

509 WEST 38TH STREET/512 WEST 39TH STREET

MANHATTAN, NEW YORK

Remedial Action Work Plan

NYC VCP Number: 15CVCP009M

OER Project Number: 12EH-N302M

Prepared for:

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REMEDIAL ACTION WORK PLAN

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
VCA	Voluntary Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
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 DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional

Acronym	Definition
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semivolatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, Charles J McGuckin, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 509 West 38th Street/ 512 West 39th Street Site 15CVCP009M.

I, Craig Werle, am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 509 West 38th Street/ 512 West 39th Street Site 15CVCP009M.

I certify that this Remedial Action Work Plan (RAWP) 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 RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Charles J. McGuckin, P.E.
NYS Professional Engineer #069509

11/6/14
Date



Craig Werle
QEP Name

11/6/14
Date

Craig A. Werle
QEP Signature

EXECUTIVE SUMMARY

HY 38 Owner, LLC and HY 39 Owner, LLC have applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 14,900-square foot site located at 509 West 38th Street (Block 710, Lot 22) and 512 West 39th Street (Block 710, Lot 42) in Manhattan, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is comprised of two adjacent parcels located at 509 West 38th Street and 512 West 39th Street in the Hudson Yards section in Manhattan, New York and is identified as Block 710 and Lots 22 and 42, respectively, on the New York City Tax Map. Figure 1 shows the Site location. The Site is 14,900-square feet and is bounded by West 39th Street to the north, West 38th Street to the south, commercial building (DHL facility)/Tenth Avenue to the east, and commercial building (auto parts/body shop)/Eleventh Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, Lot 22 is a vacant lot and Lot 42 is a one-story commercial building used by a construction company for storage. Lot 22 is approximately 12,400 square feet and Lot 42 is approximately 2,500 square feet. Lot 22 was demolished in July 2012 and was previously a three-story building with a partial cellar that was used as a recording studio.

The topography of the Site is generally flat and the topography of the surrounding area slopes to the west. The surrounding area is comprised of primarily multi-story residential and commercial buildings with ground level retail space and restaurants. The Lincoln Tunnel, which is operated by the Port Authority of New York and New Jersey (PANYNJ), runs beneath West 38th Street along the southern portion of the Site.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of a 30-story mixed use (commercial and residential) building with a cellar. Layout of the proposed site development is presented in Figure 3. The current zoning designation is C2-8 which is a commercial district that is predominantly residential in character. The proposed use is consistent with existing zoning for the property.

The planned redevelopment consists of a residential tower rising over a five-story base comprised of retail, community facility, and residential amenity uses. The ground floor will contain retail and two lobbies. One lobby will serve as the residential tower amenity and a separate lobby will serve the three floor community facility and one floor commercial located on floors two through five. The residential portion of the building will include 225 units. The basement will include approximately 6,400 square feet of mechanical/maintenance room, super's office, shop and staff locker rooms as well as approximately 3,200 square feet of residential amenities such as gym, bike storage and leased storage. The building is an 80/20 development with 20% (45) of the units earmarked as Inclusionary Housing and under the auspices of HPD.

The Site area is approximately 14,900 square feet with 125 square feet footage of frontage along 38th street and 25 square feet footage along 39th street. Planned excavation ranges from 1 foot in areas of Lot 42's proposed slab-on-grade on 39th Street to 25 feet in the proposed elevator pit area on Lot 22 on 38th Street. The 38th Street parcel will be excavated to a minimum of 14 feet with the exception of setbacks on the northern and eastern property lines which will be setback 9.5 to 12 feet, respectively. Soil will be excavated to a depth of approximately five to ten feet in the setback areas as shown in the Support of Excavation (SOE) drawings in Figure 7. The foundation design consists of spread footings bearing on rock supported by pile caps and grade beams, with a minimum slab thickness of 5 inches. Based on preliminary estimates, approximately 6,850 cubic yards (CY) of soil removal is anticipated for the development cut of Lot 22. Lot 42, which is currently a one-story storage facility, will be demolished and the ground will be leveled and paved.

Summary of Environmental Findings

1. Elevation of the property ranges from 24 to 29 feet.

2. Depth to groundwater ranges from 7 to 10 feet at the Site.
3. Groundwater flow is generally from east to west beneath the Site.
4. Depth to bedrock ranges from 6 to 20 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of 4 to 11 feet of historic fill containing varying amounts of gravel, boulders, brick, and concrete underlain by 5 to 10 feet of brown fine to medium sand with silt, gravel, some clay underlain by bedrock.
6. Soil investigation results were compared to NYSDEC Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs) as presented in NYSDEC Part 375.6 and CP-51. Soil/fill samples showed no VOCs, PCBs or pesticides detected above Unrestricted Use SCOs. PCE (max of 7.5 ppb) was detected below Unrestricted Use SCOs. Seven SVOCs including benzo(a)anthracene (maximum of 24,000 ppb), benzo(a)pyrene (maximum of 22,000 ppb), benzo(b)fluoranthene (maximum of 29,000 ppb), Benzo[k]fluoranthene (maximum of 9,300 ppb), chrysene (maximum of 26,000 ppb), dibenzo(a,h)anthracene (maximum of 3,100 ppb), and indeno(1,2,3-cd)pyrene (maximum of 16,000) were detected above their respective Track 2 Restricted Residential Use SCOs in three shallow samples. Highest concentrations were detected one boring, SB-1, indicating a shallow hotspot. Metals including barium (maximum of 590 ppm), chromium (71.2 ppm), copper (maximum of 130 ppm), lead (max of 630 ppm), mercury (maximum of 1.8 ppm), nickel (53.5 ppm) and zinc (maximum of 490 ppm) were detected above their respective Track 1 Unrestricted Use SCOs. Of these metals, barium, lead and mercury were also detected above their respective Track 2 Restricted Residential SCOs in three shallow samples. As part of the RI, Langan Engineering collected four endpoint samples (in Lot 22) at a depth of 14 feet below grade between August 27 and 30, 2012. In addition, as part of the RI and Supplemental RI, Roux Associates collected six endpoint samples at depths varying from 5 feet below grade (in Lot 42) to 15 feet below grade (in Lot 22) between April 7 and August 1, 2014. Endpoint sample results indicate that some SVOCs (mostly PAHs) and barium were detected above their respective Track 2 Restricted Residential SCOs in Lot 42.

7. The Supplemental RI completed by Roux Associates in August 2014 included the collection of seven soil samples from four soil borings (SB-3 through SB-6) and one soil vapor sample (SV-8). VOCs (2-butanone and tetrachloroethene) and metals (barium, chromium) were detected in SB-5 at concentrations exceeding the Track 1 Unrestricted Use SCOs, but none exceeded Track 2 Restricted Residential Use SCOs. PCE (max of 3500 ppb) was detected above Unrestricted Use SCOs. SV-8 results are discussed below in bullet 9.
8. No groundwater samples were collected during the 2012 RI. Groundwater samples collected during the 2014 RI were compared to NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). Groundwater samples showed that PCBs and Pesticides were not detected in any samples. VOCs including 1,2,4,5-tetramethylbenzene (5.6 µg/L), 1,2,4-trimethylbenzene (120 µg/L), 1,2-dichlorobenzene (7.1 µg/L), 1,3,5-trimethylbenzene (29 µg/L), benzene (71 µg/L), ethylbenzene (91 µg/L), m+p-Xylene (360 µg/L), naphthalene (99 µg/L), n-propylbenzene (8.9 µg/L), o-xylene (240 µg/L), and toluene (99 µg/L), were detected above AWQS in MW-2. Tetrachloroethene was also detected above AWQS and ranged in concentrations from 5.6 to 14 µg/L in four of the five samples. Total VOC concentrations in the wells ranged from 9.8 micrograms per liter (µg/L) to 1,240 µg/L in MW-2. Several SVOCs, including naphthalene at 70 ppb, phenol at 52 ppb, and several PAHs below 5 ppb, were detected above AWQS with the highest concentrations in MW-2. Several metals were identified but only dissolved antimony, iron, manganese, selenium and sodium were detected above AWQS.
9. Soil vapor samples were compared to the compounds listed in the Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion (October 2006). Soil vapor samples collected during the 2012 RI (SV-1 through SV-4) indicated chlorinated and petroleum related compounds at elevated concentrations. Concentrations of petroleum-related VOCs (BTEX) ranged from 0.43 µg/m³ to 220 µg/m³. Other compounds detected at elevated levels included acetone (1,030 µg/m³) and cis-1,2-dichloroethene (1,100 µg/m³). Chlorinated compounds were identified in all four soil vapor samples and included tetrachloroethylene (PCE) ranging from 30 to 94,000 µg/m³ and trichloroethene (TCE) ranging from 3 to 1,700

$\mu\text{g}/\text{m}^3$. PCE and TCE were also detected during the 2014 RI (SV-5 through SV-7) and Supplemental RI (SV-8) soil vapor sampling at a maximum concentration of 35,600 $\mu\text{g}/\text{m}^3$ and 12,500 $\mu\text{g}/\text{m}^3$, respectively. Cis-1,2-dichloroethene and 1,1-dichloroethene were detected during the supplemental RI at 76,100 $\mu\text{g}/\text{m}^3$ and 3,120 $\mu\text{g}/\text{m}^3$, respectively. Carbon tetrachloride was not detected in any sample. 1,1,1-trichloroethane was detected in two samples at a maximum concentration of 74 $\mu\text{g}/\text{m}^3$. The PCE and TCE concentrations fall within the “Mitigate” ranges established in the NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006).

Summary of the Remedy

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.

6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. On Lot 22, excavation of all onsite soils to a general depth of approximately 14 feet. Beneath the elevator shafts, excavation will extend to approximately 25 feet. Setbacks on the north (9.5 feet) and east side (12 feet) will have a depth of excavation of approximately 5 to 10 feet. On Lot 42, excavation of two hot spots around SB-1 and SB-2 to a depth of approximately 10 feet below grade. Post excavation samples, one bottom sample and two sidewall samples will be collected from each location to determine the performance of the remedy with respect to attainment of Track 2 SCOs. Approximately, 10000 tons of soil/fill be excavated and removed from this Site.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations;
10. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities;
11. Collection and analysis of six post-excavation end-point samples (two in Lot 42 and four in Lot 22) to determine the performance of the remedy with respect to attainment of SCOs;
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations;

13. Groundwater depth at this Site is from 7 feet to 10 feet below grade. Excavations for development purposes with extend from 14 feet below grade and to 25 feet below grade for elevators. Dewatering will be required. Dewatering permits will be obtained from NYCDEP prior to start of construction.
14. Installation and operation of an active sub-slab depressurization system in the setback areas on the north and east sides of Lot 22.
15. Installation of a vapor barrier system beneath the building slab and along outside foundation sidewalls below grade. A waterproofing/ vapor barrier system consisting of a Carlisle MiraPLY- H and MiraPLY-V 20-mil geomembrane will be installed beneath the building slab and up the sidewalls, respectively, according to manufacturer specifications.
16. Construction and maintenance of an engineered composite cover consisting of building slab (5 inches minimum) on Lot 22 and reinforced concrete slab (7 inches) on Lot 42 to prevent human exposure to residual soil/fill remaining under the Site.
17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
18. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
19. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
20. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

21. The property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the Site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan. Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site Safety Coordinator to implement the Health and Safety Plan. The Site Safety Coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site Safety Coordinator is Marco Carcich - Monadnock Construction (Safety Director) and can be reached at (212)715-0700.

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains only to workers performing specific tasks including removing hazardous material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYCOER. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and include steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Wendy Shen at (631) 232-2600 or NYC Office of Environmental Remediation Project Manager Rebecca Bub at (212) 341-2073.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation are 7:00am to 4:00pm, Monday through Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, provides project contact names and numbers, and locations of project documents can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Jay Osofsky - Manadnock Construction at (718) 576.3641, the NYC Office of Environmental Remediation Project Manager Rebecca Bub at (212) 341-2073, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical

testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at Columbus Library located at 742 10th Avenue, New York, NY 10019.

Long-Term Site Management. If long-term protection after the cleanup is required, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC OER. Requirements that the property owner must comply with are established through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

HY 38 Owner, LLC and HY 39 Owner, LLC have applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 509 West 38th Street (Block 710, Lot 22)/512 West 39th Street (Block 710, Lot 42) in the Hudson Yards section of Manhattan, New York (the “Site”). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternative analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 Site Location and Current Usage

The Site is comprised of two adjacent parcels located at 509 West 38th Street and 512 West 39th Street in the Hudson Yards section in Manhattan, New York and is identified as Block 710 and Lots 22 and 42, respectively, on the New York City Tax Map. Figure 1 shows the Site location. The Site is 14,900-square feet and is bounded by West 39th Street to the north, West 38th Street to the south, commercial building (DHL facility)/Tenth Avenue to the east, and commercial building (auto parts/body shop)/Eleventh Avenue to the west. A map of the site boundary is shown in Figure 2. Currently, Lot 22 is a vacant lot and Lot 42 is a one-story commercial building used by a construction company for storage. Lot 22 is approximately 12,400 square feet and Lot 42 is approximately 2,500 square feet. Lot 22 was demolished in July 2012 and was previously a three-story building with a partial cellar that was used as a recording studio.

The topography of the Site is generally flat and the topography of the surrounding area slopes to the west. The surrounding area is comprised of primarily multi-story residential and commercial buildings with ground level retail space and restaurants. The Lincoln Tunnel, which

is operated by the Port Authority of New York and New Jersey (PANYNJ), runs beneath West 38th Street along the southern portion of the Site.

1.2 Proposed Redevelopment Plan

The proposed future use of the Site will consist of a 30-story mixed use (commercial and residential) building with a cellar. Layout of the proposed site development is presented in Figure 3. The current zoning designation is C2-8 which is a commercial district that is predominantly residential in character. The proposed use is consistent with existing zoning for the property.

The planned redevelopment consists of a residential tower rising over a five-story base comprised of retail, community facility, and residential amenity uses. The ground floor will contain retail and two lobbies. One lobby will serve as the residential tower amenity and a separate lobby will serve the three floor community facility and one floor commercial located on floors two through five. The residential portion of the building will include 225 units. The basement will include approximately 6,400 square feet of mechanical/maintenance room, super's office, shop and staff locker rooms as well as approximately 3,200 square feet of residential amenities such as gym, bike storage and leased storage. The building is an 80/20 development with 20% (45) of the units earmarked as Inclusionary Housing and under the auspices of HPD.

The Site area is approximately 14,900 square feet with 125 square feet footage of frontage along 38th street and 25 square feet footage along 39th street. Planned excavation ranges from 1 foot in areas of Lot 42's proposed slab-on-grade on 39th Street to 25 feet in the proposed elevator pit area on Lot 22 on 38th Street. The 38th Street parcel will be excavated to a minimum of 14 feet with the exception of setbacks on the northern and eastern property lines which will be setback 9.5 to 12 feet, respectively. Soil will be excavated to a depth of approximately five to ten feet in the setback areas as shown in the Support of Excavation (SOE) drawings in Figure 7. The foundation design consists of spread footings bearing on rock supported by pile caps and grade beams, with a minimum slab thickness of 5 inches. Based on preliminary estimates, approximately 6,850 cubic yards (CY) of soil removal is anticipated for the development cut of Lot 22. Lot 42, which is currently a one-story storage facility, will be demolished and the ground will be leveled and paved.

Depth to groundwater is approximately 9.5 feet below grade therefore dewatering is anticipated.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 Description of Surrounding Property

The Site is bordered to the north by West 39th Street, to the south by West 38th Street and to the east and west by commercial developments (DHL storage to the east and auto parts/body shop to the west). Beyond the adjoining properties, the surrounding area is comprised primarily of multi-story, mixed-use residential, commercial and retail properties. There are no sensitive receptors (such as schools, daycare facilities, hospitals) within 500-foot radius of the Site.

Figure 4 shows the surrounding land usage.

1.4 Remedial investigation

A remedial investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report, 509 West 38th Street/ 512 West 39th Street*”, dated August, 2014 (RIR).

Summary of Past Uses of Site and Areas of Concern

Lot 22 has been improved with commercial developments since at least 1890 and was developed with the last building structure sometime prior to 1911. Past uses included a bakery, a dyeing facility, and other commercial uses including a dry cleaning facility from 1992 to 1997. The former building was renovated between 2000 and 2001 and has since been used as a music recording studio and equipment rental facility. Lot 22 was occupied by a three-story building with a partial cellar that was demolished in July 2012, and is currently bordered by one-and four-story brick or masonry structures. The former building included a partial basement with mechanical rooms and storage; ground floor with production studios, offices, reception area, equipment rental, and garage; second floor with storage and apartment; and third floor with a recording studio.

Based on previous Phase I and II Environmental Site Assessments (ESA) performed at Lot 22, five 275-gallon ASTs and a 2,000-gallon vaulted AST were removed from the property in August 1998. Additionally, a 2,000-gallon UST was removed from the property in October 2012.

Lot 42 was previously a 5-story residence from at least 1890 until the 1930s. By 1950, the residential building had been replaced with a 1-story commercial building that was used for tire storage (1950), machine shop (1976-1993) and auto repair (1994-2005).

Building Department records indicate both Lots have an E-designation for underground storage tanks testing protocol (hazmat) and window wall attenuation and alternate ventilation (noise).

The AOCs identified for this site include:

1. Lot 22 was a former dry cleaner between 1992 and 1997.
2. Past use of Lot 22 as a dyeing facility.
3. Evidence of former USTs and ASTs identified during the ESA. One historical 2,000 gallon fuel oil UST was removed from the former garage area in Lot 22 in July 2012. Five historical 275-gallon ASTs and one historical 2,000-gallon vaulted AST were removed from the southwestern portion of Lot 22 in August 1998.
4. Past use of Lot 42 as a machine shop and auto repair facility.
5. 4 to 11 feet of Historic fill material.

Summary of the Work Performed under the Remedial Investigation

HY 38 Owner, LLC and HY 39 Owner, LLC performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e., structures, buildings, etc.);
2. Performed a geophysical survey of the Site utilizing Ground Penetrating Radar (GPR) and electromagnetic locator;

3. Installed ten soil borings (four during the 2012 RI, two during the 2014 RI and four during the 2014 Supplemental RI) across the entire project Site, and collected fifteen soil samples for chemical analysis from the soil borings to evaluate soil quality;
4. Installed four groundwater monitoring wells during the 2014 RI to establish groundwater flow and collected four groundwater samples for chemical analysis to evaluate groundwater quality; and
5. Installed eight soil vapor probes (four during the 2012 RI, three during the 2014 RI and one during the 2014 Supplemental RI) around the Site perimeter and collected eight samples for chemical analysis.

Summary of Environmental Findings

1. Elevation of the property ranges from 24 to 29 feet.
2. Depth to groundwater ranges from 7 to 10 feet at the Site.
3. Groundwater flow is generally from east to west beneath the Site.
4. Depth to bedrock ranges from 6 to 20 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of 4 to 11 feet of historic fill containing varying amounts of gravel, boulders, brick, and concrete underlain by 5 to 10 feet of brown fine to medium sand with silt, gravel, some clay underlain by bedrock.
6. Soil investigation results were compared to NYSDEC Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs) as presented in NYSDEC Part 375.6 and CP-51. Soil/fill samples showed no PCBs or pesticides detected above Unrestricted Use SCOs. No VOCs were detected in 2012 investigation. Two VOCs, 2-butanone detected in one sample at 170 µg/kg and tetrachloroethene (PCE) was detected in all soil samples at trace levels except for one location (SB-5), where it was detected above Restricted Residential Use SCOS at concentration of 3500 µg/kg. Seven SVOCs including benzo(a)anthracene (maximum of 24,000 ppb), benzo(a)pyrene (maximum of 22,000 ppb), benzo(b)fluoranthene (maximum of 29,000 ppb), Benzo[k]fluoranthene (maximum of 9,300 ppb), chrysene (maximum of 26,000 ppb), dibenzo(a,h)anthracene (maximum of 3,100 ppb), and indeno(1,2,3-cd)pyrene (maximum

of 16,000) were detected above their respective Track 2 Restricted Residential Use SCOs in three shallow samples. Highest concentrations were detected one boring, SB-1, indicating a shallow hotspot. Metals including barium (maximum of 590 ppm), chromium (71.2 ppm), copper (maximum of 130 ppm), lead (max of 630 ppm), mercury (maximum of 1.8 ppm), nickel (53.5 ppm) and zinc (maximum of 490 ppm) were detected above their respective Track 1 Unrestricted Use SCOs. Of these metals, barium, lead and mercury were also detected above their respective Track 2 Restricted Residential SCOs in three shallow samples. As part of the RI, Langan Engineering collected four endpoint samples (in Lot 22) at a depth of 14 feet below grade between August 27 and 30, 2012. In addition, as part of the RI and Supplemental RI, Roux Associates collected six endpoint samples at depths varying from 5 feet below grade (in Lot 42) to 15 feet below grade (in Lot 22) between April 7 and August 1, 2014. Endpoint sample results indicate that some SVOCs (mostly PAHs) and barium were detected above their respective Track 2 Restricted Residential SCOs in Lot 42.

7. No groundwater samples were collected during the 2012 RI. Groundwater samples collected during the 2014 RI were compared to NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). Groundwater samples showed that PCBs and Pesticides were not detected in any samples. VOCs including 1,2,4,5-tetramethylbenzene (5.6 µg/L), 1,2,4-trimethylbenzene (120 µg/L), 1,2-dichlorobenzene (7.1 µg/L), 1,3,5-trimethylbenzene (29 µg/L), benzene (71 µg/L), ethylbenzene (91 µg/L), m+p-Xylene (360 µg/L), naphthalene (99 µg/L), n-propylbenzene (8.9 µg/L), o-xylene (240 µg/L), and toluene (99 µg/L), were detected above AWQS in MW-2. Tetrachloroethene was also detected above AWQS and ranged in concentrations from 5.6 to 14 µg/L in four of the five samples. Total VOC concentrations in the wells ranged from 9.8 micrograms per liter (µg/L) to 1,240 µg/L in MW-2. Several SVOCs, including naphthalene at 70 ppb, phenol at 52 ppb, and several PAHs below 5 ppb, were detected above AWQS with the highest concentrations in MW-2. Several metals were identified but only dissolved antimony, iron, manganese, selenium and sodium were detected above AWQS.

8. Soil vapor samples were compared to the compounds listed in the Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion (October 2006). Soil vapor samples collected during the 2012 RI (SV-1 through SV-4) indicated chlorinated and petroleum related compounds at elevated concentrations. Concentrations of petroleum-related VOCs (BTEX) ranged from 0.43 $\mu\text{g}/\text{m}^3$ to 220 $\mu\text{g}/\text{m}^3$. Other compounds detected at elevated levels included acetone (1,030 $\mu\text{g}/\text{m}^3$) and cis-1,2-dichloroethene (1,100 $\mu\text{g}/\text{m}^3$). Chlorinated compounds were identified in all four soil vapor samples and included tetrachloroethylene (PCE) ranging from 30 to 94,000 $\mu\text{g}/\text{m}^3$ and trichloroethene (TCE) ranging from 3 to 1,700 $\mu\text{g}/\text{m}^3$. PCE and TCE were also detected during the 2014 RI (SV-5 through SV-7) and Supplemental RI (SV-8) soil vapor sampling at a maximum concentration of 35,600 $\mu\text{g}/\text{m}^3$ and 12,500 $\mu\text{g}/\text{m}^3$, respectively. Cis-1,2-dichloroethene and 1,1-dichloroethene were detected during the supplemental RI at 76,100 $\mu\text{g}/\text{m}^3$ and 3,120 $\mu\text{g}/\text{m}^3$, respectively. Carbon tetrachloride was not detected in any sample. 1,1,1-trichloroethane was detected in two samples at a maximum concentration of 74 $\mu\text{g}/\text{m}^3$. The PCE and TCE concentrations fall within the “Mitigate” ranges established in the NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006).

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Groundwater

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

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

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

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Land use; and
- Sustainability.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated as follows;

Alternative 1 involves:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs has been achieved with post-excavation

endpoint sampling. Based upon results of remedial investigations, this would require excavation of entire site from 0 to 14 feet below grade. If soil/fill containing analytes at concentrations above Track 1 Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building is complete, additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but an SSDS and vapor barrier would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent any potential future exposures from soil vapor; and
- Placement of a final cover over the entire Site as part of new development.

Alternative 2 involves:

- Establishment of Track 4 Site-Specific SCOs.
- Excavation and removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. For development purposes, Lot 22 will be excavated to a general depth of approximately 14 feet. Beneath the elevator shafts, excavation will extend to approximately 25 feet. Setbacks on the north (9.5 feet) and east side (12 feet) will have a depth of excavation of approximately 5 to 10 feet. On Lot 42, excavation of two hot spots around SB-1 and SB-2 to a depth of approximately 10 feet below grade. Post excavation samples, one bottom sample and two sidewall samples will be collected from each location to determine the performance of the remedy with respect to attainment of Track 2 SCOs. If soil/fill containing VOCs, SVOCs or metals at concentrations above Track 4 Site Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building is complete, additional excavation will be performed to meet Track 4 Site Specific SCOs;
- Placement of a final cover over the Site to prevent exposure to remaining soil/fill;
- Installation and operation of an active SSDS in setback areas;

- Placement of soil vapor barrier beneath the building slab and along foundation side walls to prevent any potential future exposures from soil vapor;
- Establishment of Use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended; and
- Continued registration as an E-designation property to memorialize the remedial action and the Engineering and Institutional Controls required by this RAWP.

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls (ECs) or Institutional Controls (ICs). Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1, the Track 1 remedy would be protective of human health and the environment by removing contaminated soil/fill exceeding Track 1 Unrestricted Use SCOs and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater. It will also eliminate any potential sources for on-site production of soil vapors.

Alternative 2 would achieve comparable protections of human health and the environment by excavating the historic fill, CVOC and SVOC hotspots at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCOs, as well as by placement of Institutional and Engineering controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls

including a Site Management Plan and continued registration as an E-designation property would ensure that the composite cover system remains intact and protective. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into the groundwater.

For both Alternatives, potential exposure to contaminated soils during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented by dewatering. Groundwater usage is prohibited by city laws and regulations. Potential future migration of soil vapors into the new building would be prevented by installing an active SSDS and vapor barrier below the new building's foundation and continuing the vapor barrier around foundation walls as part of new construction.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, address the chemical-specific SCGs and RAOs for soil by excavation and removal of all material above the Track 1 SCOs and Groundwater Protection Standards. All soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations. Compliance with SCGs for soil vapor would also be achieved by installing a SSDS and vapor barrier below the new building's foundation and continuing the vapor barrier around foundation walls, as part of development.

Alternative 2 would address the chemical-specific SCGs for soil and soil vapor by establishment of Track 4 SCOs and removal of a minimum of 14 feet of soil for development purposes in Lot 22 and hot spot excavation to 10 feet below grade in Lot 42. Similar to the Track 1 alternative, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. Compliance with SCGs for soil vapor would also be achieved by

installing a vapor barrier/waterproofing system below the new building's basement slab and the operation and maintenance of a SSDS along the setback areas as part of development.

For both alternatives, health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) that comply with the applicable SCGs shall be implemented during Site redevelopment under this RAWP. Focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-term effectiveness and impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

Both Alternative #1 and Alternative #2 have similar short-term effectiveness during their implementations, as each requires excavation of historic fill material. Both alternatives would result in short term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts would be higher for Alternative 1 due to excavation of greater amounts of historic fill material below the excavation depth of the proposed building and in driveway areas. However, focused attention to means and methods employed during the remedial action for a Track 1 or Track 2 remedial action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impacts of these activities.

Additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits.

Alternatives 1 and 2 are both considered to be effective in protecting human health and the environment in the short term. Alternative 1 would eliminate and Alternative 2 would reduce exposure to contaminant sources. Both alternatives would employ appropriate measures to prevent short term impacts, including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Construction workers operating under appropriate management procedures and a Construction Health and Safety Plan (CHASP) will be protected from on-Site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs .

The Track 1 remedy would be effective over the long-term by providing a permanent cleanup of onsite contamination through removal of all soils in excess of the Track 1 SCOs.

Alternative 2 would also be effective over the long-term by attaining Track 4 SCOs through the placement of a concrete slab and vapor barrier under the building and cover materials elsewhere, establishing use restrictions, establishing a Site Management Plan (SMP) to ensure long-term management of ECs/ICs, and placing a deed restriction to memorialize these controls for the long term. Groundwater use restriction will eliminate potential exposure to groundwater and establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term. The SMP will ensure long-term effectiveness of all ECs/ICs by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended, assuring that protections designed into the remedy will provide continued high levels of protection and perpetuity. Installation and

operation of an active SSDS will minimize the potential for accumulation of vapors with the occupied structure and eliminate associated inhalation exposure.

Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

The Track 1 alternative would provide maximum reduction of toxicity, mobility and volume of contaminated media onsite by excavation and removal of all soils that exceeded the Track 1 unrestricted use SCOs.

Alternative 2 would greatly reduce the toxicity, mobility and volume of contaminated media onsite because it would include the removal of approximately 14 feet of soil for development purposes in Lot 22 and hot spot excavation to 10 feet in Lot 42 and will achieve Track 2 SCOs. Placement of a building slab, vapor barrier and active SSDS in Lot 22 and placement of a concrete slab in Lot 42 will lower the toxicity by eliminating potential exposures with the remaining soil and vapors. Use restrictions for groundwater will ensure that there is no use of on-site groundwater for potable purposes.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The Track 1 alternative is both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is high.

Similarly, Alternative 2 is also both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed, which utilize standard industry methods.

For implementation of both remedies, standard construction equipment utilized for the overall earthwork would be used. OSHA trained personnel will complete all activities that include excavation and handling of impacted soils. No special permits other than earthwork permits required for completion of the required site redevelopment scope are required for implementation of the remedy.

Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

The costs associated with Track 1 alternative is higher than the Track 2 alternative due to higher costs being driven by higher total volume of soil that would be excavated and transported from the Site and disposed of at an offsite location. If additional soil/fill with analytes above Track 1 Unrestricted Use SCOs remains after excavation for the new building, long-term costs for Alternative 2 would likely be higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2. In both cases, however, appropriate public health and environmental protections are achieved.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and subgrade structures. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soils during the redevelopment of the Site.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial observations by the project team, both alternatives appear to be acceptable to the community. Both remedial actions provide for protection of public health and the environment and minimize potential contaminant exposures. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternative and the selected remedial action. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Attachment C.

Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

Both remedial alternatives are compatible with the proposed use and with land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by residential and commercial properties and the proposed alternative provides comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the property achieved by this remedy are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. The alternative

is equally protective of natural resources and cultural resources. This RAWP will be subject to public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

Both remedial alternatives have the potential to utilize sustainable means to achieve the cleanup goals. This program contemplates the utilization of several green remediation methods that are compatible with the alternative. The selection of the disposal facility for the excavated soil will be based on the proximity to the Site to reduce the fuel usage of the transportation vehicles. Both remedial Alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The full list of green remediation activities considered in this program is included in the Sustainability Statement.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

The preferred remedial action alternative is Alternative 2, the Track 4 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.
6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. On Lot 22, excavation of all onsite soils to a general depth of approximately 14 feet. Beneath the elevator shafts, excavation will extend to approximately 25 feet. Setbacks on the north (9.5 feet) and east side (12 feet) will have a depth of excavation of approximately 5 to 10 feet. On Lot 42, excavation of two hot spots around SB-1 and SB-2 to a depth of

approximately 10 feet below grade. Post excavation samples, one bottom sample and two sidewall samples will be collected from each location to determine the performance of the remedy with respect to attainment of Track 2 SCOs. Approximately, 10000 tons of soil/fill be excavated and removed from this Site.

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations;
10. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities;
11. Collection and analysis of six post-excavation end-point samples (two in Lot 42 and four in Lot 22) to determine the performance of the remedy with respect to attainment of SCOs;
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations;
13. Groundwater depth at this Site is from 7 feet to 10 feet below grade. Excavations for development purposes with extend from 14 feet below grade and to 25 feet below grade for elevators. Dewatering will be required. Dewatering permits will be obtained from NYCDEP prior to start of construction.
14. Installation and operation of an active sub-slab depressurization system in the setback areas on the north and east sides of Lot 22.

15. Installation of a vapor barrier system beneath the building slab and along outside foundation sidewalls below grade. A waterproofing/ vapor barrier system consisting of a Carlisle MiraPLY- H and MiraPLY-V 20-mil geomembrane will be installed beneath the building slab and up the sidewalls, respectively, according to manufacturer specifications.
16. Construction and maintenance of an engineered composite cover consisting of building slab (5 inches minimum) on Lot 22 and reinforced concrete slab (7 inches) on Lot 42 to prevent human exposure to residual soil/fill remaining under the Site.
17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
18. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
19. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
20. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
21. The property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

4.2 Soil Cleanup Objectives and soil/Fill management

Track 4 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are included in the 6 NYCRR Part 703.5 Table 6.8 (b) (Restricted Residential) as amended for compounds below:

<u>Contaminant</u>	<u>Track 4 SCOs</u>
Total SVOCs	250ppm
Mercury	1.5 ppm
PCE	1.3 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 3. The location of planned excavations is shown in Figure 6.

Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 10,000 tons.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-Point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Ten end-point samples have been collected during previous RIs. Specifically, four end-point samples were collected by Langan in Lot 22 in August 2012 and six end-point samples were collected by Roux Associates in Lots 22 and 42 in April and August 2014 during the RI and Supplemental RI. To evaluate attainment of Track 4 Site Specific SCOs, four confirmation soil samples will be collected on Lot 22 and analyzed for trigger compounds. Additional confirmation sampling will be collected from two “hot spot” excavation locations in lot 42, around SB-1 and SB-2 at depth of approximately 10 feet below grade. One bottom sample and two sidewall samples will be collected from each hot spot location. For comparison to Track

4 SCOs, analytes will only include trigger compounds and elements established on the Track 4 SCO list, which includes VOCs SVOCs and metals. The approximate collection location of the endpoint soil samples is shown on Figure 5.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program, will be performed in conjunction with post remedial end-point samples to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. Frequency for hot-spot end-point sample collection is as follows:

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. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In

all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all confirmation and end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all confirmation and end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be Confirmation samples will be analyzed for compounds and elements as described above utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semivolatile organic compounds by EPA Method 8270; and
- Target Analyte List metals.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e. spills hotline) will be performed.

Quality Assurance/Quality Control

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

One duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. One trip blank will be submitted to the laboratory with each shipment of soil samples.

For the additional end-point sampling, one duplicate sample, one trip blank and one field blank per day/shipment will be collected and submitted to the laboratory for analysis.

Import and Reuse of Soils

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3. The estimated quantity of soil to be imported into the Site for backfill and cover soil is 400 tons. The estimated quantity of onsite soil/fill expected to be reused/relocated on Site is 0 tons.

4.3 Engineering Controls

The excavation required for the proposed Site development will achieve Track 4 Site-Specific SCOs. Engineering Controls are required in the remedial action to address residual contamination remaining at the site. The Site has three elements which constitute the primary Engineering Controls, consisting of:

- composite cover system consisting concrete building slabs;
- soil vapor barrier; and
- sub-slab depressurization system.

Composite Cover System

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of building slab over the property in Lot 22 (minimum 5 inches thick) and concrete slab (minimum 7 inches) in Lot 42.

Figure 7 shows the typical design for each remedial cover type used on this Site. Figure 7 shows the location of each cover type built at the Site.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

VAPOR BARRIER

Migration of soil vapor will be mitigated with a combination of building slab, vapor barrier. A waterproofing/ vapor barrier system consisting of a Carlisle MiraPLY- H and MiraPLY-V 20-mil geomembrane will be installed beneath the building slab and up the sidewalls, respectively, according to manufacturer specifications. The RAR will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from the primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty. A detailed description including manufacturer's specifications are presented in Appendix 7.

SUB-SLAB DEPRESSURIZATION SYSTEM

Migration of soil vapor will be mitigated with the construction of an active sub-slab depressurization system. The SSDS will be incorporated into the design of the building and will be installed during construction. The SSDS will consist of 4-inch diameter perforated piping installed in gravel trenches beneath the concrete slab in a looped system around the interior edge of the building perimeter. The gravel trenches will be wrapped with a 10-ounce non-woven geotextile fabric to prevent entry of fines into the piping. The perforated piping will be connected to a 2-horsepower regenerative blower and a 6-inch cast iron riser that will extend to an exhaust louver on the third floor of the building. The blower configuration of the SSDS design for the site is shown in Figure 9 and specifications are included in Appendix 8. The design is based on the building design that has setbacks on the north and east sides. Modifications will be made to the SSDS layout as needed during construction.

The SSDS will be tested at startup to demonstrate that the system is performing adequately as designed. To simplify the verification of proper system operation, a low vacuum switch (with manual reset) will be installed on the blower inlet to provide warning if a low vacuum situation were to occur. A warning light will be installed in the interior space of the proposed building (i.e., manager's office). Should a low vacuum situation occur, the warning light will turn on to notify the appropriate personnel.

Upon startup, an air sample will be collected from the exhaust of the depressurization system for analysis using USEPA method TO-15. The air test results will be used to perform a Division of Air Resources (DAR-1) analysis to estimate emissions. Emission levels based on the

DAR-1 analysis will be compared to annual guidance concentrations and short term guidance concentrations to determine whether or not air emission control is required. The effluent of the blower and/or vapor phase treatment (if needed) will also be monitored using a photoionization detector (PID) during each O&M visit. A detailed description of the SSDS O&M plan will be contained in the SMP that will be submitted with the RAR.

4.4 Institutional Controls

Institutional Controls (IC) have been incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR. The property will continue to be registered with an E-Designation by the NYC Buildings Department.

Institutional Controls for this remedial action are:

- The property will continue to be registered with an E-Designation by the NYC Buildings Department. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(1)(3).

- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for residential/commercial use and will not be used for a higher level of use without prior approval by OER.

4.5 Site Management plan

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in this RAWP and the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Voluntary Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of EC's; (4) inspection and certification of EC's; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled by OER on a periodic basis to be established in the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by March 31 of the year following the reporting period.

4.6 Qualitative Human Health Exposure Assessment

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA).

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Sources

Historic fill material is present at the Site from grade to approximately 4 to 11 feet below grade. Based on the results of the Remedial Investigation Report the contaminants of concern found are:

Soil

- VOCs including tetrachloroethene exceeded Track 2 Restricted Residential SCOs.
- SVOCs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene and indeno[1,2,3-cd]pyrene exceeded Track 2 Restricted Residential SCOs.
- Metals including barium, lead and mercury exceeded Track 2 Restricted Residential SCOs and chromium, copper and zinc that exceeded Track 1 Unrestricted Use SCOs.

Groundwater

- VOCs including 1,2,4,5-tetramethylbenzene, 1,2,4-trimethylbenzene, 1,2-dichlorobenzene, 1,3,5-trimethylbenzene, BTEX, naphthalene, n-propylbenzene and tetrachloroethene exceeded their AWQS.
- SVOCs including several PAHs exceeded their AWQS.
- Several metals including, manganese, selenium and sodium exceeded their respective AWQS.

Soil vapor

- Soil vapor samples collected during the 2012 and 2014 RI and Supplemental RI indicated chlorinated VOCs were present at elevated concentrations.
- Chlorinated VOCs detected above NYS DOH mitigation thresholds including PCE, and TCE.

Nature, Extent, Fate and Transport of Contaminants

VOCs, SVOCs and metals are present in the shallow fill materials throughout the Site. VOCs, SVOCs and metals were also detected in groundwater. Some chlorinated VOCs in soil vapor were detected above the guidance issued by New York State DOH and were also found in soil and groundwater samples collected. Chlorinated VOCs encountered may be indicative of past site operations as a dry cleaner. Most of the data exceeding Track 2 were found within the upper 5 feet of soil in Lot 42.

Potential Routes of Exposure

The following exposure pathways are considered most applicable to the Site:

- Dermal absorption through direct contact with soil and water;
- Incidental soil/groundwater ingestion; and,
- Inhalation of airborne volatiles and particulates.

Existence of Human Health Exposure

Potential Exposure Pathways for Soil

Human exposure to contaminants in Site soils may occur through direct contact or airborne transport during remedial excavation and construction activities. Construction and remedial workers are expected to be exposed to surface and subsurface soils and groundwater. Their greatest exposure to contaminated materials will be during excavation. Therefore, all construction activities related to excavation should be subject to health and safety and air monitoring procedures.

Soils will be excavated to a depth of approximately 14 feet below grade in Lot 22 and hot spot excavation will be completed in Lot 42 to a depth of approximately 10 feet below grade and disposed off-Site and will eliminate potential source areas. The contemplated remedial action is a cleanup achieving Track 2 Soil cleanup objectives. The building will incorporate a vapor barrier under the slab and an active SSDS will be installed around the setback areas. Therefore, potential surface soil exposure pathways are considered incomplete for future conditions. Potential exposures would only occur during site remediation and construction but not under future use scenarios, thus not impacting future occupants of the Site.

Potential Exposure Pathways for Groundwater

The primary human health concern associated with groundwater contamination is the use of groundwater as a potable water supply. No significant human exposure to contaminated groundwater from the Site is occurring at present nor will it occur in the future because the area is served by a public water supply derived from outside of New York City.

Incidental exposure to the groundwater plume contamination beneath the Site could occur to construction workers during excavation below groundwater. Exposure would occur via incidental ingestion or dermal contact. Therefore, excavation and construction activities beneath Site will be subject to strict health and safety and air monitoring procedures.

Potential Exposure Pathways for Soil Gas and Air

Sources of chlorinated related VOCs were identified in soil, groundwater and soil vapor during the remedial investigation. Construction workers could be exposed to airborne contamination (volatile organics or fugitive dust) during construction activities. To protect construction workers from ingestion and inhalation of dust or volatiles, dust monitoring and dust suppression measures should be implemented based on the procedures outlined in the Site CHASP and NYSDEC's TAGM-4031, titled "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites".

Under future conditions, there will be no potential exposures via transport of fugitive dust or vapors in ambient air because most soil will be removed to a depth of 14 feet below grade and all potential sources will be removed. Further, the Site will be covered by buildings, a soil vapor barrier and a SSDS.

Nearby residents (i.e., those living along adjoining sides of the site) may be exposed to either volatile or dust emissions during the construction activities via the inhalation exposure route. As such, continuous air monitoring will be conducted during construction. Strict health and safety measures to suppress either volatile or dust emissions will be also implemented based on a community air monitoring program.

Receptor Populations

On-Site Receptors – The majority of the Site (Lot 22) is currently vacant and access to Site is restricted by a perimeter fence. Lot 42 is currently occupied by a one story commercial building. Onsite receptors are limited to trespassers and site representatives and visitors granted access to the property. During redevelopment of the Site, the on-Site potential receptors will include construction workers, site representatives, and visitors. Once the Site is redeveloped, the on-Site potential sensitive receptors will include adult and child building residents, workers and visitors.

Off-Site Receptors - Potential off-Site receptors within a 0.25-mile radius of the Site include: adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses (up to 0.25 mile) – existing and future

2. Residential Buildings (up to 0.25 mile) – existing and future
3. Building Construction/Renovation (up to 0.25 mile) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to .25 mile) – existing and future

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with water, fill, soil, or building materials.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways for the current site condition. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a residential structure, site-wide impervious surface cover cap, a subsurface vapor barrier system and a SSDS for the building. Soils within Lot 22 will be excavated to a depth of approximately 14 feet and disposed off-site. Potential post-construction use of groundwater is not considered an option because prohibitions currently exist in NYC on potable use of groundwater and groundwater use restrictions will prevent potential exposure to groundwater in the future. Removal of on-site soil will remove potential source areas for soil vapor contamination. Vapor barrier installation below grade and SSDS installation and operation will further prevent vapor exposures. During remedial construction, on-Site and off-Site

exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and oversight

Principal personnel who will participate in the remedial action include Wendy Shen, Senior Engineer, Craig Werle, Principal Hydrogeologist and Charlie McGuckin, Principal Engineer. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Charlie McGuckin and Craig Werle, respectively.

5.2 Site Security

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

5.3 Work Hours

The hours for operation of remedial construction will be from 7:00am to 4:00pm. These hours conform to the New York City Department of Buildings construction code requirements.

5.4 Construction Health and Safety Plan

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Marco Carcich - Monadnock Construction (Safety Director). Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. 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 performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. 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 HASP. That document will define the specific project contacts for use in case of emergency.

5.5 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. Exceedances 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

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter 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 of the work area or exclusion zone 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 perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring

particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ 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 PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 Agency Approvals

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

5.7 Site Preparation

Pre-Construction Meeting

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.

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 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.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated 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 Markout 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 RAWP. 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 RAWP.

Dewatering

Excavation will extend below the water table therefore dewatering will be required. Submersible pumps may be used to extract groundwater from gravel lined sumps in the excavations or a system of well points may be used for groundwater extraction. Extracted groundwater will be conveyed to a storage tank or treatment system.

Depending on the selected discharge option, a NYC DEP sewer use permit will be obtained for discharge of treated groundwater to the nearest sewers.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

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.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

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 cause downed 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.

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, haybales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

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 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 NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to 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 OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the

discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on 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 onsite or offsite 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 OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 Traffic Control

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route, on local roads for trucks leaving the site is the following:

- Proceed north on Tenth Ave;

- Turn left on West 41st St.;
- Proceed half a block and turn left into the entrance to the Lincoln Tunnel.

5.9 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.

5.10 Reporting and Record Keeping

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial 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 excursions, if any;
- Photograph of notable Site conditions and activities.

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

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).

5.11 Complaint Management

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

5.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be

followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- 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.

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- 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 (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Continue registration of the property with an E-Designation by the NYC Department of Buildings.

- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, Charles J. McGuckin am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 509 West 38th Street/ 512 West 39th Street Site VCP15CVCP009M.

I, Craig Werle, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 509 West 38th Street/ 512 West 39th Street Site VCP15CVCP009M.

I certify that the OER-approved Remedial Action Work Plan dated November 2014 and Stipulations in a letter dated month day, year; if any 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.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, an eight-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	24
Demobilization	25	1
Submit Remedial Action Report	32	6

- 1 Summary of Volatile Organic Compounds in Soil
- 2 Summary of Semivolatile Organic Compounds in Soil
- 3 Summary of Metals in Soil
- 4 Summary of Polychlorinated Biphenyls in Soil
- 5 Summary of Pesticides in Soil
- 6 Summary of Volatile Organic Compounds in Groundwater
- 7 Summary of Semivolatile Organic Compounds in Groundwater
- 8 Summary of Metals in Groundwater
- 9 Summary of Polychlorinated Biphenyls in Groundwater
- 10 Summary of Pesticides in Groundwater
- 11 Summary of Volatile Organic Compounds in Soil Vapor

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	1,1,1,2-Tetrachloroethane	--	--		NA	NA	NA
1,1,1-Trichloroethane	680	100000		0.16 U	0.14 U	0.14 U	0.11 U
1,1,2,2-Tetrachloroethane	--	--		1.2 U	1.1 U	1.1 U	0.87 U
1,1,2-Trichloroethane	--	--		0.93 U	0.84 U	0.82 U	0.66 U
1,1-Dichloroethane	270	26000		0.61 U	0.56 U	0.54 U	0.44 U
1,1-Dichloroethene	330	100000		0.5 U	0.46 U	0.45 U	0.36 U
1,1-Dichloropropene	--	--		NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--		NA	NA	NA	NA
1,2,3-Trichloropropane	--	--		NA	NA	NA	NA
1,2,4,5-Tetramethylbenzene	--	--		NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--		0.82 U	0.75 U	0.73 U	0.59 U
1,2,4-Trimethylbenzene	3600	52000		0.67 U	0.61 U	0.59 U	0.48 U
1,2-Dibromoethane	--	--		0.48 U	0.44 U	0.43 U	0.35 U
1,2-Dichlorobenzene	1100	100000		NA	NA	NA	NA
1,2-Dichloroethane	20	3100		0.62 U	0.56 U	0.55 U	0.44 U
1,2-Dichloroethene (total)	--	--		NA	NA	NA	NA
1,2-Dichloropropane	--	--		0.49 U	0.45 U	0.44 U	0.35 U
1,3,5-Trimethylbenzene	8400	52000		0.55 U	0.5 U	0.48 U	0.39 U
1,3-Dichlorobenzene	2400	49000		NA	NA	NA	NA
1,3-Dichloropropane	--	--		NA	NA	NA	NA
1,3-Dichloropropene	--	--		NA	NA	NA	NA
1,4-Dichlorobenzene	1800	13000		NA	NA	NA	NA
1,4-Diethylbenzene	--	--		NA	NA	NA	NA
1,4-Dioxane	100	13000		NA	NA	NA	NA
2,2-Dichloropropane	--	--		NA	NA	NA	NA
2-Butanone (MEK)	120	100000		1.1 U	0.98 U	0.96 U	0.77 U
2-Hexanone	--	--		0.85 U	0.78 U	0.75 U	0.61 U
4-Ethyltoluene	--	--		NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--		0.76 U	0.7 U	0.68 U	0.55 U
Acetone	50	100000		11 J	7.4 U	7.2 U	5.8 U
Acrylonitrile	--	--		NA	NA	NA	NA

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	BENZENE, 1,4-DIETHYL	-	--		NA	NA	NA
Benzene	60	4800		0.6 U	0.55 U	0.53 U	0.43 U
Bromobenzene	--	--		NA	NA	NA	NA
Bromochloromethane	--	--		NA	NA	NA	NA
Bromodichloromethane	--	--		0.91 U	0.83 U	0.81 U	0.65 U
Bromoform	--	--		0.58 U	0.53 U	0.51 U	0.41 U
Bromomethane	--	--		1.4 U	1.2 U	1.2 U	0.98 U
Carbon disulfide	--	--		0.44 U	0.41 U	0.39 U	0.32 U
Carbon tetrachloride	760	2400		0.6 U	0.55 U	0.53 U	0.43 U
Chlorobenzene	1100	100000		0.6 U	0.55 U	0.53 U	0.43 U
Chloroethane	--	--		0.68 U	0.62 U	0.6 U	0.49 U
Chloroform	370	49000		0.62 U	0.56 U	0.55 U	0.44 U
Chloromethane	--	--		0.67 U	0.62 U	0.6 U	0.48 U
cis-1,2-Dichloroethene	250	100000		0.36 U	0.32 U	0.32 U	0.26 U
cis-1,3-Dichloropropene	--	--		0.56 U	0.51 U	0.5 U	0.4 U
Dibromochloromethane	--	--		0.71 U	0.65 U	0.63 U	0.51 U
Dibromochloropropane	--	--		1.6 U	1.5 U	1.5 U	1.2 U
Dibromomethane	--	--		NA	NA	NA	NA
Dichlorodifluoromethane	--	--		0.56 U	0.51 U	0.5 U	0.4 U
Diethyl Ether	--	--		NA	NA	NA	NA
Ethylbenzene	1000	41000		0.36 U	0.33 U	0.32 U	0.26 U
Freon 113	--	--		6.4	1 J	1.2 J	0.29 U
Hexachlorobutadiene	--	--		NA	NA	NA	NA
Isopropylbenzene	--	--		NA	NA	NA	NA
m+p-Xylene	--	--		1.1 U	1 U	1 U	0.82 U
Methylene chloride	50	100000		11 J	7.7 J,B	7.7 J,B	2 J
MTBE	930	100000		0.45 U	0.41 U	0.4 U	0.32 U
Naphthalene	12000	100000		1.3 U	1.2 U	1.2 U	0.95 U
n-Butylbenzene	12000	100000		0.54 U	0.49 U	0.48 U	0.39 U
n-Propylbenzene	3900	100000		0.51 U	0.47 U	0.45 U	0.37 U
o-Chlorotoluene	--	--		NA	NA	NA	NA

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	o-Xylene	--	--		0.45 U	0.41 U	0.4 U
p-Chlorotoluene	--	--		NA	NA	NA	NA
p-Isopropyltoluene	--	--		NA	NA	NA	NA
sec-Butylbenzene	11000	100000		0.57 U	0.52 U	0.51 U	0.41 U
Styrene	--	--		0.41 U	0.37 U	0.36 U	0.29 U
tert-Butylbenzene	5900	100000		NA	NA	NA	NA
Tetrachloroethene	1300	19000		5.5 J	4 J	3 J	130
Toluene	700	100000		0.47 U	0.43 U	0.42 U	0.34 U
trans-1,2-Dichloroethene	190	100000		0.64 U	0.58 U	0.57 U	0.46 U
trans-1,3-Dichloropropene	--	--		0.64 U	0.58 U	0.56 U	0.45 U
trans-1,4-Dichloro-2-butene	--	--		NA	NA	NA	NA
Trichloroethene	470	21000		0.61 U	0.55 U	0.54 U	2 J
Trichlorofluoromethane	--	--		0.44 U	0.4 U	0.38 U	0.31 U
Vinyl acetate	--	--		NA	NA	NA	NA
Vinyl chloride	20	900		0.34 U	0.31 U	0.3 U	0.24 U
Xylenes (total)	260	100000		0.73 U	0.67 U	0.65 U	0.52 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #4-14'	SB-1	SB-1	SB-2	SB-2DUP	SB-2
	Part 375 Unrestricted Use	Part 375 Restricted Residential		8/30/2012	4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014
1,1,1,2-Tetrachloroethane	--	--		NA	1.3 U	1.1 U	1.2 U	1.3 U	65 U
1,1,1-Trichloroethane	680	100000		0.13 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
1,1,2,2-Tetrachloroethane	--	--		0.98 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
1,1,2-Trichloroethane	--	--		0.75 U	1.9 U	1.6 U	1.8 U	1.9 U	98 U
1,1-Dichloroethane	270	26000		0.5 U	1.9 U	1.6 U	1.8 U	1.9 U	98 U
1,1-Dichloroethene	330	100000		0.41 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
1,1-Dichloropropene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,2,3-Trichlorobenzene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,2,3-Trichloropropane	--	--		NA	13 U	11 U	12 U	13 U	650 U
1,2,4,5-Tetramethylbenzene	--	--		NA	5.2 U	4.3 U	4.9 U	5 U	260 U
1,2,4-Trichlorobenzene	--	--		0.67 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,2,4-Trimethylbenzene	3600	52000		0.54 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,2-Dibromoethane	--	--		0.39 U	5.2 U	4.3 U	4.9 U	5 U	260 U
1,2-Dichlorobenzene	1100	100000		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,2-Dichloroethane	20	3100		0.5 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
1,2-Dichloroethene (total)	--	--		NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	--	--		0.4 U	4.5 U	3.8 U	4.3 U	4.4 U	230 U
1,3,5-Trimethylbenzene	8400	52000		0.44 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,3-Dichlorobenzene	2400	49000		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,3-Dichloropropane	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,3-Dichloropropene	--	--		NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1800	13000		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
1,4-Diethylbenzene	--	--		NA	NA	NA	NA	NA	NA
1,4-Dioxane	100	13000		NA	130 U	110 U	120 U	130 U	6500 U
2,2-Dichloropropane	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
2-Butanone (MEK)	120	100000		0.87 U	13 U	11 U	12 U	13 U	650 U
2-Hexanone	--	--		0.69 U	13 U	11 U	12 U	13 U	650 U
4-Ethyltoluene	--	--		NA	5.2 U	4.3 U	4.9 U	5 U	260 U
4-Methyl-2-pentanone (MIBK)	--	--		0.62 U	13 U	11 U	12 U	13 U	650 U
Acetone	50	100000		11	12 J	4.8 J	8 J	4.5 J	650 U
Acrylonitrile	--	--		NA	13 U	11 U	12 U	13 U	650 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #4-14'	SB-1	SB-1	SB-2	SB-2DUP	SB-2
	Part 375 Unrestricted Use	Part 375 Restricted Residential		8/30/2012	4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014
BENZENE, 1,4-DIETHYL	-	--		NA	5.2 U	4.3 U	4.9 U	5 U	260 U
Benzene	60	4800		0.49 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Bromobenzene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Bromochloromethane	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Bromodichloromethane	--	--		0.74 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Bromoform	--	--		0.47 U	5.2 U	4.3 U	4.9 U	5 U	260 U
Bromomethane	--	--		1.1 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
Carbon disulfide	--	--		0.36 U	13 U	11 U	12 U	13 U	650 U
Carbon tetrachloride	760	2400		0.48 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Chlorobenzene	1100	100000		0.49 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Chloroethane	--	--		0.55 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
Chloroform	370	49000		0.5 U	1.9 U	1.6 U	1.8 U	1.9 U	98 U
Chloromethane	--	--		0.55 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
cis-1,2-Dichloroethene	250	100000		0.29 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
cis-1,3-Dichloropropene	--	--		0.45 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Dibromochloromethane	--	--		0.57 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Dibromochloropropane	--	--		1.3 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Dibromomethane	--	--		NA	13 U	11 U	12 U	13 U	650 U
Dichlorodifluoromethane	--	--		0.46 U	13 U	11 U	12 U	13 U	650 U
Diethyl Ether	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Ethylbenzene	1000	41000		0.29 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Freon 113	--	--		0.32 U	NA	NA	NA	NA	NA
Hexachlorobutadiene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Isopropylbenzene	--	--		NA	1.3 U	1.1 U	1.2 U	1.3 U	65 U
m+p-Xylene	--	--		0.92 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
Methylene chloride	50	100000		8.9 J,B	13 U	11 U	12 U	13 U	650 U
MTBE	930	100000		0.37 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
Naphthalene	12000	100000		1.3 J	6.5 U	5.4 U	6.2 U	6.3 U	2300
n-Butylbenzene	12000	100000		0.44 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
n-Propylbenzene	3900	100000		0.41 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
o-Chlorotoluene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #4-14' 8/30/2012 -	SB-1 4/7/2014 0.5-2.5	SB-1 4/10/2014 5-7	SB-2 4/7/2014 0.5-2.5	SB-2DUP 4/7/2014 0.5-2.5	SB-2 4/10/2014 5-5.5
	o-Xylene	--	--		0.36 U	2.6 U	2.2 U	2.5 U	2.5 U
p-Chlorotoluene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
p-Isopropyltoluene	--	--		NA	1.3 U	1.1 U	1.2 U	1.3 U	65 U
sec-Butylbenzene	11000	100000		0.46 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Styrene	--	--		0.33 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
tert-Butylbenzene	5900	100000		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Tetrachloroethene	1300	19000		2.4 J	0.9 J	4.7	7.5	7.5	65 U
Toluene	700	100000		0.38 U	1.9 U	1.6 U	1.8 U	1.9 U	45 J
trans-1,2-Dichloroethene	190	100000		0.52 U	1.9 U	1.6 U	1.8 U	1.9 U	98 U
trans-1,3-Dichloropropene	--	--		0.51 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
trans-1,4-Dichloro-2-butene	--	--		NA	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Trichloroethene	470	21000		0.49 U	1.3 U	1.1 U	1.2 U	1.3 U	65 U
Trichlorofluoromethane	--	--		0.35 U	6.5 U	5.4 U	6.2 U	6.3 U	330 U
Vinyl acetate	--	--		NA	13 U	11 U	12 U	13 U	650 U
Vinyl chloride	20	900		0.27 U	2.6 U	2.2 U	2.5 U	2.5 U	130 U
Xylenes (total)	260	100000		0.59 U	NA	NA	NA	NA	NA

