (300 mm) of corner. Terminate top of wall flashing with mastic, Bituthene® Liquid Membrane or termination bar.

- In planters, reflecting pools and fountains, apply membrane on wall and deck to within 1 in. (25 mm) of corner. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Extend Bituthene® Liquid Membrane at least 2½ in. (65 mm) onto deck membrane, and 2½ in. (65 mm) onto wall membrane. Terminate top of wall membrane with Bituthene® Liquid Membrane or termination bar.
- Wall to wall inside corner, apply 12 in. (300 mm) sheet membrane strip centered on corner. Press membrane tightly into corner to assure full contact. Cover the treated corner with a full sheet of membrane to ensure 2-ply coverage.
- Outside corners, apply 12 in. (300 mm) sheet membrane strip centered on corner. Cover the treated corner with a full sheet of membrane to ensure 2-ply coverage.

Expansion Joints in Concrete Construction

Bituthene® membrane is not an expansion joint filler or sealant, but may be used as an expansion joint cover only in limited, special situations, as shown in Figures 1 and 2.

To adequately waterproof an expansion joint requires the use of materials specifically designed to do that job. Bituthene® waterproofing systems can, in most cases, be tied into expansion joint waterproofing and/or covering systems to provide full waterproofing protection on a project.

Project designers and/or contractors should consult with expansion joint sealant and covering manufacturers for design and installation details. A partial listing of manufacturers is included in Technical Letter 11. Also, Section 05800 of Sweets, *Expansion Control*, and Section 07920, *Sealant and Caulking*, provide information on manufacturers and design possibilities.

Designers should consider using gutters under critical expansion joints to provide a second line of defense against seal failure.

Use of Bituthene® Membrane as an Expansion Joint Cover

Figures 1 and 2 illustrate the use of Bituthene® membrane as an expansion joint cover.

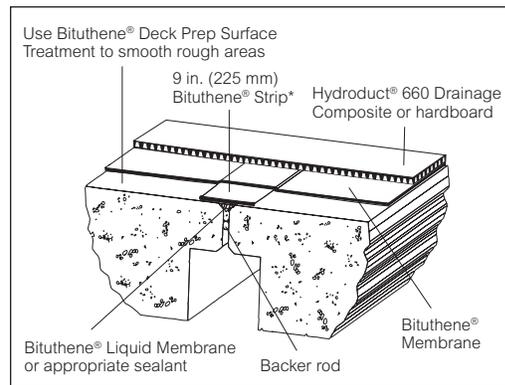


Figure 1 Passive Joint Cover

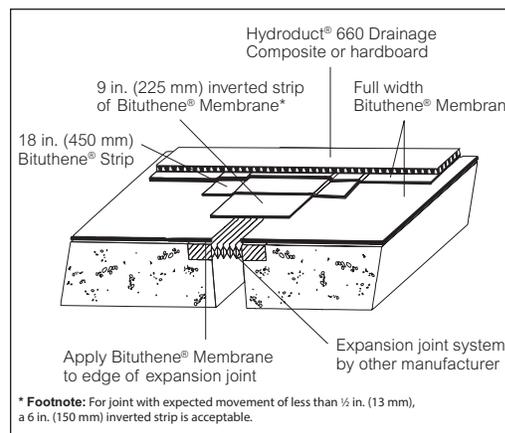


Figure 2 Active Movement Joint

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene® membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over 1/16 in. (1.5 mm) wide and all construction and control joints with 9 in. (230 mm) wide sheet membrane strip.

Application on Horizontal Surfaces

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2 in. (50 mm). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30 in. (760 mm) wide, weighing a minimum of 75 lbs (34 kg) when filled. Cover the face of the roller with a resilient material such as a 1/2 in. (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene® Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 1 in. (25 mm) of the base of the protrusion. Apply Bituthene® Liquid Membrane 0.1 in. (2.5 mm) thick around protrusion. Bituthene® Liquid Membrane should extend over the membrane a minimum of 2 1/2 in. (65 mm) and up the penetration to just below the finished height of the wearing course.

Flood Testing

Flood test all horizontal applications with a minimum 2 in. (51 mm) head of water for 24 hours. Mark any leaks and repair when the membrane is dry. Before flood testing, be sure the structure will withstand the dead load of the water. For well-sloped decks, segment the flood test to avoid deep water near drains.

Conduct the flood test 24 hours after completing the application of Bituthene® waterproofing system. Immediately after flood test is completed, and all necessary repairs made, install Hydroduct® 660 Drainage Composite to protect the Bituthene® membrane from traffic and other trades.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 6 in. (150 mm) in all directions from the slit and seal edges of the patch with Bituthene® Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct® product information sheets.

Protection of Membrane

Protect Bituthene® membranes to avoid damage from other trades, construction materials or finishes. Place protection immediately in temperatures above 77°F (25°C) to avoid potential for blisters.