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation:	SB-3	SB-4	SB-4DUP	SB-4	SB-5	SB-5	SB-6
			Sample Date:	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
			Sample Depth (ft bls):	9-10	9-10	9-10	14-15	2.5-5	14-15	8-10
1,1,1,2-Tetrachloroethane	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,1,1-Trichloroethane	680	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,1,2,2-Tetrachloroethane	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,1,2-Trichloroethane	--	--		1.7 U	1.4 U	1.4 U	1.5 U	88 U	1.9 U	1.6 U
1,1-Dichloroethane	270	26000		1.7 U	1.4 U	1.4 U	1.5 U	88 U	1.9 U	1.6 U
1,1-Dichloroethene	330	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,1-Dichloropropene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,2,3-Trichlorobenzene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,2,3-Trichloropropane	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
1,2,4,5-Tetramethylbenzene	--	--		4.4 U	3.8 U	3.8 U	4 U	230 U	5 U	4.2 U
1,2,4-Trichlorobenzene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,2,4-Trimethylbenzene	3600	52000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,2-Dibromoethane	--	--		4.4 U	3.8 U	3.8 U	4 U	230 U	5 U	4.2 U
1,2-Dichlorobenzene	1100	100000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,2-Dichloroethane	20	3100		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,2-Dichloroethene (total)	--	--		1.1 U	0.94 U	0.96 U	0.5 J	59 U	1.2 U	3.6
1,2-Dichloropropane	--	--		3.9 U	3.3 U	3.4 U	3.5 U	200 U	4.4 U	3.7 U
1,3,5-Trimethylbenzene	8400	52000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,3-Dichlorobenzene	2400	49000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,3-Dichloropropane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,3-Dichloropropene	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
1,4-Dichlorobenzene	1800	13000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
1,4-Diethylbenzene	--	--		4.4 U	3.8 U	3.8 U	4 U	20 J	5 U	4.2 U
1,4-Dioxane	100	13000		110 U	94 U	96 U	100 U	5900 U	120 U	100 U
2,2-Dichloropropane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
2-Butanone (MEK)	120	100000		11 U	2.1 J	9.6 U	10 U	170 J	2.7 J	2.3 J
2-Hexanone	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
4-Ethyltoluene	--	--		4.4 U	3.8 U	3.8 U	4 U	230 U	5 U	4.2 U
4-Methyl-2-pentanone (MIBK)	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Acetone	50	100000		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Acrylonitrile	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SB-3	SB-4	SB-4DUP	SB-4	SB-5	SB-5	SB-6
	Part 375	Part 375		8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
	Unrestricted Use	Restricted Residential		9-10	9-10	9-10	14-15	2.5-5	14-15	8-10
BENZENE, 1,4-DIETHYL	-	--		NA						
Benzene	60	4800		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Bromobenzene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Bromochloromethane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Bromodichloromethane	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Bromoform	--	--		4.4 U	3.8 U	3.8 U	4 U	230 U	5 U	4.2 U
Bromomethane	--	--		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
Carbon disulfide	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Carbon tetrachloride	760	2400		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Chlorobenzene	1100	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Chloroethane	--	--		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
Chloroform	370	49000		1.7 U	1.4 U	1.4 U	1.5 U	88 U	1.9 U	1.6 U
Chloromethane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
cis-1,2-Dichloroethene	250	100000		1.1 U	0.94 U	0.96 U	0.5 J	59 U	1.2 U	3.6
cis-1,3-Dichloropropene	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Dibromochloromethane	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Dibromochloropropane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Dibromomethane	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Dichlorodifluoromethane	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Diethyl Ether	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Ethylbenzene	1000	41000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Freon 113	--	--		NA						
Hexachlorobutadiene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Isopropylbenzene	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
m+p-Xylene	--	--		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
Methylene chloride	50	100000		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
MTBE	930	100000		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
Naphthalene	12000	100000		5.6 U	4.7 U	4.8 U	5 U	40 J	6.3 U	5.2 U
n-Butylbenzene	12000	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
n-Propylbenzene	3900	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
o-Chlorotoluene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-3	SB-4	SB-4DUP	SB-4	SB-5	SB-5	SB-6
	Part 375	Part 375		Sample Date:	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
	Unrestricted	Restricted	Sample Depth (ft bls):	9-10	9-10	9-10	14-15	2.5-5	14-15	8-10
	Use	Residential								
o-Xylene	--	--		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
p-Chlorotoluene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
p-Isopropyltoluene	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
sec-Butylbenzene	11000	100000		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
Styrene	--	--		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
tert-Butylbenzene	5900	100000		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Tetrachloroethene	1300	19000		1.8	3.8	9.5	26	3500	0.75 J	28
Toluene	700	100000		1.7 U	1.4 U	1.4 U	1.5 U	88 U	1.9 U	1.6 U
trans-1,2-Dichloroethene	190	100000		1.7 U	1.4 U	1.4 U	1.5 U	88 U	1.9 U	1.6 U
trans-1,3-Dichloropropene	--	--		1.1 U	0.94 U	0.96 U	1 U	59 U	1.2 U	1 U
trans-1,4-Dichloro-2-butene	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Trichloroethene	470	21000		1.1 U	0.94 U	0.96 U	0.58 J	59 U	1.2 U	0.37 J
Trichlorofluoromethane	--	--		5.6 U	4.7 U	4.8 U	5 U	290 U	6.3 U	5.2 U
Vinyl acetate	--	--		11 U	9.4 U	9.6 U	10 U	590 U	12 U	10 U
Vinyl chloride	20	900		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U
Xylenes (total)	260	100000		2.2 U	1.9 U	1.9 U	2 U	120 U	2.5 U	2.1 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-6	FB-080114	TRIP BLANK
	Part 375 Unrestricted Use	Part 375 Restricted Residential	Sample Date:	8/1/2014	8/1/2014	8/1/2014
			Sample Depth (ft bls):	10-11	-	-
1,1,1,2-Tetrachloroethane	--	--		1.2 U	2.5 U	2.5 U
1,1,1-Trichloroethane	680	100000		1.2 U	2.5 U	2.5 U
1,1,2,2-Tetrachloroethane	--	--		1.2 U	0.5 U	0.5 U
1,1,2-Trichloroethane	--	--		1.8 U	1.5 U	1.5 U
1,1-Dichloroethane	270	26000		1.8 U	2.5 U	2.5 U
1,1-Dichloroethene	330	100000		1.2 U	0.5 U	0.5 U
1,1-Dichloropropene	--	--		5.8 U	2.5 U	2.5 U
1,2,3-Trichlorobenzene	--	--		5.8 U	2.5 U	2.5 U
1,2,3-Trichloropropane	--	--		12 U	2.5 U	2.5 U
1,2,4,5-Tetramethylbenzene	--	--		4.7 U	2 U	2 U
1,2,4-Trichlorobenzene	--	--		5.8 U	2.5 U	2.5 U
1,2,4-Trimethylbenzene	3600	52000		5.8 U	2.5 U	2.5 U
1,2-Dibromoethane	--	--		4.7 U	2 U	2 U
1,2-Dichlorobenzene	1100	100000		5.8 U	2.5 U	2.5 U
1,2-Dichloroethane	20	3100		1.2 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	--	--		4.4	2.5 U	2.5 U
1,2-Dichloropropane	--	--		4.1 U	1 U	1 U
1,3,5-Trimethylbenzene	8400	52000		5.8 U	2.5 U	2.5 U
1,3-Dichlorobenzene	2400	49000		5.8 U	2.5 U	2.5 U
1,3-Dichloropropane	--	--		5.8 U	2.5 U	2.5 U
1,3-Dichloropropene	--	--		1.2 U	0.5 U	0.5 U
1,4-Dichlorobenzene	1800	13000		5.8 U	2.5 U	2.5 U
1,4-Diethylbenzene	--	--		4.7 U	2 U	2 U
1,4-Dioxane	100	13000		120 U	250 U	250 U
2,2-Dichloropropane	--	--		5.8 U	2.5 U	2.5 U
2-Butanone (MEK)	120	100000		12 U	5 U	5 U
2-Hexanone	--	--		12 U	5 U	5 U
4-Ethyltoluene	--	--		4.7 U	2 U	2 U
4-Methyl-2-pentanone (MIBK)	--	--		12 U	5 U	5 U
Acetone	50	100000		12 U	2.3 J	5 U
Acrylonitrile	--	--		12 U	5 U	5 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation:	SB-6	FB-080114	TRIP BLANK
			Sample Date:	8/1/2014	8/1/2014	8/1/2014
			Sample Depth (ft bls):	10-11	-	-
BENZENE, 1,4-DIETHYL	-	--		NA	NA	NA
Benzene	60	4800		1.2 U	0.5 U	0.5 U
Bromobenzene	--	--		5.8 U	2.5 U	2.5 U
Bromochloromethane	--	--		5.8 U	2.5 U	2.5 U
Bromodichloromethane	--	--		1.2 U	0.5 U	0.5 U
Bromoform	--	--		4.7 U	2 U	2 U
Bromomethane	--	--		2.3 U	2.5 U	2.5 U
Carbon disulfide	--	--		12 U	5 U	5 U
Carbon tetrachloride	760	2400		1.2 U	0.5 U	0.5 U
Chlorobenzene	1100	100000		1.2 U	2.5 U	2.5 U
Chloroethane	--	--		2.3 U	2.5 U	2.5 U
Chloroform	370	49000		1.8 U	2.5 U	2.5 U
Chloromethane	--	--		5.8 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	250	100000		4.4	2.5 U	2.5 U
cis-1,3-Dichloropropene	--	--		1.2 U	0.5 U	0.5 U
Dibromochloromethane	--	--		1.2 U	0.5 U	0.5 U
Dibromochloropropane	--	--		5.8 U	2.5 U	2.5 U
Dibromomethane	--	--		12 U	5 U	5 U
Dichlorodifluoromethane	--	--		12 U	5 U	5 U
Diethyl Ether	--	--		5.8 U	2.5 U	2.5 U
Ethylbenzene	1000	41000		1.2 U	2.5 U	2.5 U
Freon 113	--	--		NA	NA	NA
Hexachlorobutadiene	--	--		5.8 U	2.5 U	2.5 U
Isopropylbenzene	--	--		1.2 U	2.5 U	2.5 U
m+p-Xylene	--	--		2.3 U	2.5 U	2.5 U
Methylene chloride	50	100000		12 U	0.8 J	2.5 U
MTBE	930	100000		2.3 U	2.5 U	2.5 U
Naphthalene	12000	100000		0.67 J	2.5 U	2.5 U
n-Butylbenzene	12000	100000		1.2 U	2.5 U	2.5 U
n-Propylbenzene	3900	100000		1.2 U	2.5 U	2.5 U
o-Chlorotoluene	--	--		5.8 U	2.5 U	2.5 U

Table 1. Summary of Volatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-6	FB-080114	TRIP BLANK
	Part 375 Unrestricted Use	Part 375 Restricted Residential		Sample Date:	8/1/2014	8/1/2014
			Sample Depth (ft bls):	10-11	-	-
o-Xylene	--	--		2.3 U	2.5 U	2.5 U
p-Chlorotoluene	--	--		5.8 U	2.5 U	2.5 U
p-Isopropyltoluene	--	--		1.2 U	2.5 U	2.5 U
sec-Butylbenzene	11000	100000		1.2 U	2.5 U	2.5 U
Styrene	--	--		2.3 U	2.5 U	2.5 U
tert-Butylbenzene	5900	100000		5.8 U	2.5 U	2.5 U
Tetrachloroethene	1300	19000		58	0.5 U	0.5 U
Toluene	700	100000		1.8 U	2.5 U	2.5 U
trans-1,2-Dichloroethene	190	100000		1.8 U	2.5 U	2.5 U
trans-1,3-Dichloropropene	--	--		1.2 U	0.5 U	0.5 U
trans-1,4-Dichloro-2-butene	--	--		5.8 U	2.5 U	2.5 U
Trichloroethene	470	21000		0.54 J	0.5 U	0.5 U
Trichlorofluoromethane	--	--		5.8 U	2.5 U	2.5 U
Vinyl acetate	--	--		12 U	5 U	5 U
Vinyl chloride	20	900		2.3 U	1 U	1 U
Xylenes (total)	260	100000		2.3 U	2.5 U	2.5 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	1,1'-Biphenyl	--	--		NA	NA	NA
1,2,4,5-Tetrachlorobenzene	--	--		NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--		67.2 U	105 U	102 U	66.5 U
1,2-Dichlorobenzene	1100	100000		121 U	190 U	185 U	120 U
1,3-Dichlorobenzene	2400	49000		58.7 U	91.7 U	89.3 U	58 U
1,4-Dichlorobenzene	1800	13000		114 U	179 U	174 U	113 U
2,2'-oxybis (1-chloropropane)	--	--		NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--		144 U	225 U	219 U	142 U
2,4,6-Trichlorophenol	--	--		94.3 U	147 U	144 U	93.3 U
2,4-Dichlorophenol	--	--		151 U	237 U	231 U	150 U
2,4-Dimethylphenol	--	--		130 U	203 U	198 U	129 U
2,4-Dinitrophenol	--	--		156 U	244 U	237 U	154 U
2,4-Dinitrotoluene	--	--		82 U	128 U	125 U	81.2 U
2,6-Dinitrotoluene	--	--		95.4 U	149 U	145 U	94.4 U
2-Chloronaphthalene	--	--		100 U	157 U	153 U	99.2 U
2-Chlorophenol	--	--		61.3 U	95.8 U	93.3 U	60.6 U
2-Methylnaphthalene	--	--		143 U	223 U	217 U	141 U
2-Methylphenol	330	100000		70.5 U	110 U	107 U	69.8 U
2-Nitroaniline	--	--		162 U	253 U	246 U	160 U
2-Nitrophenol	--	--		50.5 U	78.9 U	76.9 U	49.9 U
3&4-Methylphenol	330	100000		80.6 U	126 U	123 U	79.7 U
3,3'-Dichlorobenzidine	--	--		97.3 U	152 U	148 U	96.2 U
3-Nitroaniline	--	--		184 U	288 U	281 U	183 U
4,6-Dinitro-2-methylphenol	--	--		234 U	366 U	356 U	231 U
4-Bromophenyl phenyl ether	--	--		89.5 U	140 U	136 U	88.5 U
4-Chloro-3-methylphenol	--	--		125 U	196 U	191 U	124 U
4-Chloroaniline	--	--		48.3 U	75.4 U	73.5 U	47.7 U
4-Chlorophenyl phenyl ether	--	--		109 U	170 U	166 U	108 U
4-Nitroaniline	--	--		76.8 U	120 U	117 U	76 U
4-Nitrophenol	--	--		69.8 U	109 U	106 U	69 U
Acenaphthene	20000	100000		67.2 U	105 U	102 U	66.5 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	Acenaphthylene	100000	100000		89.1 U	139 U	136 U
Acetophenone	--	--		NA	NA	NA	NA
Anthracene	100000	100000		101 U	158 U	154 U	100 U
Benzo[a]anthracene	1000	1000		69.4 U	109 U	106 U	68.7 U
Benzo[a]pyrene	1000	1000		73.5 U	115 U	112 U	72.7 U
Benzo[b]fluoranthene	1000	1000		156 U	243 U	237 U	154 U
Benzo[g,h,i]perylene	100000	100000		61.6 U	96.3 U	93.8 U	61 U
Benzo[k]fluoranthene	800	3900		186 U	290 U	283 U	184 U
Benzoic Acid	--	--		127 U	198 U	193 U	126 U
Benzyl Alcohol	--	--		186 U	290 U	283 U	184 U
Bis(2-chloroethoxy)methane	--	--		63.9 U	99.8 U	97.2 U	63.2 U
Bis(2-chloroethyl) ether	--	--		94.7 U	148 U	144 U	93.6 U
bis(2-Chloroisopropyl) ether	--	--		65.3 U	102 U	99.5 U	64.6 U
Bis(2-ethylhexyl) phthalate	--	--		128 U	200 U	195 U	127 U
Butylbenzyl phthalate	--	--		102 U	160 U	156 U	101 U
Carbazole	--	--		NA	NA	NA	NA
Chrysene	1000	3900		85.4 U	133 U	130 U	84.5 U
Dibenzo[a,h]anthracene	330	330		74.6 U	117 U	114 U	73.8 U
Dibenzofuran	7000	59000		86.5 U	135 U	132 U	85.6 U
Diethyl phthalate	--	--		117 U	182 U	178 U	115 U
Dimethyl phthalate	--	--		82.8 U	129 U	126 U	81.9 U
Di-n-butyl phthalate	--	--		75.4 U	118 U	115 U	74.5 U
Di-n-octyl phthalate	--	--		186 U	290 U	283 U	184 U
Fluoranthene	100000	100000		109 U	170 U	166 U	108 U
Fluorene	30000	100000		89.1 U	139 U	136 U	88.1 U
Hexachlorobenzene	330	1200		110 U	171 U	167 U	108 U
Hexachlorobutadiene	--	--		62.7 U	98.1 U	95.5 U	62.1 U
Hexachlorocyclopentadiene	--	--		138 U	216 U	210 U	137 U
Hexachloroethane	--	--		53.1 U	83 U	80.8 U	52.5 U
Indeno[1,2,3-cd]pyrene	500	500		84.6 U	132 U	129 U	83.7 U
Isophorone	--	--		63.9 U	99.8 U	97.2 U	63.2 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14' 8/27/2012 -	EndPoint #2-14' 8/28/2012 -	EndPoint-DUP 8/28/2012 -	EndPoint #3-14' 8/29/2012 -
	Naphthalene	12000	100000		45.7 U	71.4 U	69.5 U
Nitrobenzene	--	--		54.6 U	85.3 U	83.1 U	54 U
n-Nitrosodi-n-propylamine	--	--		62 U	96.9 U	94.4 U	61.3 U
n-Nitrosodiphenylamine	--	--		83.9 U	131 U	128 U	83 U
Pentachlorophenol	800	6700		140 U	219 U	213 U	138 U
Phenanthrene	100000	100000		96.9 U	151 U	148 U	95.8 U
Phenol	330	100000		80.2 U	125 U	122 U	79.3 U
Pyrene	100000	100000		75.7 U	118 U	115 U	74.9 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #4-14' 8/30/2012 -	SB-1 4/7/2014 0.5-2.5	SB-1 4/10/2014 5-7	SB-2 4/7/2014 0.5-2.5	SB-2DUP 4/7/2014 0.5-2.5	SB-2 4/10/2014 5-5.5
	1,1'-Biphenyl	--	--		NA	560 J	460 U	440 U	450 U
1,2,4,5-Tetrachlorobenzene	--	--		NA	910 U	200 U	190 U	200 U	390 U
1,2,4-Trichlorobenzene	--	--		67.4 U	910 U	200 U	190 U	200 U	390 U
1,2-Dichlorobenzene	1100	100000		122 U	910 U	200 U	190 U	200 U	390 U
1,3-Dichlorobenzene	2400	49000		58.8 U	910 U	200 U	190 U	200 U	390 U
1,4-Dichlorobenzene	1800	13000		115 U	910 U	200 U	190 U	200 U	390 U
2,2'-oxybis (1-chloropropane)	--	--		NA	1100 U	240 U	230 U	240 U	460 U
2,4,5-Trichlorophenol	--	--		144 U	910 U	200 U	190 U	200 U	390 U
2,4,6-Trichlorophenol	--	--		94.6 U	540 U	120 U	110 U	120 U	230 U
2,4-Dichlorophenol	--	--		152 U	820 U	180 U	170 U	180 U	350 U
2,4-Dimethylphenol	--	--		130 U	910 U	200 U	190 U	200 U	390 U
2,4-Dinitrophenol	--	--		156 U	4400 U	960 U	920 U	950 U	1900 U
2,4-Dinitrotoluene	--	--		82.3 U	910 U	200 U	190 U	200 U	390 U
2,6-Dinitrotoluene	--	--		95.7 U	910 U	200 U	190 U	200 U	390 U
2-Chloronaphthalene	--	--		101 U	910 U	200 U	190 U	200 U	390 U
2-Chlorophenol	--	--		61.4 U	910 U	200 U	190 U	200 U	390 U
2-Methylnaphthalene	--	--		143 U	1900	240 U	230 U	240 U	510
2-Methylphenol	330	100000		70.7 U	910 U	200 U	190 U	200 U	390 U
2-Nitroaniline	--	--		162 U	910 U	200 U	190 U	200 U	390 U
2-Nitrophenol	--	--		50.6 U	2000 U	430 U	410 U	430 U	840 U
3&4-Methylphenol	330	100000		80.8 U	1300 U	290 U	280 U	280 U	560 U
3,3'-Dichlorobenzidine	--	--		97.5 U	910 U	200 U	190 U	200 U	390 U
3-Nitroaniline	--	--		185 U	910 U	200 U	190 U	200 U	390 U
4,6-Dinitro-2-methylphenol	--	--		235 U	2400 U	520 U	500 U	510 U	1000 U
4-Bromophenyl phenyl ether	--	--		89.7 U	910 U	200 U	190 U	200 U	390 U
4-Chloro-3-methylphenol	--	--		125 U	910 U	200 U	190 U	200 U	390 U
4-Chloroaniline	--	--		48.4 U	910 U	200 U	190 U	200 U	390 U
4-Chlorophenyl phenyl ether	--	--		109 U	910 U	200 U	190 U	200 U	390 U
4-Nitroaniline	--	--		77.1 U	910 U	200 U	190 U	200 U	390 U
4-Nitrophenol	--	--		70 U	1300 U	280 U	270 U	280 U	540 U
Acenaphthene	20000	100000		67.4 U	2200	160 U	130 J	140 J	970

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #4-14' 8/30/2012 -	SB-1 4/7/2014 0.5-2.5	SB-1 4/10/2014 5-7	SB-2 4/7/2014 0.5-2.5	SB-2DUP 4/7/2014 0.5-2.5	SB-2 4/10/2014 5-5.5
	Acenaphthylene	100000	100000		89.4 U	5700	160 U	190	150 J
Acetophenone	--	--		NA	910 U	200 U	190 U	200 U	390 U
Anthracene	100000	100000		102 U	9200	120 U	450	420	3900
Benzo[a]anthracene	1000	1000		69.6 U	24000	98 J	1700	1300	8800
Benzo[a]pyrene	1000	1000		73.7 U	22000	92 J	1500	1300	7800
Benzo[b]fluoranthene	1000	1000		156 U	29000	110 J	1800	1600	8800
Benzo[g,h,i]perylene	100000	100000		61.8 U	15000	48 J	930	710	4500
Benzo[k]fluoranthene	800	3900		186 U	9300	47 J	690	590	3700
Benzoic Acid	--	--		127 U	2900 U	650 U	620 U	640 U	1200 U
Benzyl Alcohol	--	--		186 U	910 U	200 U	190 U	200 U	390 U
Bis(2-chloroethoxy)methane	--	--		64 U	980 U	220 U	210 U	210 U	420 U
Bis(2-chloroethyl) ether	--	--		94.9 U	820 U	180 U	170 U	180 U	350 U
bis(2-Chloroisopropyl) ether	--	--		65.5 U	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--		128 U	910 U	200	190 U	200 U	410
Butylbenzyl phthalate	--	--		103 U	910 U	91 J	190 U	200 U	88 J
Carbazole	--	--		NA	4200	200 U	140 J	160 J	1100
Chrysene	1000	3900		85.6 U	26000	91 J	1500	1300	9200
Dibenzo[a,h]anthracene	330	330		74.8 U	3100	120 U	200	160	1100
Dibenzofuran	7000	59000		86.7 U	2800	200 U	79 J	100 J	780
Diethyl phthalate	--	--		117 U	910 U	200 U	190 U	200 U	390 U
Dimethyl phthalate	--	--		83 U	910 U	200 U	190 U	200 U	390 U
Di-n-butyl phthalate	--	--		75.6 U	910 U	200 U	190 U	200 U	390 U
Di-n-octyl phthalate	--	--		186 U	910 U	200 U	190 U	200 U	390 U
Fluoranthene	100000	100000		109 U	78000	190	3400	2800	18000
Fluorene	30000	100000		89.4 U	2700	200 U	120 J	140 J	1300
Hexachlorobenzene	330	1200		110 U	540 U	120 U	110 U	120 U	230 U
Hexachlorobutadiene	--	--		62.9 U	910 U	200 U	190 U	200 U	390 U
Hexachlorocyclopentadiene	--	--		138 U	2600 U	570 U	550 U	570 U	1100 U
Hexachloroethane	--	--		53.2 U	730 U	160 U	150 U	160 U	310 U
Indeno[1,2,3-cd]pyrene	500	500		84.9 U	16000	45 J	1000	830	4500
Isophorone	--	--		64 U	820 U	180 U	170 U	180 U	350 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	NYSDEC Part 375 Restricted Residential	Sample Designation: EndPoint #4-14'	SB-1	SB-1	SB-2	SB-2DUP	SB-2
			Sample Date: 8/30/2012	4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014
			Sample Depth (ft bls): -	0.5-2.5	5-7	0.5-2.5	0.5-2.5	5-5.5
Naphthalene	12000	100000	45.8 U	2600	200 U	69 J	74 J	880
Nitrobenzene	--	--	54.7 U	820 U	180 U	170 U	180 U	350 U
n-Nitrosodi-n-propylamine	--	--	62.2 U	910 U	200 U	190 U	200 U	390 U
n-Nitrosodiphenylamine	--	--	84.1 U	730 U	160 U	150 U	160 U	310 U
Pentachlorophenol	800	6700	140 U	730 U	160 U	150 U	160 U	310 U
Phenanthrene	100000	100000	97.2 U	71000	110 J	2000	1700	15000
Phenol	330	100000	80.4 U	910 U	200 U	190 U	200 U	390 U
Pyrene	100000	100000	76 U	66000	170	3000	2500	18000

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standar

Blank results are in micrograms per liter

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-3	SB-4	SB-5	SB-6	FB-080114
	Part 375 Unrestricted Use	Part 375 Restricted Residential	Sample Date:	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
			Sample Depth (ft bls):	9-10	14-15	14-15	10-11	-
1,1'-Biphenyl	--	--		420 U	410 U	420 U	450 U	2 U
1,2,4,5-Tetrachlorobenzene	--	--		180 U	180 U	180 U	200 U	10 U
1,2,4-Trichlorobenzene	--	--		180 U	180 U	180 U	200 U	5 U
1,2-Dichlorobenzene	1100	100000		180 U	180 U	180 U	200 U	2 U
1,3-Dichlorobenzene	2400	49000		180 U	180 U	180 U	200 U	2 U
1,4-Dichlorobenzene	1800	13000		180 U	180 U	180 U	200 U	2 U
2,2'-oxybis (1-chloropropane)	--	--		220 U	220 U	220 U	240 U	2 U
2,4,5-Trichlorophenol	--	--		180 U	180 U	180 U	200 U	5 U
2,4,6-Trichlorophenol	--	--		110 U	110 U	110 U	120 U	5 U
2,4-Dichlorophenol	--	--		170 U	160 U	160 U	180 U	5 U
2,4-Dimethylphenol	--	--		180 U	180 U	180 U	200 U	5 U
2,4-Dinitrophenol	--	--		890 U	860 U	880 U	950 U	20 U
2,4-Dinitrotoluene	--	--		180 U	180 U	180 U	200 U	5 U
2,6-Dinitrotoluene	--	--		180 U	180 U	180 U	200 U	5 U
2-Chloronaphthalene	--	--		180 U	180 U	180 U	200 U	0.2 U
2-Chlorophenol	--	--		180 U	180 U	180 U	200 U	2 U
2-Methylnaphthalene	--	--		220 U	220 U	220 U	240 U	0.2 U
2-Methylphenol	330	100000		180 U	180 U	180 U	200 U	5 U
2-Nitroaniline	--	--		180 U	180 U	180 U	200 U	5 U
2-Nitrophenol	--	--		400 U	390 U	400 U	430 U	10 U
3&4-Methylphenol	330	100000		270 U	260 U	260 U	280 U	5 U
3,3'-Dichlorobenzidine	--	--		180 U	180 U	180 U	200 U	5 U
3-Nitroaniline	--	--		180 U	180 U	180 U	200 U	5 U
4,6-Dinitro-2-methylphenol	--	--		480 U	470 U	480 U	510 U	10 U
4-Bromophenyl phenyl ether	--	--		180 U	180 U	180 U	200 U	2 U
4-Chloro-3-methylphenol	--	--		180 U	180 U	180 U	200 U	2 U
4-Chloroaniline	--	--		180 U	180 U	180 U	200 U	5 U
4-Chlorophenyl phenyl ether	--	--		180 U	180 U	180 U	200 U	2 U
4-Nitroaniline	--	--		180 U	180 U	180 U	200 U	5 U
4-Nitrophenol	--	--		260 U	250 U	260 U	280 U	10 U
Acenaphthene	20000	100000		150 U	140 U	150 U	160 U	0.2 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-3	SB-4	SB-5	SB-6	FB-080114
	Part 375	Part 375	Sample Date:	8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
	Unrestricted Use	Restricted Residential	Sample Depth (ft bls):	9-10	14-15	14-15	10-11	-
Acenaphthylene	100000	100000		150 U	140 U	150 U	160 U	0.2 U
Acetophenone	--	--		180 U	180 U	180 U	200 U	5 U
Anthracene	100000	100000		110 U	110 U	110 U	120 U	0.2 U
Benzo[a]anthracene	1000	1000		110 U	110 U	110 U	120 U	0.2 U
Benzo[a]pyrene	1000	1000		150 U	140 U	150 U	160 U	0.2 U
Benzo[b]fluoranthene	1000	1000		110 U	110 U	110 U	120 U	0.2 U
Benzo[g,h,i]perylene	100000	100000		150 U	140 U	150 U	160 U	0.2 U
Benzo[k]fluoranthene	800	3900		110 U	110 U	110 U	120 U	0.2 U
Benzoic Acid	--	--		600 U	580 U	600 U	640 U	50 U
Benzyl Alcohol	--	--		180 U	180 U	180 U	200 U	2 U
Bis(2-chloroethoxy)methane	--	--		200 U	190 U	200 U	210 U	5 U
Bis(2-chloroethyl) ether	--	--		170 U	160 U	160 U	180 U	2 U
bis(2-Chloroisopropyl) ether	--	--		NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--		180 U	48 J	180 U	200 U	3 U
Butylbenzyl phthalate	--	--		180 U	180 U	180 U	200 U	5 U
Carbazole	--	--		180 U	180 U	180 U	200 U	2 U
Chrysene	1000	3900		110 U	110 U	110 U	120 U	0.2 U
Dibenzo[a,h]anthracene	330	330		110 U	110 U	110 U	120 U	0.2 U
Dibenzofuran	7000	59000		180 U	180 U	180 U	200 U	2 U
Diethyl phthalate	--	--		180 U	180 U	180 U	200 U	5 U
Dimethyl phthalate	--	--		180 U	180 U	180 U	200 U	5 U
Di-n-butyl phthalate	--	--		180 U	180 U	180 U	200 U	5 U
Di-n-octyl phthalate	--	--		180 U	180 U	180 U	200 U	5 U
Fluoranthene	100000	100000		110 U	110 U	110 U	120 U	0.2 U
Fluorene	30000	100000		180 U	180 U	180 U	200 U	0.2 U
Hexachlorobenzene	330	1200		110 U	110 U	110 U	120 U	0.8 U
Hexachlorobutadiene	--	--		180 U	180 U	180 U	200 U	0.5 U
Hexachlorocyclopentadiene	--	--		530 U	520 U	530 U	560 U	20 U
Hexachloroethane	--	--		150 U	140 U	150 U	160 U	0.8 U
Indeno[1,2,3-cd]pyrene	500	500		150 U	140 U	150 U	160 U	0.2 U
Isophorone	--	--		170 U	160 U	160 U	180 U	5 U

Table 2. Summary of Semivolatile Organic Compounds in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SB-3	SB-4	SB-5	SB-6	FB-080114
	Part 375 Unrestricted Use	Part 375 Restricted Residential		8/1/2014	8/1/2014	8/1/2014	8/1/2014	8/1/2014
Naphthalene	12000	100000		180 U	180 U	180 U	200 U	0.2 U
Nitrobenzene	--	--		170 U	160 U	160 U	180 U	2 U
n-Nitrosodi-n-propylamine	--	--		180 U	180 U	180 U	200 U	5 U
n-Nitrosodiphenylamine	--	--		150 U	140 U	150 U	160 U	2 U
Pentachlorophenol	800	6700		150 U	140 U	150 U	160 U	0.8 U
Phenanthrene	100000	100000		110 U	110 U	110 U	120 U	0.2 U
Phenol	330	100000		180 U	180 U	180 U	200 U	5 U
Pyrene	100000	100000		110 U	110 U	110 U	120 U	0.2 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Standards available

Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standards

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standar

Blank results are in micrograms per liter

Table 3. Summary of Metals in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14'	EndPoint #2-14'	EndPoint-DUP	EndPoint #3-14'
	Part 375 Unrestricted Use	Part 375 Restricted Residential		8/27/2012	8/28/2012	8/28/2012	8/29/2012
Aluminum	--	--		26000	4200	3860	8500
Antimony	--	--		0.245 U	0.255 U	0.249 U	0.242 U
Arsenic	13	16		2.03	1.56	1.17	3.45
Barium	350	400		315	105	93.7	159
Beryllium	7.2	72		0.111 U	0.116 U	0.113 U	0.11 U
Cadmium	2.5	4.3		0.111 U	0.116 U	0.113 U	0.11 U
Calcium	--	--		2840	1440	1180	3950
Chromium	30	180		71.2	10.8	11.1	18.9
Cobalt	--	--		28.9	8.01	5.51	11.4
Copper	50	270		0.134 U	7.74	6.19	18.5
Iron	--	--		52300 E	11000	9760	20100
Lead	63	400		0.189 U	3.9	3.41	56.4
Magnesium	--	--		13700	1630	1620	2970
Manganese	1600	2000		421	618	429	706
Mercury	0.18	0.81		0.105 U	0.109 U	0.106 U	0.104 U
Nickel	30	310		53.5	18.7	16.1	21
Potassium	--	--		17700	1220	1230	1940
Selenium	3.9	180		1.09	0.641	0.565 U	3.26
Silver	2	180		0.111 U	0.116 U	0.113 U	0.11 U
Sodium	--	--		224	165	125	203
Thallium	--	--		0.356 U	0.371 U	0.362 U	0.353 U
Vanadium	--	--		134	16.7	18.1	32.1
Zinc	109	10000		80.4	16.5	14.5	49.1

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

mg/kg - Milligrams per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

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Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Blank results are in micrograms per liter

Table 3. Summary of Metals in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC	NYSDEC	Sample Designation:	EndPoint #4-14'	SB-1	SB-1	SB-2	SB-2DUP	SB-2	SB-3
	Part 375 Unrestricted Use	Part 375 Restricted Residential	Sample Date:	8/30/2012	4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014	8/1/2014
			Sample Depth (ft bls):	-	0.5-2.5	5-7	0.5-2.5	0.5-2.5	5-5.5	9-10
Aluminum	--	--		5140	5400	10000	11000	10000	12000	7300
Antimony	--	--		0.246 U	4.3 U	4.7 U	1.9 J	1.5 J	4.6 U	4.4 U
Arsenic	13	16		2.02	11	7.6	7.1	7.5	16	2.8
Barium	350	400		64.8	590	220	580	530	450	59
Beryllium	7.2	72		0.311	0.24 J	0.37 J	0.35 J	0.53	0.5	0.3 J
Cadmium	2.5	4.3		0.112 U	0.3 J	0.95 U	0.07 J	0.92 U	0.92 U	0.87 U
Calcium	--	--		1090	33000	3300	7900	8100	14000	1300
Chromium	30	180		11.1	13	27	26	23	29	26
Cobalt	--	--		5.18	4.1	7.5	8.3	8	9.4	6.5
Copper	50	270		11.3	41	30	68	130	37	13
Iron	--	--		10300	11000	19000	23000	24000	31000	14000
Lead	63	400		4.9	490	120	630	490	260	1.6 J
Magnesium	--	--		1860	2400	4200	4000	3100	4900	2800
Manganese	1600	2000		380	210	310	380	610	340	180
Mercury	0.18	0.81		0.105 U	0.95	0.1 U	1	1.8	0.36	0.07 U
Nickel	30	310		14	11	17	16	14	16	15
Potassium	--	--		1590	1200	3500	4300	3100	5100	1700
Selenium	3.9	180		2.3	0.38 J	0.28 J	0.28 J	1.8 U	0.47 J	1.7 U
Silver	2	180		0.112 U	0.86 U	0.95 U	0.89 U	0.92 U	0.92 U	0.87 U
Sodium	--	--		173	490	190	220	250	260	100 J
Thallium	--	--		0.357 U	1.7 U	1.9 U	1.8 U	1.8 U	1.8 U	1.7 U
Vanadium	--	--		21	18	32	39	36	43	22
Zinc	109	10000		20	490	110	380	340	210	26

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

mg/kg - Milligrams per kilogram

ft bls - Feet below land surface

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Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use Standard

Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standard

Blank results are in micrograms per liter

Table 3. Summary of Metals in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC	NYSDEC	Sample Designation:	SB-4	SB-5	SB-6	FB-080114
	Part 375 Unrestricted Use	Part 375 Restricted Residential					
			Sample Depth (ft bls):	14-15	14-15	10-11	-
Aluminum	--	--		4800	19000	7400	0.1 U
Antimony	--	--		4.2 U	1.1 J	4.6 U	0.05 U
Arsenic	13	16		3.6	7.5	5.4	0.002 J
Barium	350	400		100	370	210	0.01 U
Beryllium	7.2	72		0.28 J	0.17 J	0.36 J	0.005 U
Cadmium	2.5	4.3		0.84 U	0.86 U	0.92 U	0.005 U
Calcium	--	--		1400	2700	3000	0.05 J
Chromium	30	180		13	46	20	0.01 U
Cobalt	--	--		4.5	17	7	0.02 U
Copper	50	270		12	27	17	0.01 U
Iron	--	--		12000	35000	17000	0.05 U
Lead	63	400		6.6	4.4	12	0.01 U
Magnesium	--	--		2400	9700	3400	0.03 J
Manganese	1600	2000		450	520	380	0.01 U
Mercury	0.18	0.81		0.08 U	0.07 U	0.08 U	0.0002 U
Nickel	30	310		9.4	23	15	0.025 U
Potassium	--	--		2500	11000	3200	2.5 U
Selenium	3.9	180		1.7 U	1.7 U	1.8 U	0.01 U
Silver	2	180		0.84 U	0.86 U	0.92 U	0.007 U
Sodium	--	--		140 J	140 J	180	2 U
Thallium	--	--		1.7 U	1.7 U	1.8 U	0.02 U
Vanadium	--	--		19	69	28	0.01 U
Zinc	109	10000		22	66	33	0.05 U

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U - Indicates that the compound was analyzed for but not detected

mg/kg - Milligrams per kilogram

ft bls - Feet below land surface

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Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standard

Blank results are in micrograms per liter

Table 4. Summary of Polychlorinated Biphenyls in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	EndPoint #1-14'	EndPoint #2-14'	EndPoint-DUP	EndPoint #3-14'
	Part 375 Unrestricted Use	Part 375 Restricted Residential		8/27/2012	8/28/2012	8/28/2012	8/29/2012
Aroclor-1016	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1221	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1232	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1242	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1248	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1254	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1260	--	--		85.9	19.7 U	19.2 U	18.7 U
Aroclor-1262	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Aroclor-1268	--	--		18.9 U	19.7 U	19.2 U	18.7 U
Total PCBs	100	1000		85.9	19.7 U	19.2 U	18.7 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

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PCBs - Polychlorinated Biphenyls

Table 4. Summary of Polychlorinated Biphenyls in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: EndPoint #4-14'	SB-1	SB-1	SB-2	SB-2DUP	SB-2	
	Part 375 Unrestricted Use	Part 375 Restricted Residential							
			Sample Date:	8/30/2012	4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014
			Sample Depth (ft bls):	-	0.5-2.5	5-7	0.5-2.5	0.5-2.5	5-5.5
Aroclor-1016	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1221	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1232	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1242	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1248	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1254	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1260	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1262	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Aroclor-1268	--	--	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	
Total PCBs	100	1000	19 U	35.8 U	39.3 U	38.5 U	39.2 U	38.4 U	

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

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Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standard

PCBs - Polychlorinated Biphenyls

Table 5. Summary of Pesticides in Soil, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SB-1	SB-1	SB-2	SB-2DUP	SB-2
	Part 375 Unrestricted Use	Part 375 Restricted Residential		4/7/2014	4/10/2014	4/7/2014	4/7/2014	4/10/2014
4,4'-DDD	3.3	13000		17 U	1.9 U	1.76 U	1.93 U	18.5 U
4,4'-DDE	3.3	8900		17 U	1.9 U	1.76 U	1.93 U	18.5 U
4,4'-DDT	3.3	7900		32 U	3.55 U	3.29 U	3.62 U	34.7 U
Aldrin	5	97		17 U	1.9 U	1.76 U	1.93 U	18.5 U
alpha-BHC	20	480		7.11 U	0.79 U	0.732 U	0.803 U	7.71 U
alpha-Chlordane	94	4200		21.3 U	2.37 U	2.2 U	2.41 U	23.1 U
beta-BHC	36	360		17 U	1.9 U	1.76 U	1.93 U	18.5 U
Chlordane	--	--		138 U	15.4 U	14.3 U	15.7 U	150 U
delta-BHC	40	100000		17 U	1.9 U	1.76 U	1.93 U	18.5 U
Dieldrin	5	200		10.7 U	1.18 U	1.1 U	1.2 U	11.6 U
Endosulfan I	2400	24000		17 U	1.9 U	1.76 U	1.93 U	18.5 U
Endosulfan II	2400	24000		17 U	1.9 U	1.76 U	1.93 U	18.5 U
Endosulfan sulfate	2400	24000		7.11 U	0.79 U	0.732 U	0.803 U	7.71 U
Endrin ketone	--	--		17 U	1.9 U	1.76 U	1.93 U	18.5 U
Endrin	14	11000		7.11 U	0.79 U	0.732 U	0.803 U	7.71 U
gamma-BHC (Lindane)	100	1300		7.11 U	0.79 U	0.732 U	0.803 U	7.71 U
gamma-Chlordane	--	--		21.3 U	2.37 U	2.2 U	2.41 U	23.1 U
Heptachlor epoxide	--	--		32 U	3.55 U	3.29 U	3.62 U	34.7 U
Heptachlor	42	2100		8.53 U	0.948 U	0.878 U	0.964 U	9.25 U
Methoxychlor	--	--		32 U	3.55 U	3.29 U	3.62 U	34.7 U
Toxaphene	--	--		320 U	35.5 U	32.9 U	36.2 U	347 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

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Shaded data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential Standards

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MW-1	MW-2	MW-3	MW-4	MW-4DUP	FIELD BLANK
		Sample Date:	4/10/2014	4/11/2014	4/10/2014	4/10/2014	4/10/2014	4/7/2014
1,1,1,2-Tetrachloroethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,1-Trichloroethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,2,2-Tetrachloroethane	5		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1		1.5 U	7.5 U	1.5 U	1.5 U	1.5 U	1.5 U
1,1-Dichloroethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1-Dichloroethene	5		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloropropene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichlorobenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichloropropane	0.04		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4,5-Tetramethylbenzene	5		2 U	5.6 J	2 U	0.78 J	2 U	2 U
1,2,4-Trichlorobenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4-Trimethylbenzene	5		2.5 U	120	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dibromoethane	--		2 U	10 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene	3		2.5 U	7.1 J	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dichloroethane	0.6		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	1		1 U	5 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	5		2.5 U	29	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichlorobenzene	3		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichloropropane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dichlorobenzene	3		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dioxane	--		250 U	1200 U	250 U	250 U	250 U	250 U
2,2-Dichloropropane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Butanone (MEK)	50		5 U	6.4 J	5 U	5 U	5 U	5 U
2-Hexanone	50		5 U	25 U	5 U	5 U	5 U	5 U
4-Ethyltoluene	--		2 U	60	2 U	2 U	2 U	2 U
4-Methyl-2-pentanone (MIBK)	--		5 U	25 U	5 U	5 U	5 U	5 U
Acetone	50		3.3 J	31	7.2	3.4 J	2.4 J	5 U
Acrylonitrile	5		5 U	25 U	5 U	5 U	5 U	5 U
BENZENE, 1,4-DIETHYL	-		2 U	12	2 U	2 U	2 U	2 U
Benzene	1		0.19 J	71	0.24 J	0.5 U	0.5 U	0.5 U
Bromobenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Bromochloromethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MW-1	MW-2	MW-3	MW-4	MW-4DUP	FIELD BLANK
		Sample Date:	4/10/2014	4/11/2014	4/10/2014	4/10/2014	4/10/2014	4/7/2014
Bromodichloromethane	50		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50		2 U	10 U	2 U	2 U	2 U	2 U
Bromomethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Carbon disulfide	60		5 U	25 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloroethane	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloroform	7		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloromethane	--		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
cis-1,3-Dichloropropene	5		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	50		0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloropropane	--		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Dibromomethane	5		5 U	25 U	5 U	5 U	5 U	5 U
Dichlorodifluoromethane	5		5 U	25 U	5 U	5 U	5 U	5 U
Diethyl Ether	--		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Ethylbenzene	5		2.5 U	91	2.5 U	2.5 U	2.5 U	2.5 U
Hexachlorobutadiene	0.5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Isopropylbenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
m+p-Xylene	5		2.5 U	360	2.5 U	2.5 U	2.5 U	2.5 U
Methylene chloride	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
MTBE	10		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Naphthalene	10		2 J	99	2.5 U	2.5 U	2.5 U	2.5 U
n-Butylbenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
n-Propylbenzene	5		2.5 U	8.9 J	2.5 U	2.5 U	2.5 U	2.5 U
o-Chlorotoluene	--		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
o-Xylene	5		2.5 U	240	2.5 U	2.5 U	2.5 U	2.5 U
p-Chlorotoluene	--		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
p-Isopropyltoluene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
sec-Butylbenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
Styrene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U
tert-Butylbenzene	5		2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: MW-1 MW-2 MW-3 MW-4 MW-4DUP FIELD BLANK						
		Sample Date: 4/10/2014 4/11/2014 4/10/2014 4/10/2014 4/10/2014 4/7/2014						
Tetrachloroethene	5	14	2.5 U	8.9	5.6	5.8	0.5 U	
Toluene	5	2.5 U	99	2.5 U	2.5 U	2.5 U	2.5 U	
trans-1,2-Dichloroethene	5	2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U	
trans-1,3-Dichloropropene	--	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	
trans-1,4-Dichloro-2-butene	--	2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U	
Trichloroethene	5	0.5	2.5 U	0.5 U	0.5 U	0.19 J	0.5 U	
Trichlorofluoromethane	5	2.5 U	12 U	2.5 U	2.5 U	2.5 U	2.5 U	
Vinyl acetate	--	5 U	25 U	5 U	5 U	5 U	5 U	
Vinyl chloride	2	1 U	5 U	1 U	1 U	1 U	1 U	

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014	TRIP BLANK 4/7/2014	TRIP BLANK 4/10/2014	TRIP BLANK 4/11/2014
1,1,1,2-Tetrachloroethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,1-Trichloroethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,2,2-Tetrachloroethane	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1		1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
1,1-Dichloroethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1-Dichloroethene	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloropropene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichlorobenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichloropropane	0.04		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4,5-Tetramethylbenzene	5		2 U	2 U	2 U	2 U	2 U
1,2,4-Trichlorobenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4-Trimethylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dibromoethane	--		2 U	2 U	2 U	2 U	2 U
1,2-Dichlorobenzene	3		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dichloroethane	0.6		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	1		1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichlorobenzene	3		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichloropropane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dichlorobenzene	3		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dioxane	--		250 U	250 U	250 U	250 U	250 U
2,2-Dichloropropane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Butanone (MEK)	50		5 U	5 U	5 U	5 U	5 U
2-Hexanone	50		5 U	5 U	5 U	5 U	5 U
4-Ethyltoluene	--		2 U	2 U	2 U	2 U	2 U
4-Methyl-2-pentanone (MIBK)	--		5 U	5 U	5 U	5 U	5 U
Acetone	50		5 U	1.1 J	5 U	5 U	13
Acrylonitrile	5		5 U	5 U	5 U	5 U	5 U
BENZENE, 1,4-DIETHYL	-		2 U	2 U	2 U	2 U	2 U
Benzene	1		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromobenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Bromochloromethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014	TRIP BLANK 4/7/2014	TRIP BLANK 4/10/2014	TRIP BLANK 4/11/2014
Bromodichloromethane	50		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50		2 U	2 U	2 U	2 U	2 U
Bromomethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloroethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloroform	7		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloromethane	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
cis-1,3-Dichloropropene	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	50		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloropropane	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Dibromomethane	5		5 U	5 U	5 U	5 U	5 U
Dichlorodifluoromethane	5		5 U	5 U	5 U	5 U	5 U
Diethyl Ether	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Ethylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Hexachlorobutadiene	0.5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Isopropylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
m+p-Xylene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Methylene chloride	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
MTBE	10		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Naphthalene	10		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
n-Butylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
n-Propylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
o-Chlorotoluene	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
o-Xylene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
p-Chlorotoluene	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
p-Isopropyltoluene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
sec-Butylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Styrene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
tert-Butylbenzene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U

Table 6. Summary of Volatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014	TRIP BLANK 4/7/2014	TRIP BLANK 4/10/2014	TRIP BLANK 4/11/2014
Tetrachloroethene	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
trans-1,2-Dichloroethene	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
trans-1,3-Dichloropropene	--		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,4-Dichloro-2-butene	--		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trichloroethene	5		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5		2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vinyl acetate	--		5 U	5 U	5 U	5 U	5 U
Vinyl chloride	2		1 U	1 U	1 U	1 U	1 U

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µg/L -Micrograms per liter

J - Estimated Value

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DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:						
		Sample Date:	MW-1 4/10/2014	MW-2 4/11/2014	MW-3 4/10/2014	MW-4 4/10/2014	MW-4DUP 4/10/2014	FIELD BLANK 4/7/2014
1,1'-Biphenyl	--		2 U	20 U	2 U	2 U	2 U	2 U
1,2,4,5-Tetrachlorobenzene	--		10 U	100 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	5		5 U	50 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	3		2 U	20 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene	3		2 U	20 U	2 U	2 U	2 U	2 U
1,4-Dichlorobenzene	3		2 U	20 U	2 U	2 U	2 U	2 U
2,2'-oxybis (1-chloropropane)	5		2 U	20 U	2 U	2 U	2 U	2 U
2,4,5-Trichlorophenol	--		5 U	50 U	5 U	5 U	5 U	5 U
2,4,6-Trichlorophenol	--		5 U	50 U	5 U	5 U	5 U	5 U
2,4-Dichlorophenol	5		5 U	50 U	5 U	5 U	5 U	5 U
2,4-Dimethylphenol	50		5 U	50 U	5 U	5 U	5 U	5 U
2,4-Dinitrophenol	10		20 U	200 U	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5		5 U	50 U	5 U	5 U	5 U	5 U
2,6-Dinitrotoluene	5		5 U	50 U	5 U	5 U	5 U	5 U
2-Chloronaphthalene	10		0.2 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chlorophenol	--		2 U	20 U	2 U	2 U	2 U	2 U
2-Methylnaphthalene	--		1.2	15	0.1 J	0.18 J	0.12 J	0.2 U
2-Methylphenol	--		5 U	50 U	5 U	5 U	5 U	5 U
2-Nitroaniline	5		5 U	50 U	5 U	5 U	5 U	5 U
2-Nitrophenol	--		10 U	100 U	10 U	10 U	10 U	10 U
3&4-Methylphenol	--		5 U	36 J	5 U	5 U	5 U	5 U
3,3'-Dichlorobenzidine	5		5 U	50 U	5 U	5 U	5 U	5 U
3-Nitroaniline	5		5 U	50 U	5 U	5 U	5 U	5 U
4,6-Dinitro-2-methylphenol	--		10 U	100 U	10 U	10 U	10 U	10 U
4-Bromophenyl phenyl ether	--		2 U	20 U	2 U	2 U	2 U	2 U
4-Chloro-3-methylphenol	--		2 U	20 U	2 U	2 U	2 U	2 U
4-Chloroaniline	5		5 U	50 U	5 U	5 U	5 U	5 U
4-Chlorophenyl phenyl ether	--		2 U	20 U	2 U	2 U	2 U	2 U
4-Nitroaniline	5		5 U	50 U	5 U	5 U	5 U	5 U
4-Nitrophenol	--		10 U	100 U	10 U	10 U	10 U	10 U
Acenaphthene	20		0.26	5.3	0.2 U	0.2 U	0.07 J	0.2 U
Acenaphthylene	20		0.2 U	1.2	0.2 U	0.2 U	0.2 U	0.2 U