- On horizontal applications, exposed to construction traffic, use Hydroduct® 660 Drainage Composite. Adhere as necessary to membrane with Preprufe® Detail Tape. Alternate methods of protection are to use 1/8 in. (3 mm) or 1/4 in. (6 mm) asphalt hardboard. In mud slab waterproofing, or other applications where positive drainage is not desired, and where reinforced concrete slabs are placed over the membrane, the use of 1/4 in. (6 mm) hardboard or 2 layers of 1/8 in. (3 mm) hardboard is recommended.
- Cover any exposed Bituthene® membranes with weather resistant flashing such as copper, aluminum or neoprene. Install protection the same day the membrane is applied or immediately after 24 hour flood testing. No waiting before backfill or application of wearing course is necessary.

Insulation

Always apply Bituthene® membrane directly to primed

or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene® membranes over lightweight insulating concrete.

Approvals

- City of Los Angeles Research Report RR 24386
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E
- Bituthene® System 4000 Membrane carries an Underwriters' Laboratory Class A Fire Rating (Building Materials Directory, File #R7910) when used in either of the following constructions:
 - Limited to noncombustible decks at inclines not exceeding 1/4 in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of 1/8 in. (3 mm) protection board, encased in 2 in. (50 mm) minimum concrete monolithic pour.
 - Limited to noncombustible decks at inclines not exceeding 1/4 in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of DOW Styrofoam PD Insulation Board [2 in. (50 mm) thick]. This is covered with one layer of 2 ft x 2 ft x 2 in. (0.6 m x 0.6 m x 50 mm) concrete paver topping.

Warranty

Five year material warranties covering Bituthene® and Hydroduct® products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

Supply

Bituthene® System 4000	3 ft x 66.7 ft roll (200 ft ²) [0.9 m x 20 m (18.6 m ²)]
Roll weight	83 lbs (38 kg) gross
Palletization	25 rolls per pallet
Storage	Store upright in dry conditions below 95°F (+35°C).
System 4000 Surface Conditioner	1 x 0.625 gal (2.3 L) bottle in each roll of System 4000 Membrane
Ancillary Products	
Surface Conditioner Sprayer	2 gal (7.6 L) capacity professional grade sprayer with specially engineered nozzle
Bituthene® Liquid Membrane	1.5 gal (5.7 L) pail/125 pails per pallet or 4 gal (15.1 L) pail/48 pails per pallet
Preprufe® Detail Tape	2 in. x 50 ft (50 mm x 15 m) roll/16 rolls per carton
Bituthene® Mastic	Twelve 30 oz (0.9 L) tubes/carton or 5 gal (18.9 L) pail/36 pails per pallet
Complementary Material	
Hydroduct®	See separate data sheets

Equipment by others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene® System 4000 Waterproofing Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1/16 in. (1.5 mm) nominal	ASTM D3767—method A
Flexibility, 180° bend over 1 in. (25 mm) mandrel at -25°F (-32°C)	Unaffected	ASTM D1970
Tensile strength, membrane, die C	325 lbs/in. ² (2240 kPa) minimum	ASTM D412 modified ¹
Tensile strength, film	5,000 lbs/in. ² (34.5 MPa) minimum	ASTM D882 modified ¹
Elongation, ultimate failure of rubberized asphalt	300% minimum	ASTM D412 modified ¹
Crack cycling at -25°F (-32°C), 100 cycles	Unaffected	ASTM C836
Lap adhesion at minimum application temperature	5 lbs/in. (880 N/m)	ASTM D1876 modified ²
Peel strength	9 lbs/in. (1576 N/m)	ASTM D903 modified ³
Puncture resistance, membrane	50 lbs (222 N) minimum	ASTM E154
Resistance to hydrostatic head	231 ft (71 m) of water	ASTM D5385
Permeance	0.05 perms (2.9 ng/m ² sPa) maximum	ASTM E96, section 12—water method
Water absorption	0.1% maximum	ASTM D570

Footnotes:

1. The test is run at a rate of 2 in. (50 mm) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 2 in. (50 mm) per minute at 40°F (5°C).
3. The 180° peel strength is run at a rate of 12 in. (300 mm) per minute.

Physical Properties for Bituthene® System 4000 Surface Conditioner

Property	Typical Value
Solvent type	Water
Flash point	>140°F (>60°C)
VOC* content	91 g/L
Application temperature	25°F (-4°C) and above
Freeze thaw stability	5 cycles (minimum)
Freezing point (as packaged)	14°F (-10°C)
Dry time (hours)	1 hour**

* Volatile Organic Compound

** Dry time will vary with weather conditions

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For additional information on Grace's Residential Waterproofing, call: 1-866-333-3SBM (3726)

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