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:						FIELD BLANK 4/7/2014
		MW-1 Sample Date: 4/10/2014	MW-2 4/11/2014	MW-3 4/10/2014	MW-4 4/10/2014	MW-4DUP 4/10/2014		
Acetophenone	--	5 U	50 U	5 U	5 U	5 U	5 U	
Anthracene	50	0.11 J	3.7	0.2 U	0.1 J	0.08 J	0.2 U	
Benzo[a]anthracene	0.002	0.09 J	3.5	0.2 U	0.2 U	0.2 U	0.2 U	
Benzo[a]pyrene	0	0.14 J	2.9	0.2 U	0.1 J	0.1 J	0.2 U	
Benzo[b]fluoranthene	0.002	0.11 J	3.8	0.2 U	0.07 J	0.2 U	0.2 U	
Benzo[g,h,i]perylene	--	0.15 J	2.1	0.2 U	0.13 J	0.11 J	0.2 U	
Benzo[k]fluoranthene	0.002	0.2 U	1.2	0.2 U	0.2 U	0.2 U	0.2 U	
Benzoic Acid	--	50 U	500 U	50 U	50 U	50 U	50 U	
Benzyl Alcohol	--	2 U	20 U	2 U	2 U	2 U	2 U	
Bis(2-chloroethoxy)methane	5	5 U	50 U	5 U	5 U	5 U	5 U	
Bis(2-chloroethyl) ether	--	2 U	20 U	2 U	2 U	2 U	2 U	
Bis(2-ethylhexyl) phthalate	5	3 U	30 U	3 U	3 U	3 U	3 U	
Butylbenzyl phthalate	50	5 U	50 U	5 U	5 U	5 U	5 U	
Carbazole	--	2 U	12 J	2 U	2 U	2 U	2 U	
Chrysene	0.002	0.09 J	3.2	0.2 U	0.2 U	0.2 U	0.2 U	
Dibenzo[a,h]anthracene	--	0.11 J	1 U	0.2 U	0.2 U	0.1 J	0.2 U	
Dibenzofuran	--	2 U	20 U	2 U	2 U	2 U	2 U	
Diethyl phthalate	50	5 U	50 U	5 U	5 U	5 U	5 U	
Dimethyl phthalate	50	5 U	50 U	5 U	5 U	5 U	5 U	
Di-n-butyl phthalate	50	5 U	50 U	5 U	5 U	5 U	5 U	
Di-n-octyl phthalate	--	5 U	50 U	5 U	5 U	5 U	5 U	
Fluoranthene	50	0.15 J	7.6	0.2 U	0.11 J	0.18 J	0.2 U	
Fluorene	50	0.28	5.5	0.2 U	0.2 U	0.2 U	0.2 U	
Hexachlorobenzene	0.04	0.8 U	4 U	0.8 U	0.8 U	0.8 U	0.8 U	
Hexachlorobutadiene	0.5	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	
Hexachlorocyclopentadiene	5	20 U	200 U	20 U	20 U	20 U	20 U	
Hexachloroethane	5	0.8 U	4 U	0.8 U	0.8 U	0.8 U	0.8 U	
Indeno[1,2,3-cd]pyrene	0.002	0.17 J	1.7	0.2 U	0.16 J	0.14 J	0.2 U	
Isophorone	50	5 U	50 U	5 U	5 U	5 U	5 U	
Naphthalene	10	0.87	70	0.23	0.36	0.19 J	0.2 U	
Nitrobenzene	0.4	2 U	20 U	2 U	2 U	2 U	2 U	
n-Nitrosodi-n-propylamine	--	5 U	50 U	5 U	5 U	5 U	5 U	

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: MW-1 MW-2 MW-3 MW-4 MW-4DUP FIELD BLANK						
		Sample Date: 4/10/2014 4/11/2014 4/10/2014 4/10/2014 4/10/2014 4/7/2014						
n-Nitrosodiphenylamine	50	2 U	20 U	2 U	2 U	2 U	2 U	
Pentachlorophenol	1	0.8 U	4 U	0.8 U	0.8 U	0.8 U	0.8 U	
Phenanthrene	50	0.49	16	0.2 U	0.09 J	0.37	0.2 U	
Phenol	1	5 U	52	5 U	5 U	5 U	5 U	
Pyrene	50	0.19 J	7.4	0.2 U	0.12 J	0.15 J	0.2 U	

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µg/L -Micrograms per liter

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-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014
1,1'-Biphenyl	--		2 U	2 U
1,2,4,5-Tetrachlorobenzene	--		10 U	10 U
1,2,4-Trichlorobenzene	5		5 U	5 U
1,2-Dichlorobenzene	3		2 U	2 U
1,3-Dichlorobenzene	3		2 U	2 U
1,4-Dichlorobenzene	3		2 U	2 U
2,2'-oxybis (1-chloropropane)	5		2 U	2 U
2,4,5-Trichlorophenol	--		5 U	5 U
2,4,6-Trichlorophenol	--		5 U	5 U
2,4-Dichlorophenol	5		5 U	5 U
2,4-Dimethylphenol	50		5 U	5 U
2,4-Dinitrophenol	10		20 U	20 U
2,4-Dinitrotoluene	5		5 U	5 U
2,6-Dinitrotoluene	5		5 U	5 U
2-Chloronaphthalene	10		0.2 U	0.2 U
2-Chlorophenol	--		2 U	2 U
2-Methylnaphthalene	--		0.2 U	0.2 U
2-Methylphenol	--		5 U	5 U
2-Nitroaniline	5		5 U	5 U
2-Nitrophenol	--		10 U	10 U
3&4-Methylphenol	--		5 U	5 U
3,3'-Dichlorobenzidine	5		5 U	5 U
3-Nitroaniline	5		5 U	5 U
4,6-Dinitro-2-methylphenol	--		10 U	10 U
4-Bromophenyl phenyl ether	--		2 U	2 U
4-Chloro-3-methylphenol	--		2 U	2 U
4-Chloroaniline	5		5 U	5 U
4-Chlorophenyl phenyl ether	--		2 U	2 U
4-Nitroaniline	5		5 U	5 U
4-Nitrophenol	--		10 U	10 U
Acenaphthene	20		0.2 U	0.2 U
Acenaphthylene	20		0.2 U	0.2 U

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014
Acetophenone	--		5 U	5 U
Anthracene	50		0.2 U	0.2 U
Benzo[a]anthracene	0.002		0.2 U	0.2 U
Benzo[a]pyrene	0		0.2 U	0.2 U
Benzo[b]fluoranthene	0.002		0.2 U	0.2 U
Benzo[g,h,i]perylene	--		0.2 U	0.2 U
Benzo[k]fluoranthene	0.002		0.2 U	0.2 U
Benzoic Acid	--		50 U	50 U
Benzyl Alcohol	--		2 U	2 U
Bis(2-chloroethoxy)methane	5		5 U	5 U
Bis(2-chloroethyl) ether	--		2 U	2 U
Bis(2-ethylhexyl) phthalate	5		3 U	3 U
Butylbenzyl phthalate	50		5 U	5 U
Carbazole	--		2 U	2 U
Chrysene	0.002		0.2 U	0.2 U
Dibenzo[a,h]anthracene	--		0.2 U	0.2 U
Dibenzofuran	--		2 U	2 U
Diethyl phthalate	50		5 U	5 U
Dimethyl phthalate	50		5 U	5 U
Di-n-butyl phthalate	50		5 U	5 U
Di-n-octyl phthalate	--		5 U	5 U
Fluoranthene	50		0.2 U	0.2 U
Fluorene	50		0.2 U	0.2 U
Hexachlorobenzene	0.04		0.8 U	0.8 U
Hexachlorobutadiene	0.5		0.5 U	0.5 U
Hexachlorocyclopentadiene	5		20 U	20 U
Hexachloroethane	5		0.8 U	0.8 U
Indeno[1,2,3-cd]pyrene	0.002		0.2 U	0.2 U
Isophorone	50		5 U	5 U
Naphthalene	10		0.2 U	0.2 U
Nitrobenzene	0.4		2 U	2 U
n-Nitrosodi-n-propylamine	--		5 U	5 U

Table 7. Summary of Semivolatile Organic Compounds in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	FIELD BLANK	FIELD BLANK
		Sample Date:	4/10/2014	4/11/2014
n-Nitrosodiphenylamine	50		2 U	2 U
Pentachlorophenol	1		0.8 U	0.8 U
Phenanthrene	50		0.2 U	0.2 U
Phenol	1		5 U	5 U
Pyrene	50		0.2 U	0.2 U

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µg/L -Micrograms per liter

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-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 8. Summary of Metals in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4
			4/10/2014 Dissolved	4/10/2014	4/11/2014 Dissolved	4/11/2014	4/10/2014 Dissolved	4/10/2014	4/10/2014 Dissolved	4/10/2014
Aluminum	--		112	293	48	1170	12.8	313	19.9 J	713
Antimony	3		1.44 J	0.92 J	3.69	4.5	0.65 J	0.3 J	0.99 J	0.73 J
Arsenic	25		1.07	1.29	2.41	7.09	0.5 U	0.64	1 U	1.6
Barium	1000		17.75	18.63	64.4	54.45	60.77	63.64	44.42	71.3
Beryllium	3		0.5 U	0.5 U	1 U	0.11 J	0.5 U	0.5 U	1 U	1 U
Cadmium	5		0.17 J	0.15 J	0.4 U	0.36	0.06 J	0.06 J	0.06 J	0.2 J
Calcium	--		221000	231000	382000	439000	134000	138000	367000	381000
Chromium	50		1.37	2.59	17.5	30.78	7.91	8.09	3.99	5.5
Cobalt	--		9.84	9.72	6.51	8.77	3.07	3.51	8.76	11.34
Copper	200		4.44	4.46	33.66	65.33	2.36	1.88	8.01	11.15
Iron	300		1240	1540	1000 U	2190	1000 U	1000 U	1000 U	751 J
Lead	25		0.35 J	2.88	17.36	878.8	1 U	1.46	0.29 J	4.96
Magnesium	--		69300	71600	30900	35000	19900	20600	131000	134000
Manganese	300		248.8	247.2	397	544.4	244.5	275.1	318.4	422.8
Mercury	0.7		0.2 U	0.2 U	0.2 U	2.64	0.2 U	0.2 U	0.07 J	0.2 U
Nickel	100		18.2	18.91	13.37	11.67	7.02	5.4	24.18	27.44
Potassium	--		64600	68700	23100	28400	12500	12500	116000	124000
Selenium	10		5.93	6.3	14.6	14.6	21.8	24	17.2	20.9
Silver	50		0.4 U	0.4 U	0.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.8 U
Sodium	20000		122000	127000	217000	224000	78500	80300	233000	237000
Thallium	0.5		0.07 J	0.07 J	1 U	0.06 J	0.04 J	0.04 J	0.03 J	0.06 J
Vanadium	--		2.74 J	3.03 J	1.57 J	2.17 J	0.62 J	1.49 J	1.27 J	4.11 J
Zinc	2000		46.49	45.94	26.22 J	359.2	19.32	17.79	29.62	38.76

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 8. Summary of Metals in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	MW-4DUP 4/10/2014 Dissolved	MW-4DUP 4/10/2014	FIELD BLANK 4/7/2014	FIELD BLANK 4/10/2014	FIELD BLANK 4/11/2014
Aluminum	--		21.8	359	10 U	10 U	2.24 J
Antimony	3		0.78 J	1.18 J	0.12 J	1 U	0.41 J
Arsenic	25		1.51	1.29	0.5 U	0.5 U	0.5 U
Barium	1000		43.63	59.8	0.5 U	0.19 J	0.5 U
Beryllium	3		1 U	1 U	0.5 U	0.5 U	0.5 U
Cadmium	5		0.07 J	0.21 J	0.2 U	0.2 U	0.2 U
Calcium	--		361000	383000	100 U	100 U	100 U
Chromium	50		4.59	4.59	0.28 J	0.78 J	1 U
Cobalt	--		9.66	10.78	0.5 U	0.5 U	0.2 U
Copper	200		8.29	10.32	0.12 J	1 U	0.51 J
Iron	300		1000 U	1000 U	50 U	50 U	50 U
Lead	25		5 U	2.23	1 U	1 U	1 U
Magnesium	--		131000	134000	70 U	70 U	70 U
Manganese	300		349	387.6	1 U	0.15 J	0.5 U
Mercury	0.7		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100		24.04	26.16	0.5 U	0.5 U	0.5 U
Potassium	--		116000	124000	100 U	100 U	100 U
Selenium	10		19.8	19.9	5 U	5 U	5 U
Silver	50		0.4 U	0.8 U	0.4 U	0.4 U	0.4 U
Sodium	20000		229000	239000	100 U	175	30.2 J
Thallium	0.5		2.5 U	0.06 J	0.5 U	0.5 U	0.5 U
Vanadium	--		1.38 J	2.01 J	5 U	5 U	5 U
Zinc	2000		31.94	36.42	10.53	15.94	15.17

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 9. Summary of Polychlorinated Biphenyls in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC	Sample Designation:	MW-1	MW-2	MW-3	MW-4	MW-4DUP	FIELD BLANK	FIELD BLANK	FIELD BLANK
	AWQSGVs (µg/L)	Sample Date:	4/10/2014	4/11/2014	4/10/2014	4/10/2014	4/10/2014	4/7/2014	4/10/2014	4/11/2014
Aroclor-1016	--		0.083 U	0.083 U	0.083 U					
Aroclor-1221	--		0.083 U	0.083 U	0.083 U					
Aroclor-1232	--		0.083 U	0.083 U	0.083 U					
Aroclor-1242	--		0.083 U	0.083 U	0.083 U					
Aroclor-1248	--		0.083 U	0.083 U	0.083 U					
Aroclor-1254	--		0.083 U	0.083 U	0.083 U					
Aroclor-1260	--		0.083 U	0.083 U	0.083 U					
Aroclor-1262	--		0.083 U	0.083 U	0.083 U					
Aroclor-1268	--		0.083 U	0.083 U	0.083 U					
Total PCBs	0.09		0.083 U	0.083 U	0.083 U					

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 10. Summary of Pesticides in Groundwater, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC	Sample Designation:	MW-1	MW-2	MW-3	MW-4	MW-4 DUP	FIELD BLANK	FIELD BLANK	FIELD BLANK
	AWQSGVs (µg/L)	Sample Date:	4/10/2014	4/11/2014	4/10/2014	4/10/2014	4/10/2014	4/7/2014	4/10/2014	4/11/2014
4,4'-DDD	0.3		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDE	0.2		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDT	0.2		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin	0		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
alpha-BHC	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
alpha-Chlordane	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
beta-BHC	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chlordane	0.05		0.2 U	2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
delta-BHC	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dieldrin	0.004		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endosulfan I	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endosulfan II	--		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	--		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endrin ketone	--		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endrin	0		0.04 U	0.4 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
gamma-BHC (Lindane)	--		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
gamma-Chlordane	0		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor epoxide	0.03		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor	0.04		0.02 U	0.2 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Methoxychlor	35		0.2 U	2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Toxaphene	0.06		0.2 U	2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

DUP - Duplicate

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

Table 11. Summary of Volatile Organic Compounds in Soil Vapor, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter	Sample Designation:	AA-1	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	SV-8
(Concentrations in ug/m ³)	Sample Date:	8/29/2012	8/29/2012	8/29/2012	8/29/2012	8/29/2012	4/11/2014	4/11/2014	4/11/2014	8/1/2014
1,1,1-Trichloroethane		0.067 U	2.2 U	2 U	74 D	21 D	28.5 U	3.64 U	1.09 U	250 U
1,1,2,2-Tetrachloroethane		0.11 U	3.7 U	3.3 U	3.6 U	3.6 U	35.9 U	4.58 U	1.37 U	315 U
1,1,2-Trichloroethane		0.092 U	3 U	2.8 U	3 U	3 U	28.5 U	3.64 U	1.09 U	250 U
1,1-Dichloroethane		0.033 U	1.1 U	0.98 U	1.1 U	1.1 U	21.2 U	2.7 U	0.809 U	185 U
1,1-Dichloroethene		0.04 U	1.3 U	1.2 U	26 D	1.3 U	20.7 U	2.64 U	0.793 U	3120
1,2,4-Trichlorobenzene		0.11 U	3.6 U	3.3 U	3.6 U	3.5 U	38.8 U	4.95 U	1.48 U	340 U
1,2,4-Trimethylbenzene		1.6 J,D	1.3 U	1.2 U	1.3 U	14 J,D	25.7 U	3.28 U	4.72	225 U
1,2-Dibromoethane		0.52 U	17 U	16 U	17 U	17 U	40.2 U	5.13 U	1.54 U	352 U
1,2-Dichlorobenzene		0.1 U	3.3 U	3 U	3.3 U	3.3 U	31.4 U	4.01 U	1.2 U	275 U
1,2-Dichloroethane		0.066 U	2.2 U	2 U	2.1 U	2.1 U	21.2 U	2.7 U	0.809 U	185 U
1,2-Dichloropropane		0.069 U	2.3 U	2.1 U	2.2 U	2.2 U	24.2 U	3.08 U	0.924 U	212 U
1,3,5-Trimethylbenzene		0.37 J,D	1.4 U	1.3 U	1.4 U	1.4 U	25.7 U	3.28 U	1.82	225 U
1,3-Butadiene		0.044 U	1.4 U	1.3 U	1.4 U	1.4 U	11.6 U	1.48 U	0.442 U	101 U
1,3-Dichlorobenzene		0.073 U	2.4 U	2.2 U	2.4 U	2.3 U	31.4 U	4.01 U	1.2 U	275 U
1,4-Dichlorobenzene		0.09 U	2.9 U	2.7 U	2.9 U	2.9 U	31.4 U	4.01 U	1.2 U	275 U
1,4-Dioxane		0.22 U	7.2 U	6.6 U	7.2 U	7 U	18.8 U	2.4 U	0.721 U	165 U
2-Butanone (MEK)		2.8 D	2.6 U	2.4 U	2.6 U	2.6 U	4390	23.7	54.3	135 U
2-Hexanone		0.15 U	5 U	4.6 U	5 U	4.9 U	355	2.73 U	6.56	188 U
3-Chloropropene		NA	NA	NA	NA	NA	16.4 U	2.09 U	0.626 U	143 U
4-Ethyltoluene		0.93 J,D	2 U	1.8 U	2 U	1.9 U	25.7 U	3.28 U	1.31	225 U
4-Methyl-2-pentanone (MIBK)		0.1 U	3.3 U	3 U	3.3 U	3.2 U	21.4 U	2.73 U	1.42	188 U
Acetone		250 D	7.4 D	1.5 U	30 D	150 D	1030	57.2	48.7	615
Benzene		0.43 D	1.1 U	0.97 U	16 D	1 U	16.7 U	16.2	28.7	146 U
Benzyl chloride		0.042 U	1.4 U	1.3 U	1.4 U	1.3 U	27.1 U	3.45 U	1.04 U	237 U
Bromodichloromethane		0.1 U	3.3 U	3 U	3.3 U	3.2 U	35 U	4.47 U	1.34 U	307 U
Bromoethene		NA	NA	NA	NA	NA	22.9 U	2.92 U	0.874 U	200 U
Bromoform		0.13 U	4.1 U	3.8 U	4.1 U	4 U	54.1 U	6.9 U	2.07 U	474 U
Bromomethane		0.032 U	1 U	0.94 U	1 U	1 U	20.3 U	2.59 U	0.777 U	178 U
Carbon disulfide		2.6 D	0.83 U	0.76 U	24 D	0.81 U	63.5	445	55.7	143 U
Carbon tetrachloride		0.051 U	1.7 U	1.5 U	1.7 U	1.6 U	32.9 U	4.2 U	1.26 U	288 U
Chlorobenzene		0.056 U	1.8 U	1.7 U	1.8 U	1.8 U	24.1 U	3.07 U	0.921 U	211 U
Chloroethane		0.021 U	0.71 U	0.64 U	0.7 U	0.69 U	13.8 U	1.76 U	0.528 U	121 U

Table 11. Summary of Volatile Organic Compounds in Soil Vapor, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in ug/m ³)	Sample Designation:	AA-1	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	SV-8
	Sample Date:	8/29/2012	8/29/2012	8/29/2012	8/29/2012	8/29/2012	4/11/2014	4/11/2014	4/11/2014	8/1/2014
Chloroform		0.05 U	1.6 U	1.5 U	29 D	1.6 U	25.5 U	3.26 U	3.85	224 U
Chloromethane		0.85 D	1.4 U	1.3 U	1.4 U	1.3 U	10.8 U	1.38 U	0.413 U	94.6 U
cis-1,2-Dichloroethene		0.97 D	1.5 U	120 D	1100 D	300 D	20.7 U	2.64 U	0.793 U	76100
cis-1,3-Dichloropropene		0.077 U	2.5 U	2.3 U	2.5 U	2.5 U	23.7 U	3.03 U	0.908 U	208 U
Cyclohexane		0.028 U	0.92 U	0.84 U	11 D	0.89 U	122	10.4	1.18	158 U
Dibromochloromethane		0.54 U	18 U	16 U	18 U	17 U	44.6 U	5.68 U	1.7 U	390 U
Dichlorodifluoromethane		1.6 D	2.8 U	2.5 U	2.7 U	2.7 U	25.9 U	3.3 U	2.91	226 U
Ethanol		NA	NA	NA	NA	NA	277	15.7 U	9.16	1080 U
Ethyl Acetate		4.8 D	2 U	1.8 U	2 U	1.9 U	47.2 U	6.02 U	1.8 U	414 U
Ethylbenzene		0.59 D	1.7 U	1.6 U	1.7 U	1.7 U	22.7 U	4.65	4.3	199 U
Freon 113		3.5 D	1.2 U	1.1 U	1.2 U	1.2 U	40.1 U	5.11 U	1.53 U	351 U
Freon 114		0.081 U	2.6 U	2.4 U	2.6 U	2.6 U	36.6 U	4.66 U	1.4 U	320 U
Heptane		NA	NA	NA	NA	NA	NA	NA	NA	188 U
Hexachlorobutadiene		0.13 U	4.3 U	3.9 U	4.2 U	4.2 U	55.8 U	7.11 U	2.13 U	489 U
Isooctane		NA	NA	NA	NA	NA	29.3	56.5	0.934 U	214 U
Isopropanol		0.058 U	1.9 U	1.7 U	1.9 U	540 D	32.2 U	5.01	11.3	283 U
m+p-Xylene		2.2 D	3.3 U	3 U	3.3 U	3.2 U	45.6 U	13.9	12.4	398 U
Methyl Methacrylate		0.28 U	9.1 U	8.3 U	9 U	8.8 U	NA	NA	NA	NA
Methylene chloride		20 B,D	14 B,D	1.7 U	1.8 U	1.8 U	91 U	16.5	17.6	400 U
MTBE		0.029 U	0.96 U	0.88 U	0.95 U	0.93 U	18.9 U	2.4 U	0.721 U	165 U
Heptane		0.47 D	1.1 U	1 U	1.1 U	1.1 U	26.4	50	2.73	NA
n-Hexane		110 D	0.94 U	0.86 U	0.93 U	0.91 U	56.7	45.8	1.99	161 U
o-Xylene		0.77 D	1.7 U	1.6 U	1.7 U	1.7 U	22.7 U	4.86	5.3	199 U
Propene		0.054 U	1.8 U	1.6 U	1.7 U	1.7 U	NA	NA	NA	NA
Styrene		0.052 U	1.7 U	1.6 U	1.7 U	1.7 U	22.3 U	2.84 U	0.869	195 U
t-Butyl Alcohol		NA	NA	NA	NA	NA	39.7 U	5.06 U	1.52 U	349 U
Tetrachloroethene		30 D	2900 D	4500 D	94000 D	3400 D	161	608	59.7	35600
Tetrahydrofuran		0.05 U	1.6 U	1.5 U	1.6 U	1.6 U	15.4 U	1.97 U	0.59 U	135 U
Toluene		5.1 D	14 D	120 D	220 D	9.8 D	185	77.3	32.1	173 U
trans-1,2-Dichloroethene		0.032 U	1.1 U	0.96 U	60 D	1 U	20.7 U	2.64 U	0.793 U	591
trans-1,3-Dichloropropene		0.055 U	1.8 U	1.7 U	1.8 U	1.8 U	23.7 U	3.03 U	0.908 U	208 U
Trichloroethene		3 D	1.4 U	87 D	1700 D	130 D	28.1 U	4.33	1.07 U	12500

Table 11. Summary of Volatile Organic Compounds in Soil Vapor, 509 West 38th Street/512 West 39th Street, New York, New York

Parameter (Concentrations in ug/m ³)	Sample Designation:	AA-1	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	SV-8
	Sample Date:	8/29/2012	8/29/2012	8/29/2012	8/29/2012	8/29/2012	4/11/2014	4/11/2014	4/11/2014	8/1/2014
Trichlorofluoromethane	10 D	0.75 U	0.68 U	0.74 U	0.73 U	29.4 U	3.75 U	1.69	257 U	
Vinyl acetate	0.036 U	1.2 U	1.1 U	1.2 U	1.1 U	NA	NA	NA	NA	
Vinyl chloride	0.042 U	1.4 U	1.2 U	1.4 U	1.3 U	13.4 U	1.71 U	0.511 U	117 U	

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

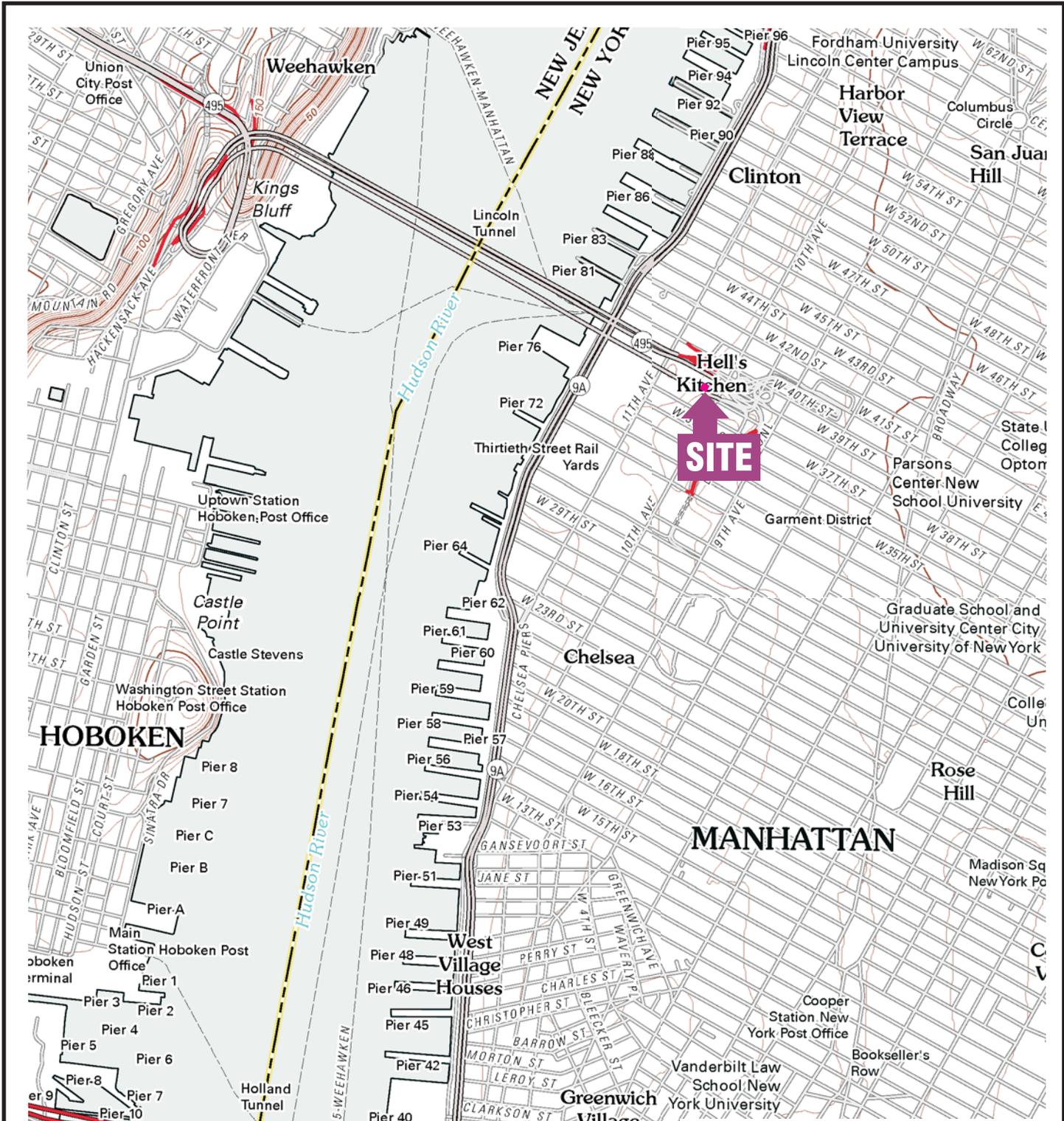
D - result is from an analysis that required a dilution

B - analyte found in the analysis batch blank

ug/m³ - Micrograms per cubic meter

Bold data indicates that parameter was detected

- 1 Site Location Map
- 2 Site Plan
- 3 Redevelopment Plan
- 4 Surrounding Land Use and Sensitive Receptors
- 5 Map of End-Point Sample Locations
- 6 Site Excavation Diagrams
- 7 Site-Wide Cover System Plan and Cover Details
- 8 Vapor Barrier/Waterproofing Membrane Diagrams (See Figure 7)
- 9 Sub-Slab Depressurization System



QUADRANGLE LOCATION



SOURCE:
 USGS; Brooklyn, NY (2010),
 Central Park, NY-NJ (2011),
 Weehawken, NJ-NY (2011),
 and Jersey City, NJ-NY (2011)
 7.5 Minute Topographic Quadrangles



Title:

SITE LOCATION MAP

509 WEST 38TH STREET/512 WEST 39TH STREET
 NEW YORK, NEW YORK

Prepared for:

HY 38 OWNER, LLC

ROUX
 ROUX ASSOCIATES, INC.
 Environmental Consulting
 & Management

Compiled by: W.S.	Date: 10SEP14
Prepared by: J.A.D.	Scale: AS SHOWN
Project Mgr.: W.S.	Project No.: 2414.0001Y000
File: 2414.0001Y107.01.CDR	

FIGURE

1



11TH AVENUE

10TH AVENUE

WEST 39TH STREET

WEST 38TH STREET

SITE

LOT 22

AUTO PARTS/BODY SHOP

DHL BUILDING

LOT 42



Title:

SITE PLAN AND SURROUNDING PROPERTIES

509 WEST 38TH STREET/512 WEST 39TH STREET
NEW YORK, NEW YORK

Prepared for:

HY 38 OWNER, LLC

 ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.S.	Date: 10SEP14	FIGURE 2
	Prepared by: J.A.D.	Scale: AS SHOWN	
	Project Mgr.: W.S.	Project No.: 2414.0001Y000	
	File: 2414.0001Y107.02.CDR		

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Redevelopment Plan

No.	Date	Issue
1	05/17/2014	SCHEMATIC DESIGN
2	05/06/2014	PROGRESS ISSUANCE

- NOTES:**
- BRICK:**
 - BRICK TYPE 1: GRAY BRICK, GLAZED BRICK, GREEN CUSTOM GLAZE ON TUMBLER BRICK (ALTERNATE OHIO PRODUCT CONTACT BILL MERRITT)
 - BRICK TYPE 2: ENDICOTT MANGANESE IRONSPOT SMOOTH
 - BRICK TYPE 3: ENDICOTT MANGANESE IRONSPOT, DANISH HAND MOULD MODULAR
 - STONE:**
 - STONE TYPE 1: SET ASBT
 - WINDOWS:**
 - WINDOW TYPE 1: STOREFRONT WINDOW FLOORS 1 TO 3
 - WINDOW TYPE 2: FLOORS 4 TO 6
 - WINDOW TYPE 3: PIONEER WINDOWS 3004H FIXED WINDOWS, WITH HORIZONTAL AND VERTICAL FINS PER DETAILS
 - WINDOW TYPE 4: PIONEER WINDOWS 3004H WITH OPERABLE CASIMENTS AND WITH HORIZONTAL AND VERTICAL FINS PER DETAILS
 - WINDOW TYPE 5: 2 HOUR FIRE RATED CURTAINWALL SYSTEM AT LOUVER
 - WINDOW TYPE 6: WINDOW TYPE 4A-NON RATED GLAZING
 - EBECAST:**
 - PC-1 PRECAST WINDOW SILL
 - PC-2 PRECAST COPING
 - LOUVERS:**
 - LOUVER TYPE 1: MECHANICAL LOUVER IN FINISHED MASONRY OPENING
 - LOUVER TYPE 2: LOUVER SCREEN WALL

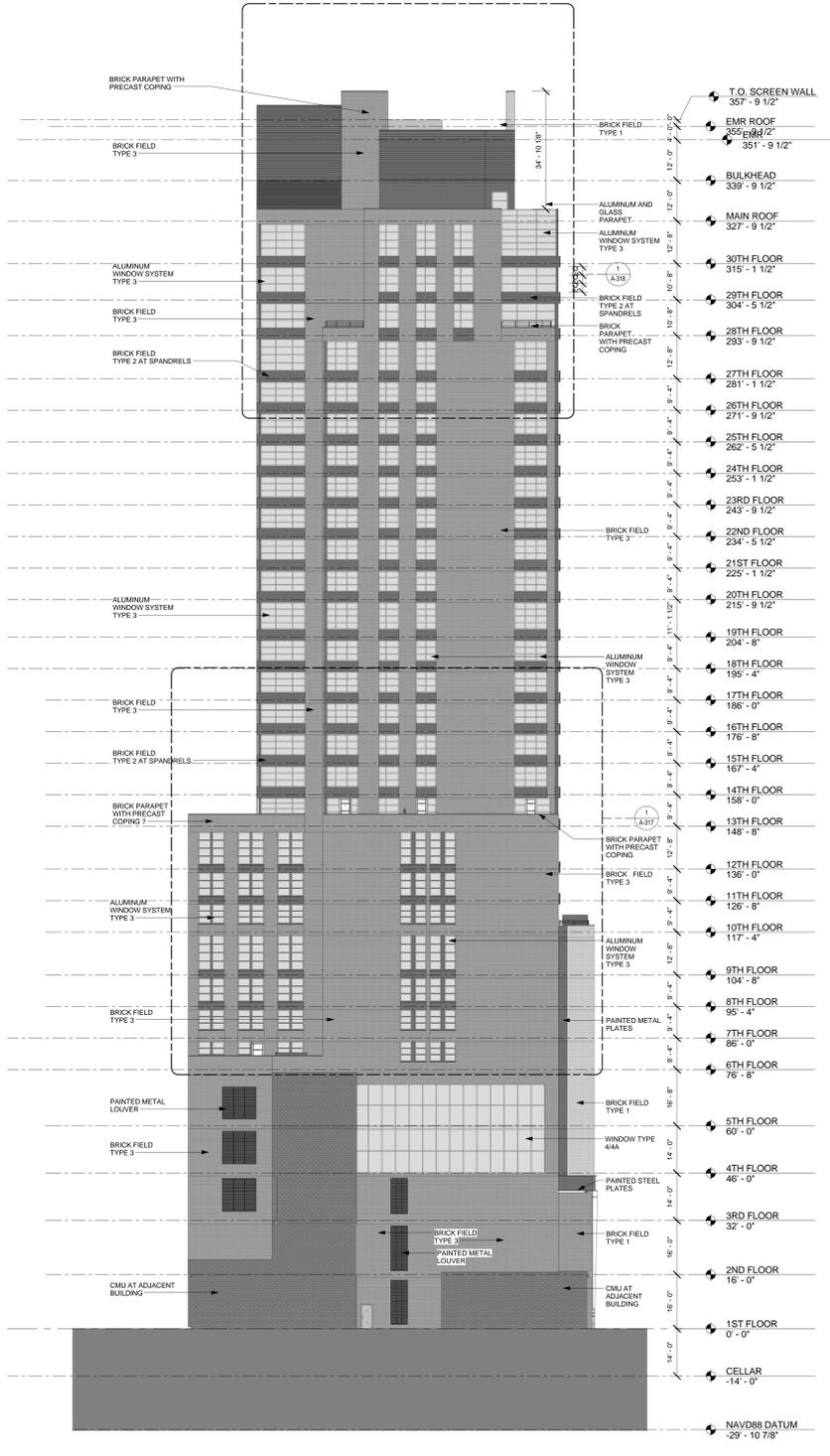
CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
745 5TH AVENUE, 33RD FLOOR
NEW YORK, NY 10151

PROJECT
509 W 38TH STREET
509 WEST 38TH STREET
NEW YORK, NY 10018

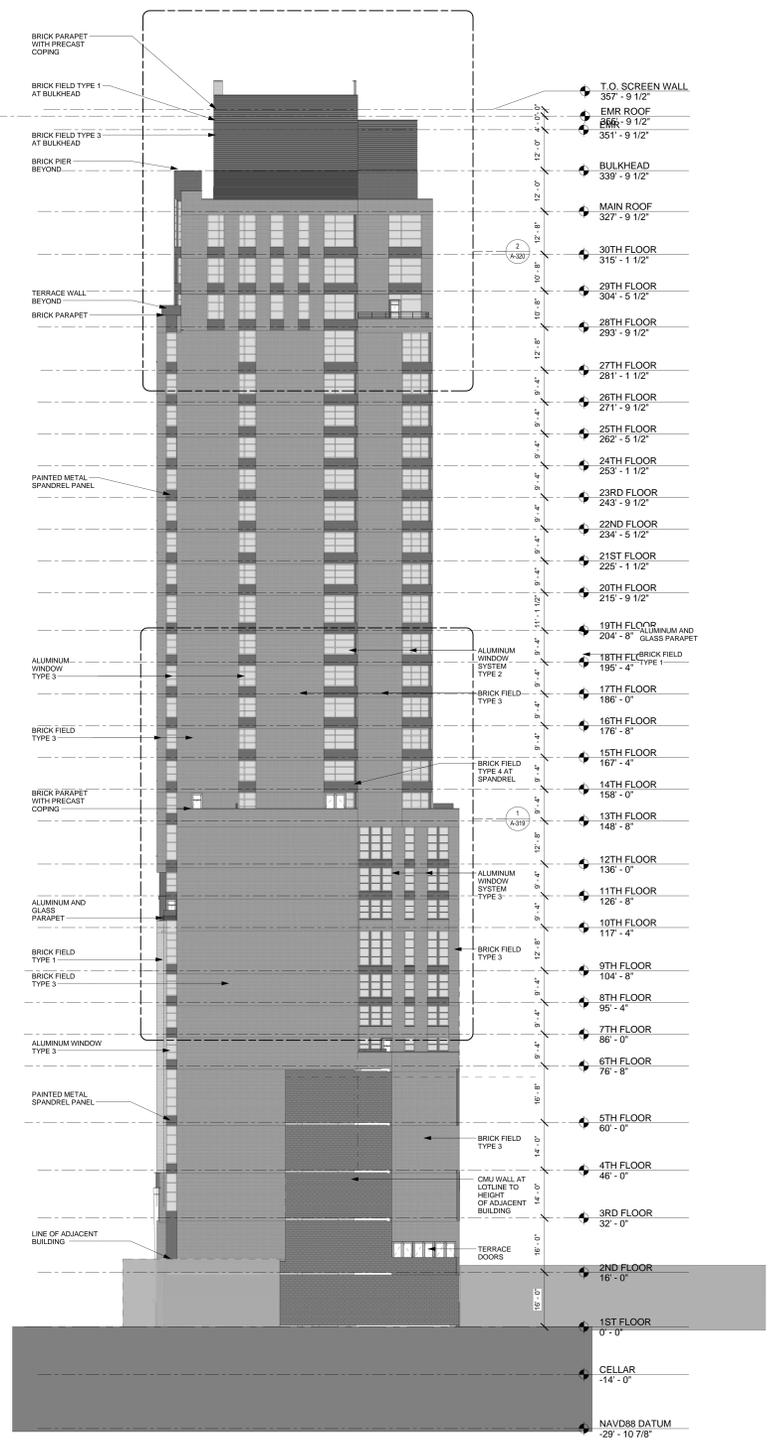
NORTH AND EAST ELEVATION

SCALE: AS NOTED
DATE: 05/06/14
PROJECT No: 1127

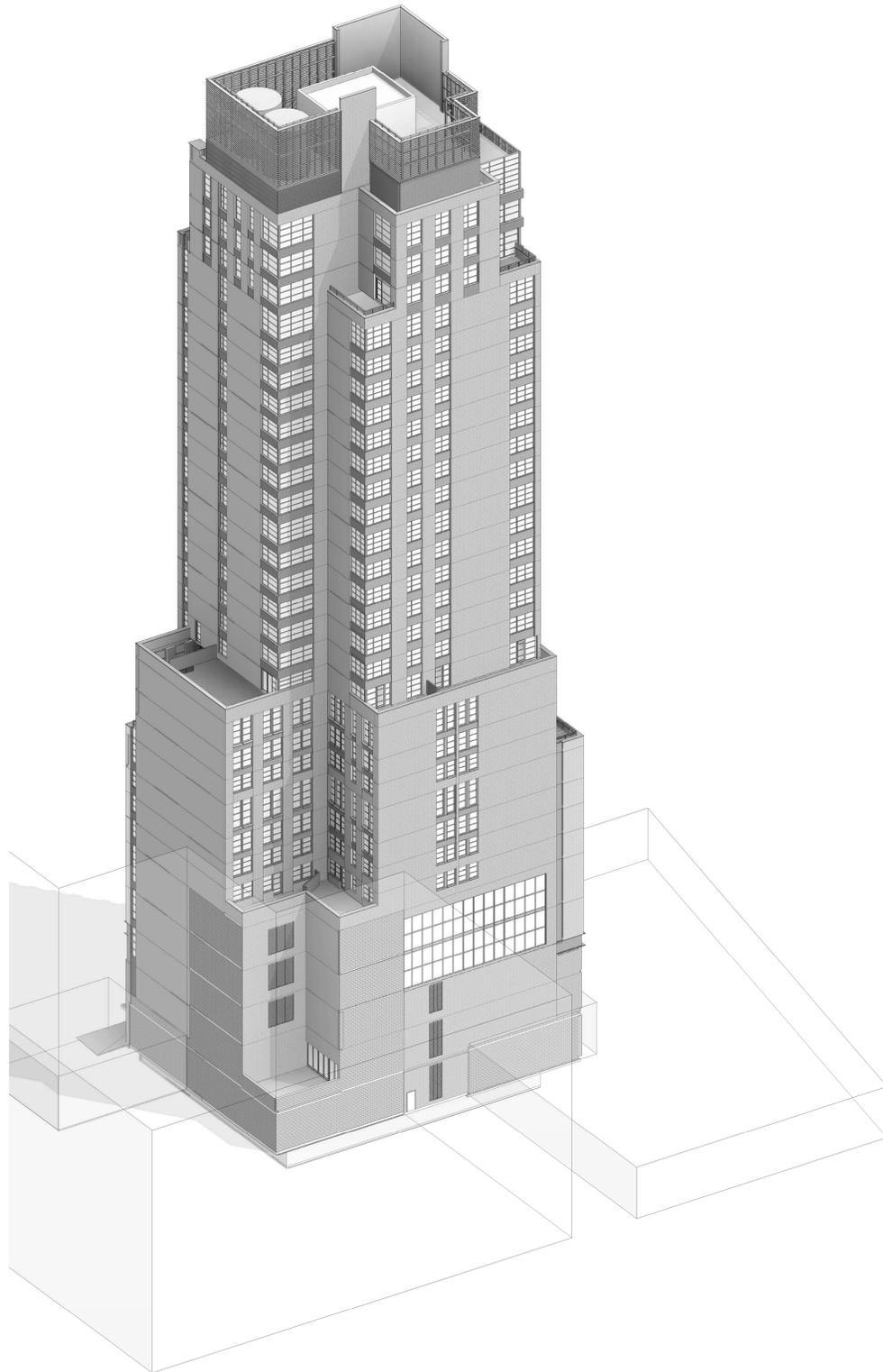
A-302



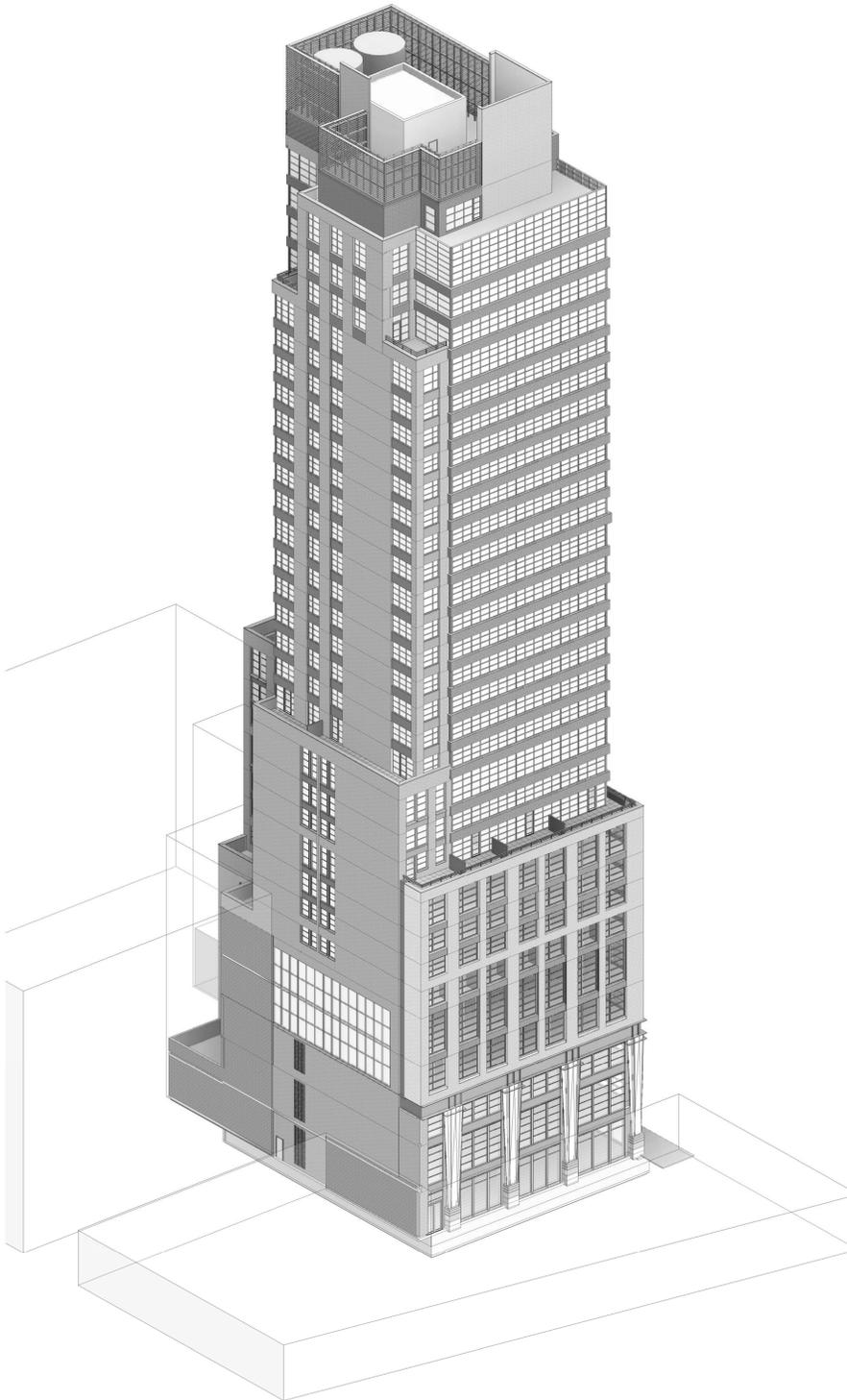
1 North Elevation
SCALE: 1/16" = 1'-0"



2 EAST ELEVATION
SCALE: 1/16" = 1'-0"



1 MASSING FROM NORTHEAST
A-303 SCALE :



2 MASSING FROM NORTHWEST
A-303 SCALE :



BKSK

BKSK ARCHITECTS LLP
FACADE DESIGN ARCHITECTS
25 WEST 26 STREET
NEW YORK, NY 10010
PH 212 607 9650



T/S ASSOCIATES

M.E.P.F. Engineers

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Environmental Consultants

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New York, NY 10001-2227
TEL: 212-479-8800
FAX: 212-479-8444

FRANK SETA & ASSOCIATES, LLC

Bidg Envelope Consultant

234 W 30th Street, Suite 206
New York, NY 10001
TEL: 212-465-1600

No.	Date	Issue
1	05/17/2014	SCHEMATIC DESIGN
2	05/06/2014	PROGRESS ISSUANCE

NOTES:

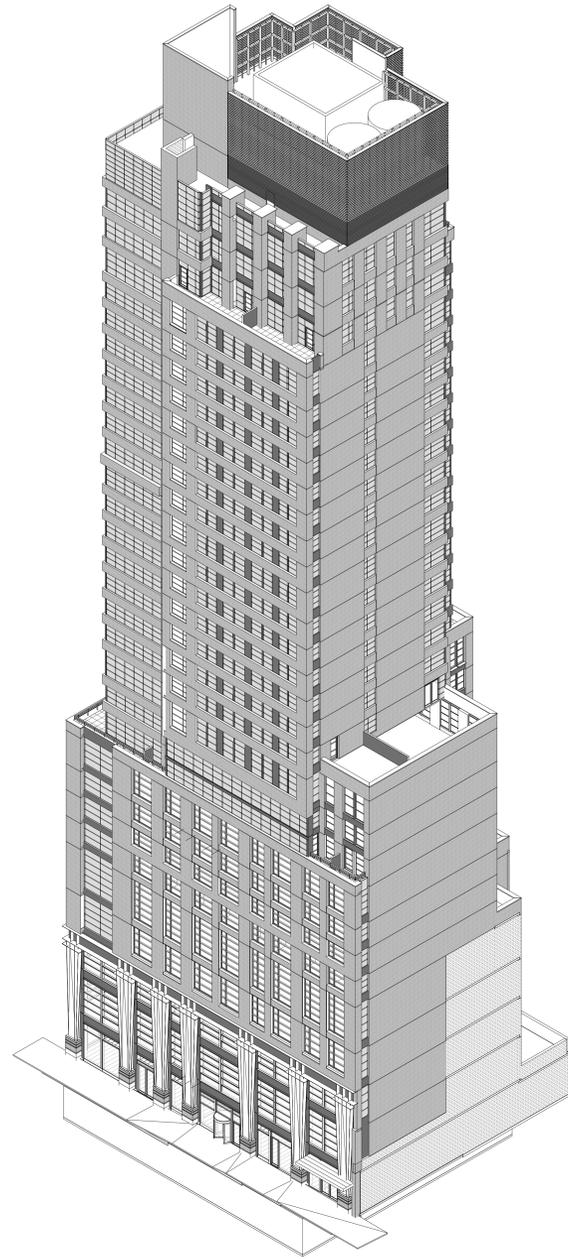
CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
745 5TH AVENUE, 33RD FLOOR
NEW YORK, NY 10151

PROJECT
509 W 38TH STREET
509 WEST 38TH STREET
NEW YORK, NY 10018

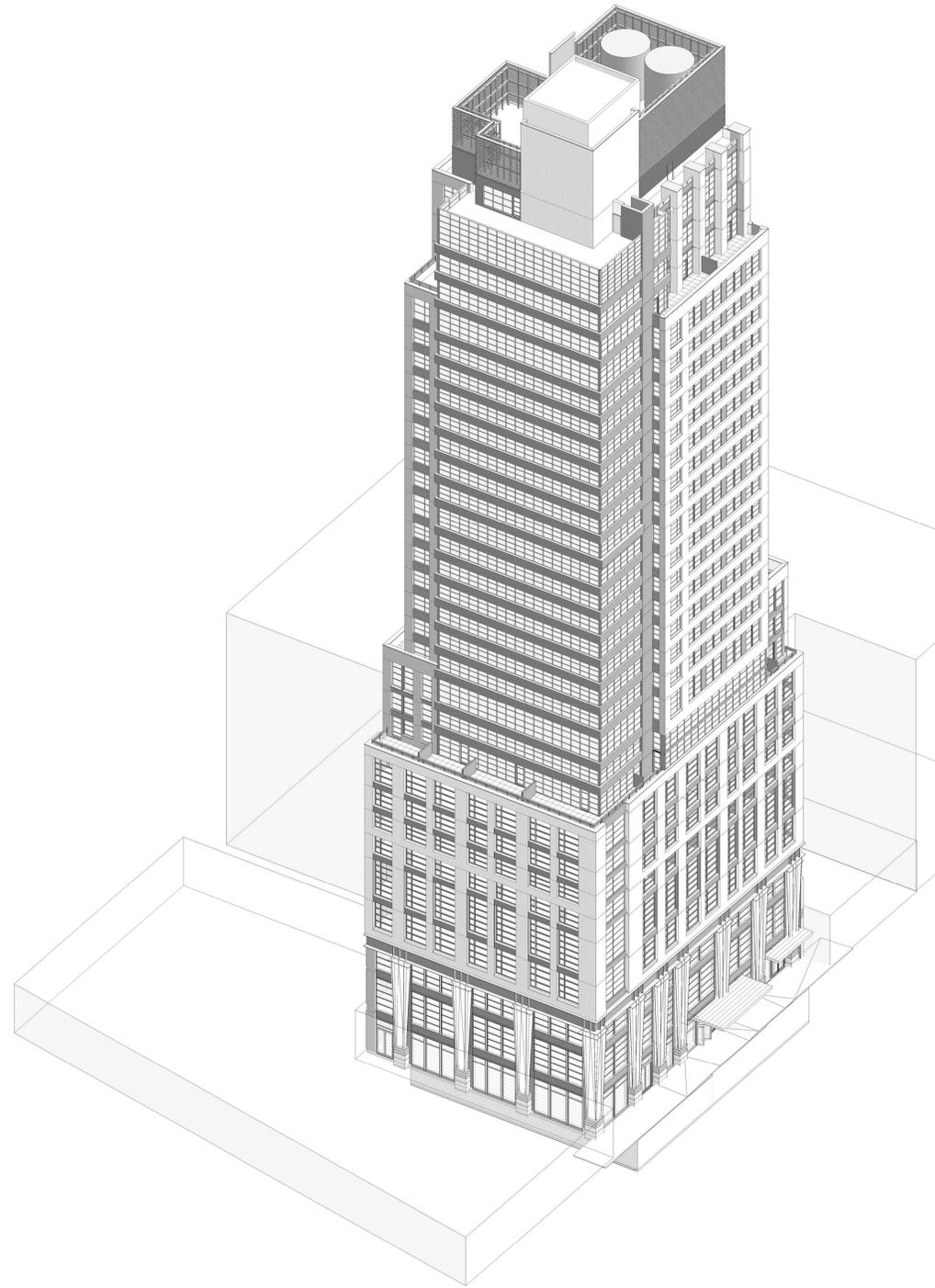
AXONOMETRIC VIEWS

SCALE: AS NOTED
DATE: 05/06/14
PROJECT No: 1127

A-303



1 MASSING FROM SOUTHEAST
A-304
SCALE:



2 MASSING FROM SOUTHWEST
A-304
SCALE:



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FACADE DESIGN ARCHITECTS
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2	05/06/2014	PROGRESS ISSUANCE

NOTES:

CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
745 5TH AVENUE, 33RD FLOOR
NEW YORK, NY 10151

PROJECT
509 W 38TH STREET
509 WEST 38TH STREET
NEW YORK, NY 10018

AXONOMETRIC VIEWS

SCALE: AS NOTED
DATE: 05/06/14
PROJECT No: 1127

Rev	Date	Issue
05/14/14	05/14/14	DESIGN DEVELOPMENT
06/09/14	06/09/14	DOB FILING SET
08/25/14	08/25/14	ARCHITECTURE/MEP/FPF BID SET
09/24/14	09/24/14	EXTERIOR BID SET

NOTES:

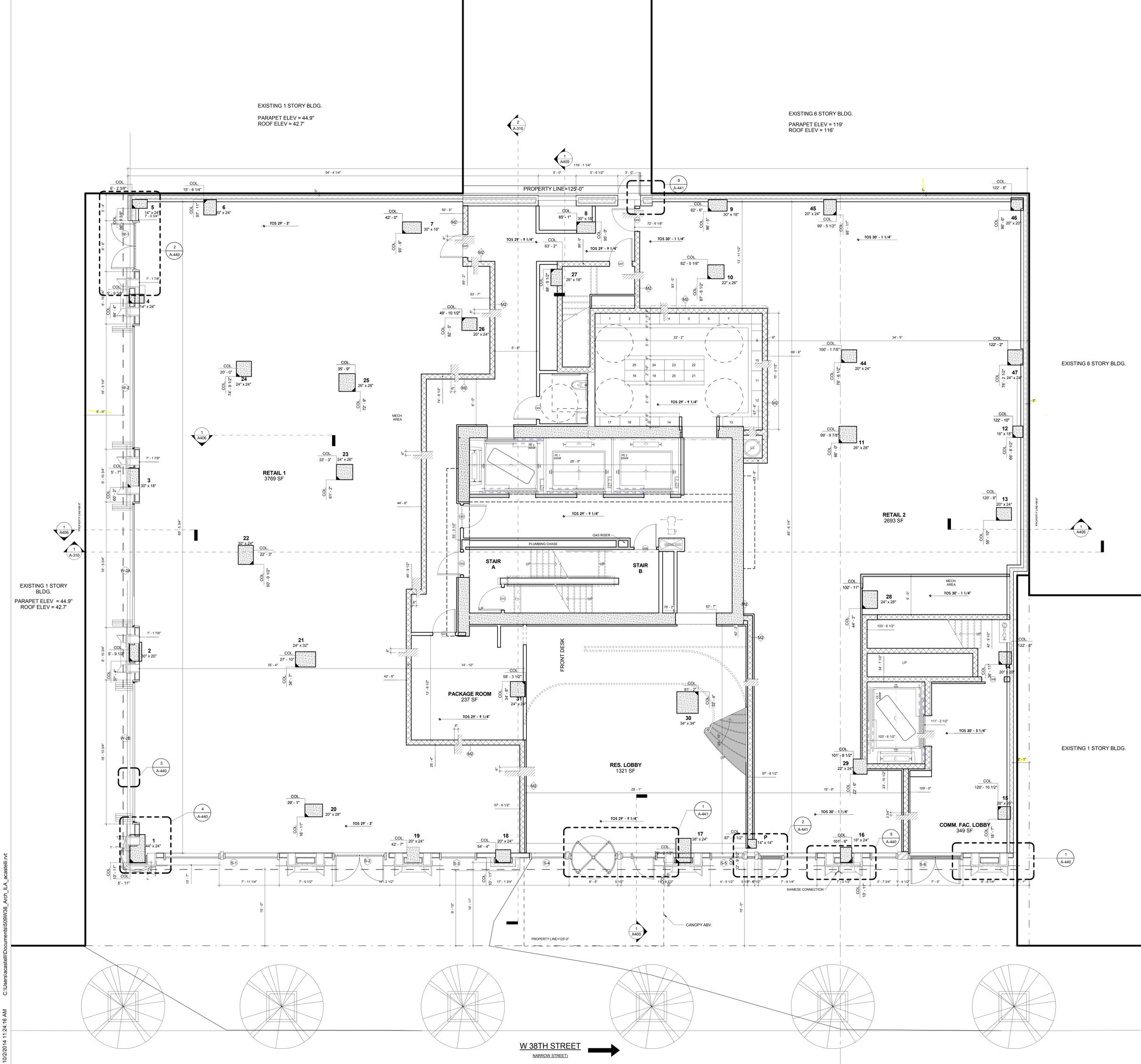
CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
 745 5TH Avenue, 33rd Floor
 New York, NY 10151

PROJECT
509 W 38th STREET
 509 West 38th Street
 New York, NY 10018

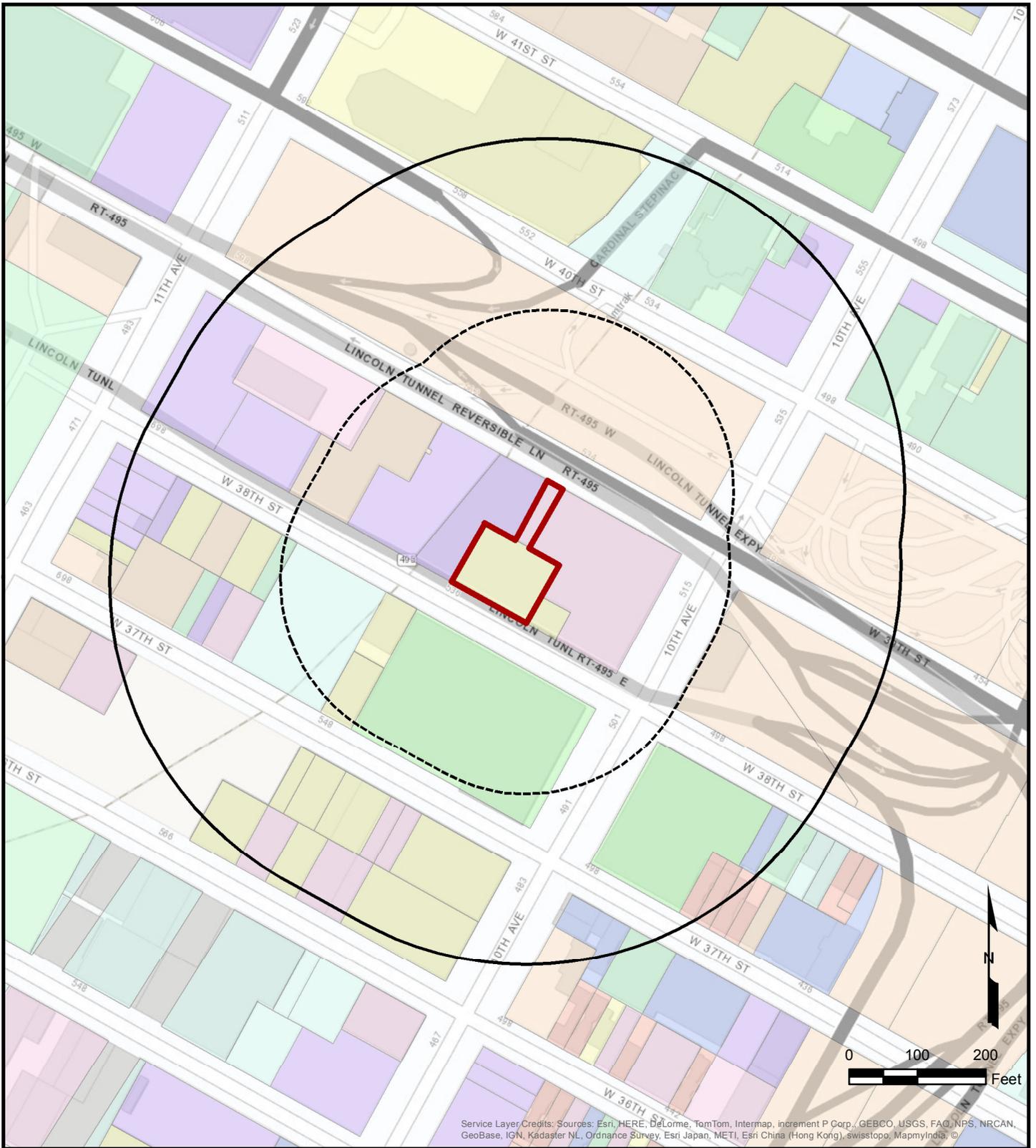
1ST FLOOR PLAN

SCALE: 1/4" = 1'-0"
 DATE: 10-01-14
 PROJECT No: 13.142

NYS LIC.# 21712



10/2/2014 11:24:16 AM C:\Users\aaastelli\Documents\509W38_Arch_ILA_scaletell.rvt



Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, ©

V:\GIS\Projects\2414\0001Y107\2414_0001Y107_101.MXD

LEGEND

- SITE BOUNDARY
 - 250FT BUFFER
 - 500FT BUFFER
 - HOSPITAL
 - DAY CARE
 - SCHOOL
-
- | | |
|---|--|
| <p>LAND USE</p> <ul style="list-style-type: none"> MULTI-FAMILY WALK-UP BUILDINGS MULTI-FAMILY ELEVATOR BUILDINGS MIXED RESIDENTIAL & COMMERCIAL BUILDINGS COMMERCIAL & OFFICE BUILDINGS | <ul style="list-style-type: none"> INDUSTRIAL & MANUFACTURING TRANSPORTATION & UTILITY PUBLIC FACILITIES & INSTITUTIONS PARKING FACILITIES VACANT LAND |
|---|--|

Source: NYC Department of City Planning; mapPLUTO Release 13v2

Title:

SURROUNDING LAND USE AND SENSITIVE RECEPTORS

509 WEST 38TH STREET/512 WEST 39TH STREET
NEW YORK, NEW YORK

Prepared For:

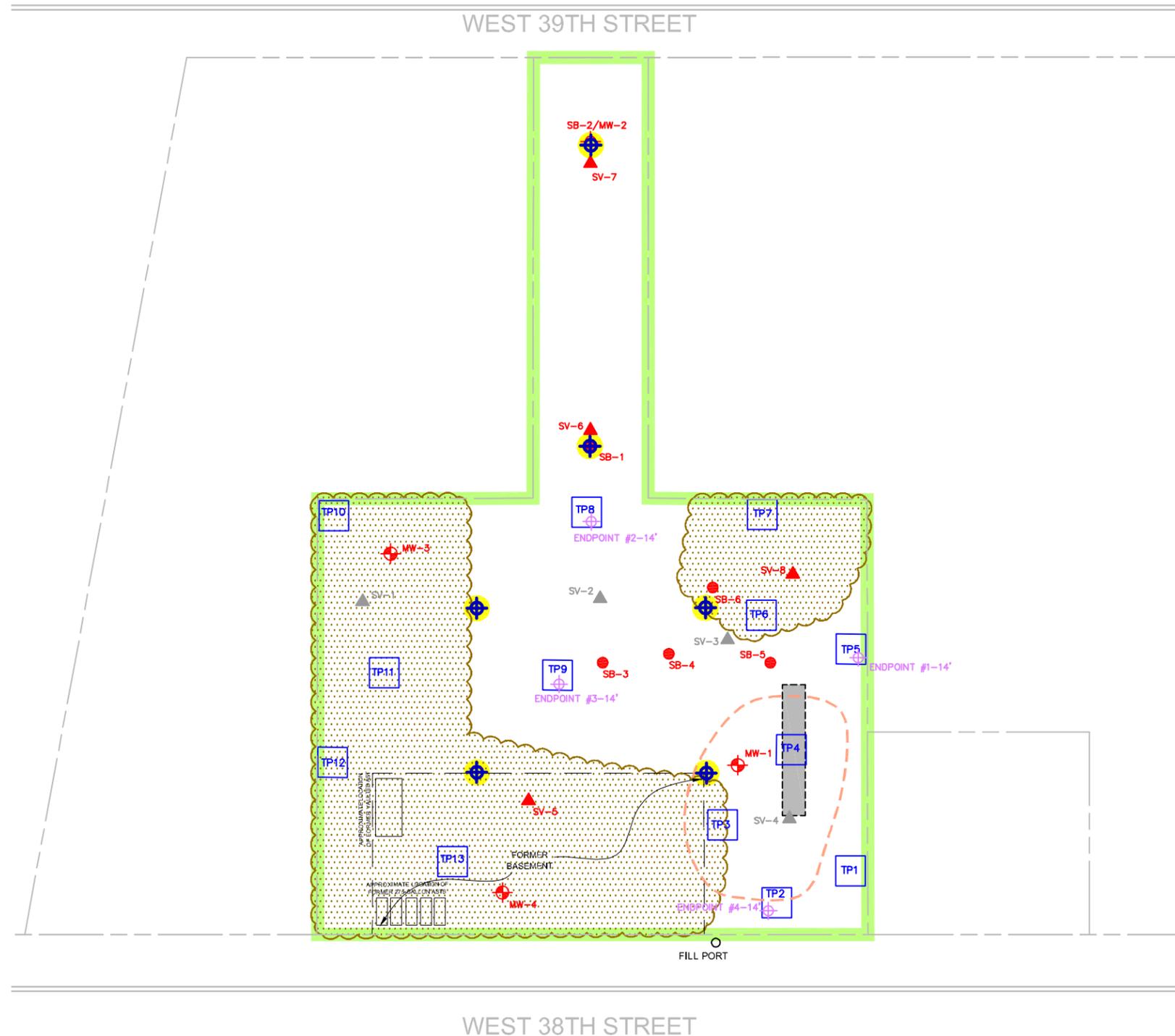
HY 38 OWNER, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: B.P.	Date: 10SEP14
Prepared by: J.A.D.	Scale: 1 in = 200 ft
Project Mgr: W.S.	Project: 2414.0001Y000
File No: 2414.0001Y107.101.MXD	

FIGURE
4

V:\CAD\PROJECTS\2414\0001Y107\2414.0001Y107.03.DWG



LEGEND

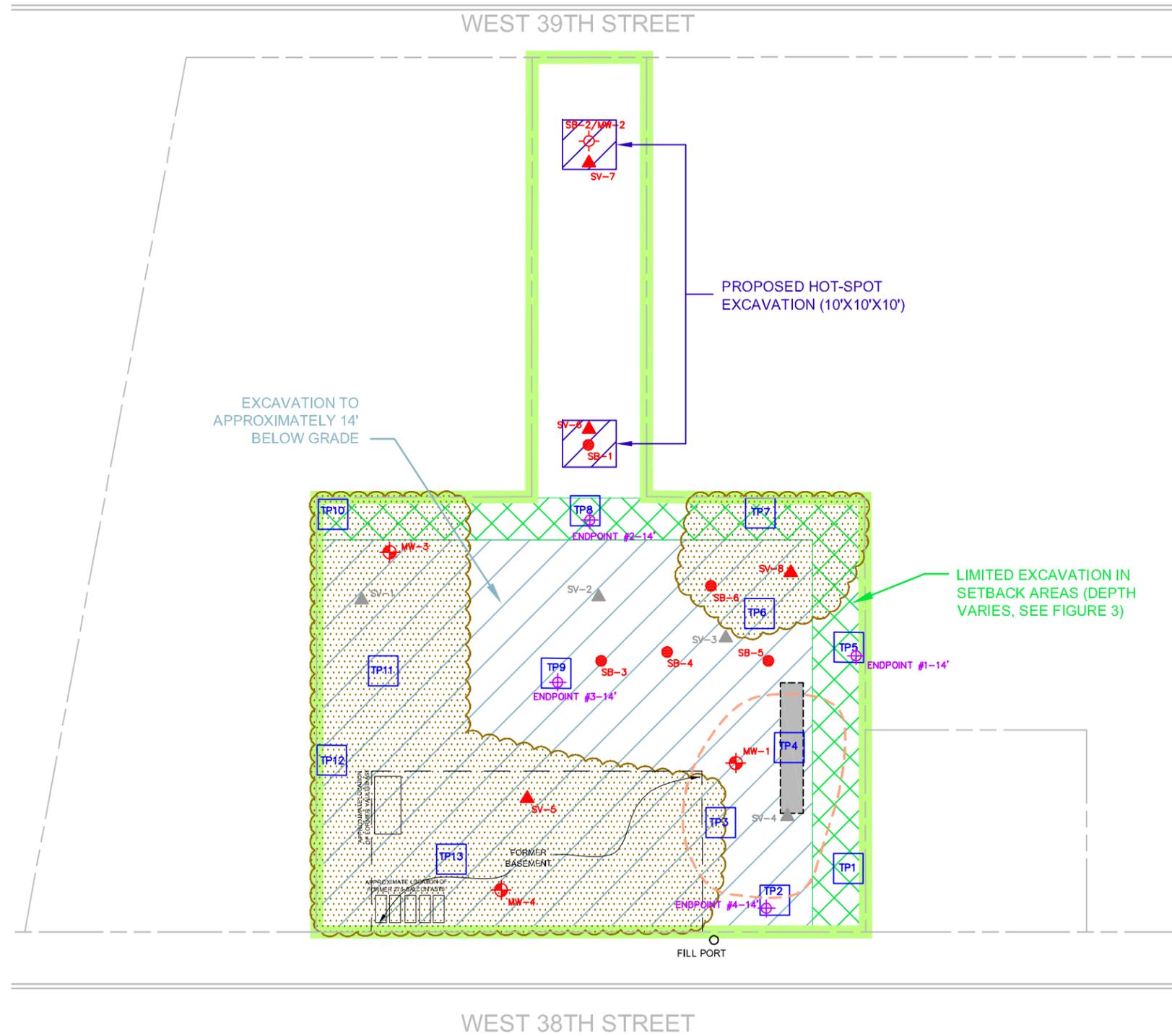
- SV-1 ▲ SOIL VAPOR SAMPLE LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- (with crosshair) PROPOSED ENDPOINT SAMPLE LOCATION AND DESIGNATION
- ENDPOINT #1-14' ⊕ ENDPOINT SAMPLE LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- SV-6 ▲ SOIL VAPOR SAMPLE LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- SB-1 ● SOIL BORING LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- MW-1 ⊕ (with crosshair) MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- SB-2/MW-2 ⊕ (with crosshair) SOIL BORING/MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- TP2 □ TEST PIT LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- APPROXIMATE LOCATION OF FORMER UST
- - - APPROXIMATE AREA OF PETROLEUM-IMPACTED MATERIAL
- ... APPROXIMATE AREAS WHERE BEDROCK WAS ENCOUNTERED ABOVE THE PROPOSED DEVELOPMENT EXCAVATION DEPTH
- █ SITE BOUNDARY

NOTES

1. BASE MAP WAS TAKEN FROM AS BUILT DIMENSIONS AND ELEVATIONS OF SIGNAGE BY GARDEN STATE ENGINEERING, SURVEYING AND PLANNING, DATED JANUARY 3, 2012.
2. TEST PIT AND SOIL SAMPLE LOCATIONS ARE APPROXIMATE.
3. PETROLEUM IMPACTED MATERIAL WAS IDENTIFIED AT DEPTHS RANGING FROM APPROXIMATELY 6.5 TO 13 FEET BELOW GRADE SURFACE.
4. ENDPOINT SOIL SAMPLE LOCATIONS (BY OTHERS) WERE COLLECTED AT THE BASE OF TEST PITS EXCAVATIONS WHEREIN BEDROCK WAS NOT ENCOUNTERED ABOVE THE PROPOSED SITE REDEVELOPMENT EXCAVATION DEPTH OF 14 FEET BELOW GRADE SURFACE. ENDPOINT SAMPLE LOCATIONS COLLECTED BY ROUX INCLUDE: SB-1 (5'-7'), SB-2 (5'-5.5'), SB-4 (14'-15'), SB-5 (14'-15'), SB-6 (10'-11').



Title:			
MAP OF ENDPOINT SAMPLE LOCATIONS			
509 WEST 38TH STREET/512 WEST 39TH STREET NEW YORK, NEW YORK			
Prepared For:			
HY 38 OWNER, LLC			
ROUX ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.S.	Date: 06NOV14	FIGURE 5
	Prepared by: J.A.D.	Scale: AS SHOWN	
	Project Mgr: W.S.	Project: 2414.0001Y000	
	File: 2414.0001Y107.03.DWG		



LEGEND

- SV-1 ▲ SOIL VAPOR SAMPLE LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- ENDPOINT #1-14' ⊕ ENDPOINT SAMPLE LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- SV-6 ▲ SOIL VAPOR SAMPLE LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- SB-1 ● SOIL BORING LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- MW-1 ⊕ MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- SB-2/MW-2 ⊕ SOIL BORING/MONITORING WELL LOCATION AND DESIGNATION (INSTALLED BY ROUX)
- TP2 □ TEST PIT LOCATION AND DESIGNATION (INSTALLED BY OTHERS)
- ▭ APPROXIMATE LOCATION OF FORMER UST
- ⋯ APPROXIMATE AREA OF PETROLEUM-IMPACTED MATERIAL
- ⋯ APPROXIMATE AREAS WHERE BEDROCK WAS ENCOUNTERED ABOVE THE PROPOSED DEVELOPMENT EXCAVATION DEPTH
- ▭ SITE BOUNDARY

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Title:			
SITE EXCAVATION DIAGRAM			
509 WEST 38TH STREET/512 WEST 39TH STREET NEW YORK, NEW YORK			
Prepared For:			
HY 38 OWNER, LLC			
ROUX ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.S.	Date: 03OCT14	FIGURE 6
	Prepared by: J.A.D.	Scale: AS SHOWN	
	Project Mgr: W.S.	Project: 2414.0001Y000	
	File: 2414.0001Y107.04.DWG		

Site-Wide Cover System Plan and Cover Details

Rev	Date	Issue
05/14/14	DESIGN DEVELOPMENT	
06/09/14	DOB FILING SET	
08/25/14	ARCHITECTURE/MEP/FP BID SET	
09/24/14	EXTERIOR BID SET	

NOTES:

- CELLAR FOUNDATION WATERPROOFING NOTES:
- CARLISLE MIRAPLY H BELOW ALL CELLAR FLOOR SLAB, FOUNDATION SLAB AND FOOTINGS
 - CARLISLE MIRAPLY V FOR ALL FOUNDATION WALLS
 - REFER TO SPECS SECTION 07 13 26 FOR MORE INFORMATION

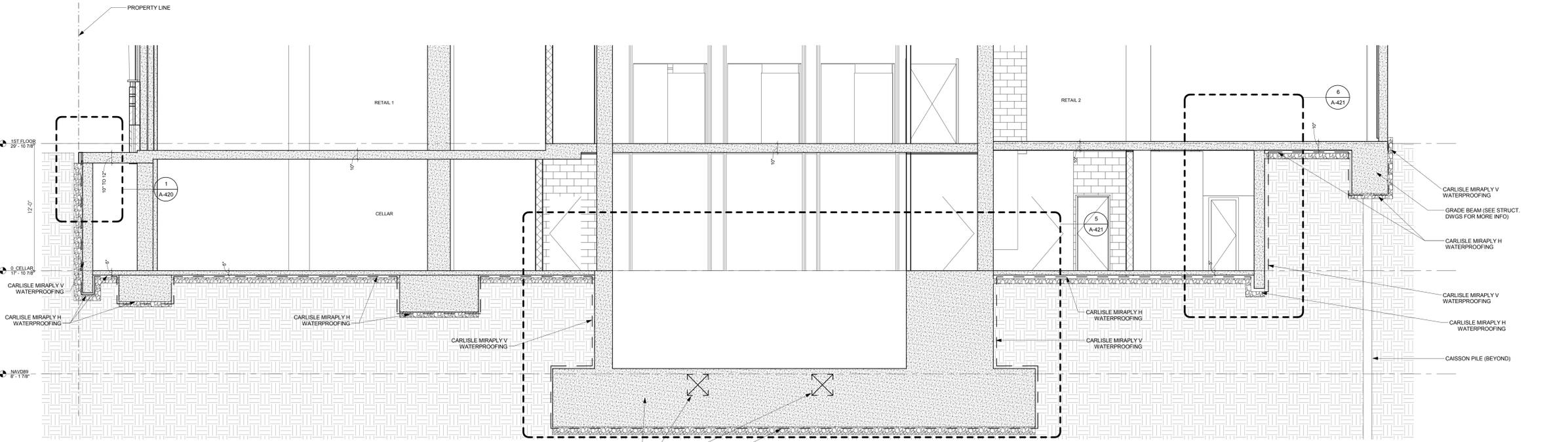
CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
 745 5TH Avenue, 33rd Floor
 New York, NY 10151

PROJECT
509 W 38th STREET
 509 West 38th Street
 New York, NY 10018

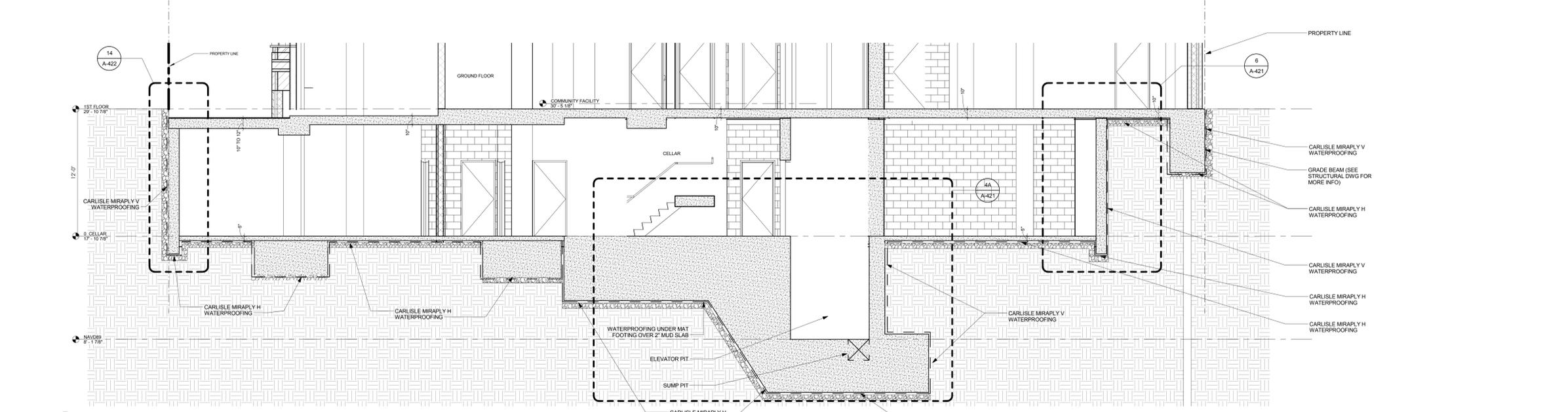
CELLAR SECTIONS

SCALE: As indicated
 DATE: 10-01-14
 PROJECT No: 13.142

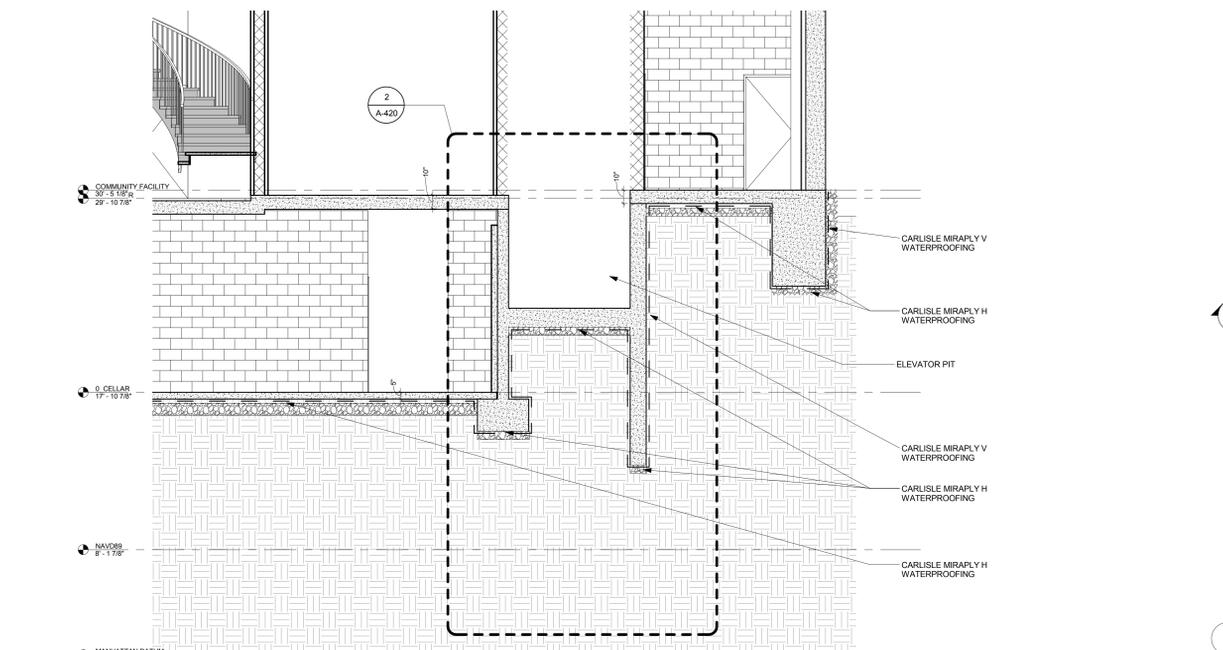
NYS LIC.# 21712



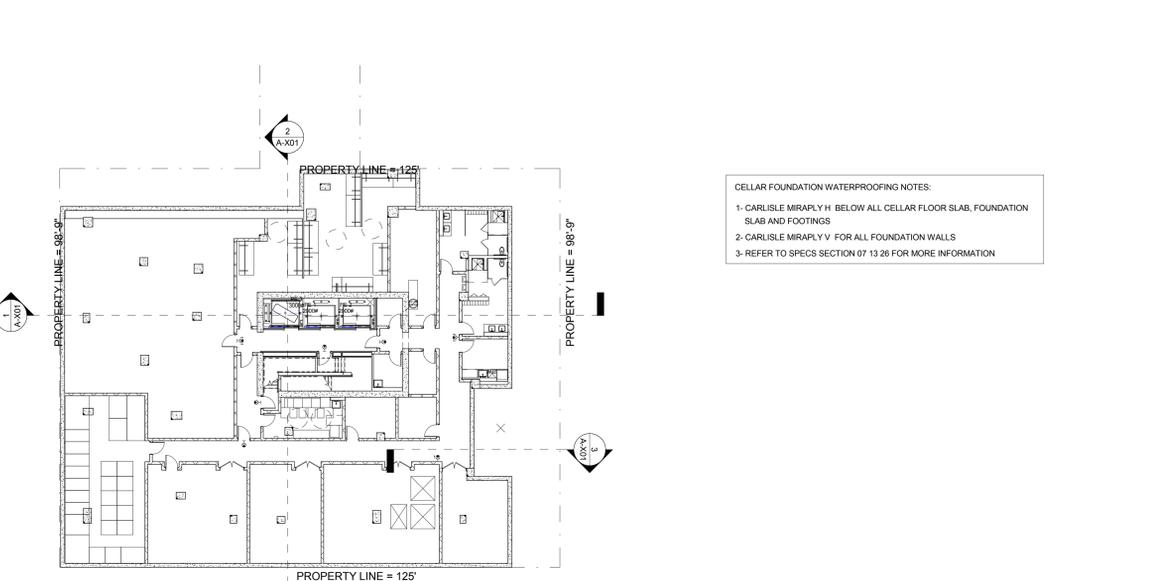
1 CELLAR EAST-WEST SECTION
 SCALE: 1/4" = 1'-0"



2 CELLAR SOUTH-NORTH SECTION
 SCALE: 1/4" = 1'-0"



3 COMM ELEVATOR SECTION EAST-WEST
 SCALE: 1/4" = 1'-0"



4 KEY - CELLAR
 SCALE: 1/16" = 1'-0"

No	Date	Rev	Issue
05/16/14	05/16/14		DESIGN DEVELOPMENT
06/09/14	06/09/14		DCB FILING SET
08/25/14	08/25/14		ARCHITECTURE/MEP/FP BID SET
09/24/14	09/24/14		EXTERIOR BID SET

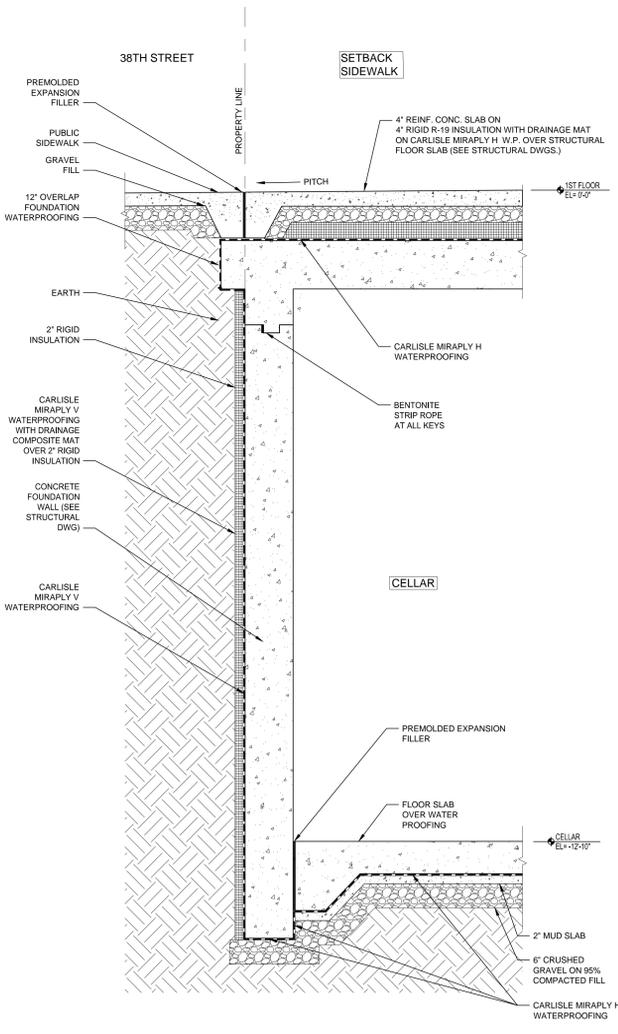
NOTES:

CLIENT
HY 38 OWNER LLC
HY 39 OWNER LLC
 745 5TH Avenue, 33rd Floor
 New York, NY 10151

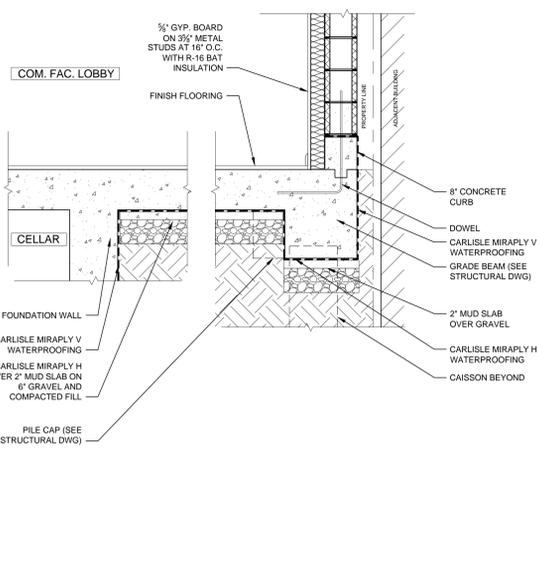
PROJECT
509 W 38th STREET
 509 West 38th Street
 New York, NY 10018

FOUNDATION DETAIL SECTIONS

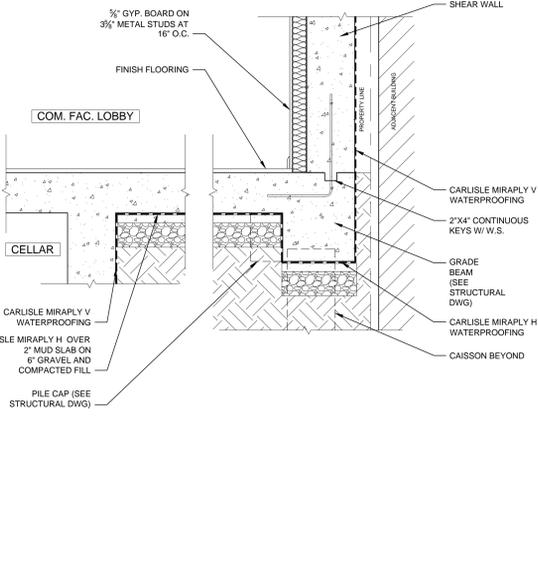
SCALE: 3/4" = 1'-0"
 DATE:
 PROJECT No:



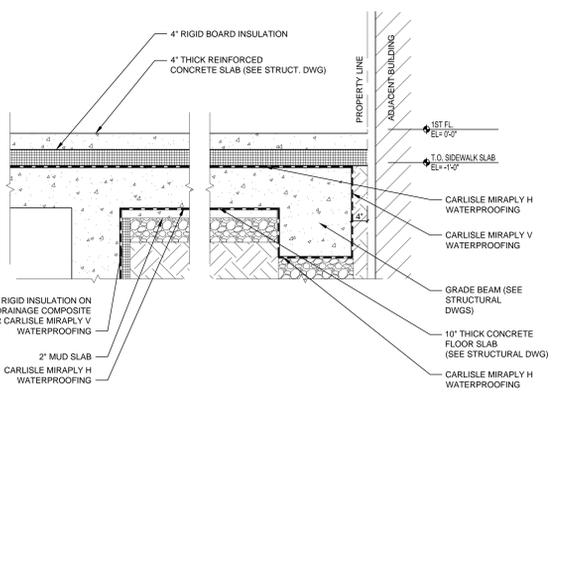
14 SECTION AT FRONT FOUNDATION WALL (38TH STREET)
 SCALE: 3/4" = 1'-0"



13 SECTION THROUGH GRADE BEAM
 SCALE: 3/4" = 1'-0"

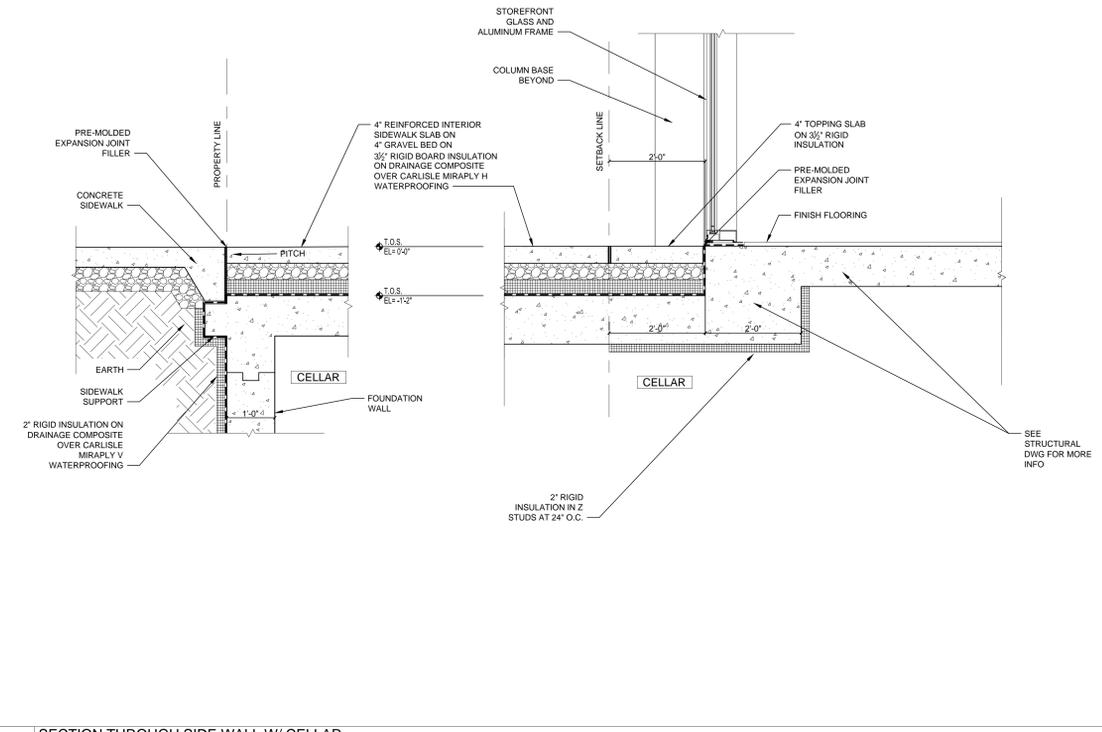


12 SECTION THROUGH COMM. FAC. LOBBY
 SCALE: 3/4" = 1'-0"

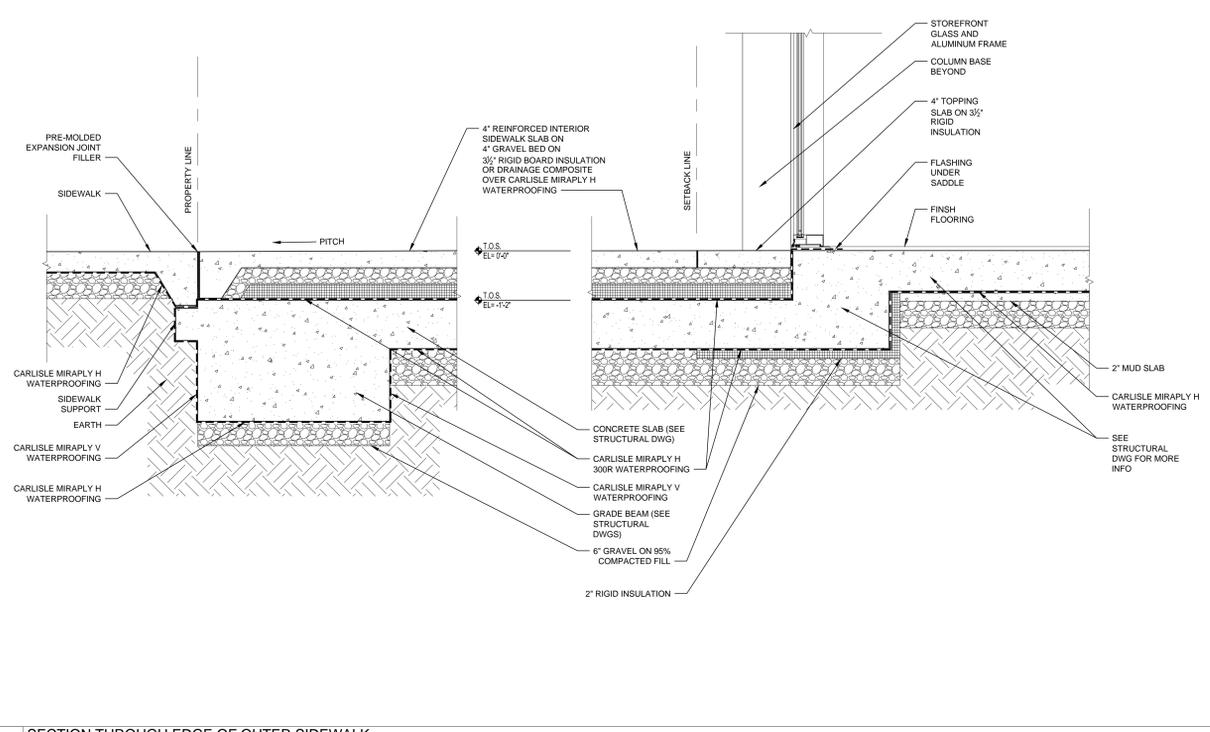


11 SECTION THROUGH SIDEWALK (EXTERIOR)
 SCALE: 3/4" = 1'-0"

CELLAR FOUNDATION WATERPROOFING NOTES:
 1- CARLISLE MIRAPLY H BELOW ALL CELLAR FLOOR SLAB, FOUNDATION SLAB AND FOOTINGS
 2- CARLISLE MIRAPLY V FOR ALL FOUNDATION WALLS
 3- REFER TO SPECS SECTION 07 13 26 FOR MORE INFORMATION



10A SECTION THROUGH SIDE WALL W/ CELLAR
 SCALE: 3/4" = 1'-0"



9 SECTION THROUGH EDGE OF OUTER SIDEWALK
 SCALE: 3/4" = 1'-0"

GENERAL

1. THESE DRAWINGS MAY BE USED FOR CONSTRUCTION ONLY IF RA CONSULTANTS LLC IS THE SPECIAL INSPECTION AGENCY FOR:
 - 1.1. EXCAVATION - SHEETING, SHORING, AND BRACING
 - 1.2. SOIL - SITE PREPARATION
 - 1.3. SOIL - INVESTIGATION (BORINGS/TEST PITS)
2. IF RA CONSULTANTS LLC HAS BEEN RELEASED OR HAS WITHDRAWN ITS RESPONSIBILITY FOR SPECIAL INSPECTIONS AND A FIRM OTHER THAN RA CONSULTANTS LLC IS ENGAGED BY THE OWNER, OWNER'S REPRESENTATIVE, OR CONTRACTOR FOR SPECIAL INSPECTION OF THE DESIGN SHOWN ON THESE DRAWINGS, THEN WE REQUIRE THAT RA CONSULTANTS LLC BE RETAINED TO REVIEW THE INSPECTION AGENCY'S FIELD REPORTS AND FOR SITE VISITS BY OUR PERSONNEL DURING RELEVANT CONSTRUCTION ACTIVITIES.
3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) (MEAN SEA LEVEL, RIMOUSKI, QUEBEC, CANADA).
4. BASE PLANS AND SECTIONS ARE DEVELOPED FROM:
 - 4.1. ARCHITECTURAL SURVEY BY CONTROL POINT ASSOCIATES, INC. DATED 08/29/2012
 - 4.2. STRUCTURAL DRAWINGS BY WSP CANTOR SEINUK DATED 06/09/2014.
5. SOIL DATA OBTAINED FROM:
 - 5.1. GEOTECHNICAL REPORT FOR 509 WEST 38TH STREET BY RA CONSULTANTS LLC DATED 12/26/2007.
 - 5.2. TEST PIT SUMMARY 509 WEST 38TH STREET BY RA CONSULTANTS LLC DATED 9/8/2012.
6. LOCATION OF EXISTING AND PROPOSED CONDITIONS INCLUDING BUT NOT LIMITED TO FOUNDATION WALL, FOOTINGS, AND SLAB LOCATIONS AND ELEVATIONS WERE TAKEN FROM STRUCTURAL AND ARCHITECTURAL DRAWINGS.
7. LOCATIONS AND ELEVATIONS OF ALL PROPOSED STRUCTURAL BUILDING ELEMENTS SHOWN ON THIS DRAWING MAY BE APPROXIMATE AND SHALL BE SUPERSEDED BY FINAL STRUCTURAL AND ARCHITECTURAL DRAWINGS.
8. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE UTILITIES AND BELOW GROUND STRUCTURES IN THE AREA OF PRIOR TO COMMENCEMENT OF WORK.
9. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL DIMENSIONS IN THE FIELD. IF CONDITIONS OBSERVED IN THE FIELD DIFFER FROM THESE DRAWINGS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER TO EVALUATE THE CONDITION. MODIFICATIONS TO THESE DRAWINGS MAY BE NECESSARY.
10. THESE DRAWINGS DO NOT ADDRESS SAFETY ISSUES RELATED TO THE EXCAVATION AND SHORING WORK. OTHERS SHALL BE RESPONSIBLE FOR SITE SAFETY AND PROVIDE A SAFETY PLAN CONFORMING TO OSHA AND ALL APPLICABLE LAWS.
11. BARRIERS AND FENCING AROUND SITE MUST BE PROVIDED BY CONTRACTOR IN ACCORDANCE WITH NEW YORK CITY DEPARTMENT OF BUILDINGS AND ALL APPLICABLE LAWS.
12. IF THE CONDITIONS OBSERVED AS THE EXCAVATION ADVANCES ARE DIFFERENT THAN THE CONDITIONS SHOWN ON THE DESIGN DRAWINGS, THE CONTRACTOR SHALL STOP WORK AND NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
13. OBSERVED MOVEMENTS OF THE SUPPORT OF EXCAVATION OR OTHER STRUCTURES SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND ENGINEER.
14. LOOSE AREAS OF FOUNDATION WALL OR FOOTINGS THAT ARE DAMAGED OR LOOSE SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR EVALUATION AND REMEDIAL MEASURES.
15. PINS, WIRE MESH, AND PARGING MAY BE REQUIRED TO STABILIZE THE FOUNDATION WALL, OR FOOTINGS.
16. ALL STRUCTURAL STEEL SHALL BE GRADE 50, ASTM A-572.
17. 1-BAG MIX SHALL CONSIST OF 1-94 LB. BAG OF CEMENT TO 1 CY OF SAND. QUANTITY OF WATER SHALL BE ADEQUATE TO ALLOW THE MIX TO FLOW.
18. THE DESIGNS ON THESE DRAWINGS ARE INTENDED FOR TEMPORARY SUPPORT OF EXCAVATION ONLY.
19. LINE DRILL ROCK ADJACENT TO EXISTING BUILDINGS AND ALONG LOT LINES PRIOR TO ROCK EXCAVATION.
20. NOTIFY DOB 24- TO 48-HRS PRIOR TO EXCAVATION (RULE 52).

SURVEY AND MONITORING

1. A PRE-CONSTRUCTION (PRE-CONDITION) SURVEY OF THE ADJACENT STRUCTURES SHALL BE DONE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REVIEW AND FAMILIARIZE HIMSELF WITH THE RESULTS OF THE SURVEY. THE CONTRACTOR SHALL MAKE A VISUAL INSPECTION OF THE ADJACENT STRUCTURES (INSIDE AND OUT) PRIOR TO STARTING THE WORK.
2. MONITOR THE ADJACENT BUILDINGS AT ABOUT 25-FT INTERVALS FOR VERTICAL AND LATERAL MOVEMENT. NOTE THAT MONITORING LOCATIONS ARE NOT SHOWN ON THE SUPPORT OF EXCAVATION PLAN FOR CLARITY.
3. OBTAIN BASELINE READINGS OF THE MONITORING POINTS PRIOR TO EXCAVATION AND NEW CONSTRUCTION.
4. PERFORM OPTICAL SURVEYS AT LEAST TWICE PER MONTH. IF MOVEMENTS OCCUR, INCREASE THE FREQUENCY OF THE READINGS AS DIRECTED BY THE ENGINEER.
5. VIBRATION MONITORS (SEISMOGRAPHS) SHALL BE PLACED ADJACENT TO AREAS WHERE WORK IS BEING PERFORMED. NOTE THAT SEISMOGRAPH LOCATIONS ARE NOT SHOWN ON THE SUPPORT OF EXCAVATION PLAN FOR CLARITY.
6. NON-LANDMARK BUILDING MOVEMENT AND VIBRATION CRITERIA:
 - A. IF THE VERTICAL OR LATERAL BUILDING MOVEMENT REACHES 1/4-INCH IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
 - B. IF THE BUILDING MOVEMENT REACHES 1/2-INCH, IMMEDIATELY INFORM THE CONSTRUCTION MANAGER AND ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER.
 - C. IF THE VIBRATIONS REACH 1-INCHES PER SECOND (IPS) THE CONSTRUCTION MANAGER AND ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
 - D. IF THE VIBRATIONS EXCEED 2-IPS, IMMEDIATELY INFORM THE CONSTRUCTION MANAGER AND ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER.
7. VIBRATION MONITORS SHALL TAKE REAL TIME READINGS.
8. ALL MONITORING DATA SHALL BE PRESENTED TO THE CONSTRUCTION MANAGER AND ENGINEER AT THE END OF EACH DAY.

EXCAVATION, SHORING, UNDERPINNING, & BUTTONS

1. STRUCTURAL CONCRETE FOR UNDERPINNING PIERS AND BUTTONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000-PSI AT 28 DAYS.
2. CONCRETE PIERS AND DRY PACK SHALL BE ALLOWED TO CURE PRIOR TO WEDGING, EXCAVATING ADJACENT PIT, OR ADVANCING THE EXCAVATION IN FRONT OF THE PIT.
3. DRY PACK SHALL CONSIST OF ONE PART CEMENT TO TWO PARTS SAND BY VOLUME. WATER SHALL BE ADDED TO PRODUCE A MIXTURE WHICH HOLDS ITS SHAPE WHEN FORMED INTO A BALL BY HAND.
4. IF SOILS RUN DURING THE EXCAVATION, GROUTING MAY BE REQUIRED TO STABILIZE SOIL AT PITS BY USING SODIUM SILICATE OR MICRO-FINE CEMENT. GROUT MIX DESIGN, EQUIPMENT, DRILLING PROCEDURE, AND SEQUENCE SHALL BE PERFORMED BY THE CONTRACTOR AND SUBMITTED FOR REVIEW.
5. TIMBER LAGGING SHALL BE ROUGH CUT, FULL SIZE CONSTRUCTION GRADE, WITH A MINIMUM ALLOWABLE BENDING STRESS OF 1200-PSI. TIMBER SIZES SHOWN ARE ACTUAL SIZES.
6. DEPTH OF EXCAVATION BELOW PREVIOUSLY INSTALLED LAGGING BOARDS SHALL NOT EXCEED 18-INCHES. MAINTAIN TIGHT CONTACT BETWEEN SOIL AND LAGGING BOARDS. IF MATERIAL IS CAVING INTO EXCAVATION, DECREASE THE UNBRACED EXCAVATION DEPTH AND/OR GROUT THE MATERIAL TO MINIMIZE LOSS.
7. IF MATERIAL BEHIND LAGGING HAS BEEN LOST OR DISTURBED, LEAVE A 1- TO 1-1/2 INCH SPACE BETWEEN LAGGING BOARDS TO IMMEDIATELY BACKFILL OR GROUT.
8. EXCAVATION FOR UNDERPINNING PIERS AND BUTTONS MUST BE PERFORMED IN THE DRY. DEWATERING MAY BE NECESSARY PRIOR TO EXCAVATION TO MAINTAIN WATER LEVELS A MINIMUM OF 1-FT BELOW THE PROPOSED SUBGRADE LEVEL OF THE PIER. HAY OR FILTER FABRIC SHALL BE USED TO MINIMIZE MIGRATION OF FINES INTO THE EXCAVATION.
9. UNDERPINNING PIER AND BUTTON SUBGRADE BEARING MATERIAL SHALL BE 2008 NYCBC CLASS 1B BEDROCK OR BETTER.
10. UNDERPINNING PIER AND BUTTON WIDTH IS 4-FT UNLESS OTHERWISE NOTED ON THE DRAWINGS.
11. UNDERPINNING PIER THICKNESS SHALL BE 2'-0" OR WIDTH OF FOOTING, WHICHEVER IS GREATER.
12. IT IS THE CONTRACTORS RESPONSIBILITY TO DESIGN THE APPROACH PITS AND EXCAVATE PITS FOLLOWING OSHA AND LOCAL LAWS.
13. DO NOT LEAVE PITS OPEN OVERNIGHT.
14. BUTTON PIERS SHALL BE CONSTRUCTED IN ONE VERTICAL LIFT.
15. ROCK BOLTS MAY BE REQUIRED BASED ON ROCK FACE OBSERVATIONS BY RA CONSULTANTS LLC (SECTION 1814.2 OF NYCBC).
16. UNDERPINNING OR BRACING REQUIRED FOR SUPPORT OF EXCAVATION MAY BE INSTALLED OUTSIDE THE PROPERTY LINE PROVIDED THAT ALL NECESSARY PERMITS, EASEMENTS AND AUTHORIZATIONS ARE OBTAINED IN ACCORDANCE WITH NEW YORK CITY DEPARTMENT OF BUILDINGS AND ALL APPLICABLE LAWS.

TIE-BACKS AND TIE-DOWNS

1. TIE-BACKS AND TIE-DOWNS SHALL BE INSTALLED IN ACCORDANCE WITH POST-TENSIONING INSTITUTE (PTI) RECOMMENDATIONS.
2. ALL TIE-BACKS AND TIE-DOWNS SHALL BE TESTED TO 1.33 THE DESIGN LOAD SHOWN ON THESE DRAWINGS.
 - 2.1. AT LEAST 5% OF TIE-BACKS AND TIE-DOWNS SHALL BE PERFORMANCE TESTED
 - 2.2. THE REMAINDER SHALL BE PROOF TESTED
3. TIE-BACKS AND TIE-DOWNS SHALL BE LOCKED AT THE LOCK-OFF LOAD SPECIFIED IN THESE DRAWINGS.
4. IF ANY OF THE ABOVE TOLERANCES ARE EXCEEDED AND IN THE OPINION OF THE ENGINEER REQUIRE CORRECTIVE MEASURES. SUCH CORRECTIVE MEASURES, INCLUDING COSTS OF ENGINEERING AND REDESIGN, SHALL BE PAID FOR BY THE CONTRACTOR.

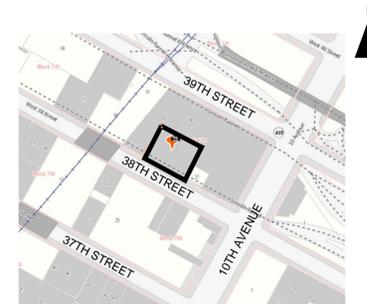
SPECIAL INSPECTIONS

1. A SPECIAL INSPECTOR AND/OR SPECIAL INSPECTION AGENCY SHALL HAVE RESPONSIBILITIES AS SET FORTH IN CHAPTER 17 OF THE NEW YORK CITY BUILDING CODE AND ELSEWHERE IN THE CODES WHERE SPECIAL INSPECTIONS ARE REQUIRED. THE RESPONSIBILITIES OF THE SPECIAL INSPECTOR OR SPECIAL INSPECTION AGENCY AT A SPECIAL INSPECTION SHALL INCLUDE THOSE TASKS AND STANDARDS SET FORTH IN CHAPTER 17 OF THE CODE, THE REFERENCE STANDARDS AND ELSEWHERE IN THE CODE, THIS RULE OR ANY RULE OF ANY AGENCY IN CONNECTION WITH THE WORK THAT IS THE SUBJECT OF SUCH SPECIAL INSPECTION.
2. NECESSARY SPECIAL INSPECTIONS:
 - A. EXCAVATION - SHEETING, SHORING, AND BRACING.
 - B. SOIL - SITE PREPARATION.
 - C. SOIL - INVESTIGATION (BORINGS/TEST PITS).

LIST OF DRAWINGS

1 OF 7	SOE-001	SUPPORT OF EXCAVATION NOTES
2 OF 7	SOE-100	SUPPORT OF EXCAVATION PLAN
3 OF 7	SOE-200	SUPPORT OF EXCAVATION SECTIONS
4 OF 7	SOE-201	SUPPORT OF EXCAVATION SECTIONS
5 OF 7	SOE-202	SUPPORT OF EXCAVATION SECTIONS
6 OF 7	SOE-300	SUPPORT OF EXCAVATION DETAILS
7 OF 7	SOE-301	TEST PIT LOGS

KEY PLAN



SOURCE: OASISNYC.NET
NOT TO SCALE

BLOCK 710
LOT 22

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REV.	DATE	DETAILS
	06/13/2014	FOUNDATION BID SET
	05/14/2014	ISSUED FOR FILING
	05/08/2014	ISSUED FOR COORDINATION

PROJECT

**509 WEST 38TH STREET
NEW YORK, NY**

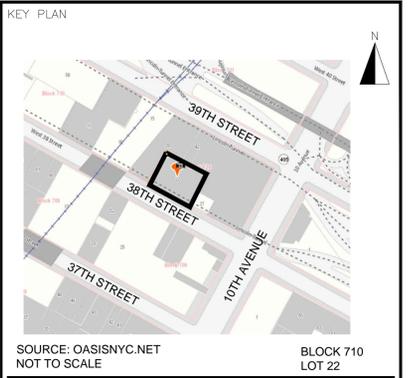
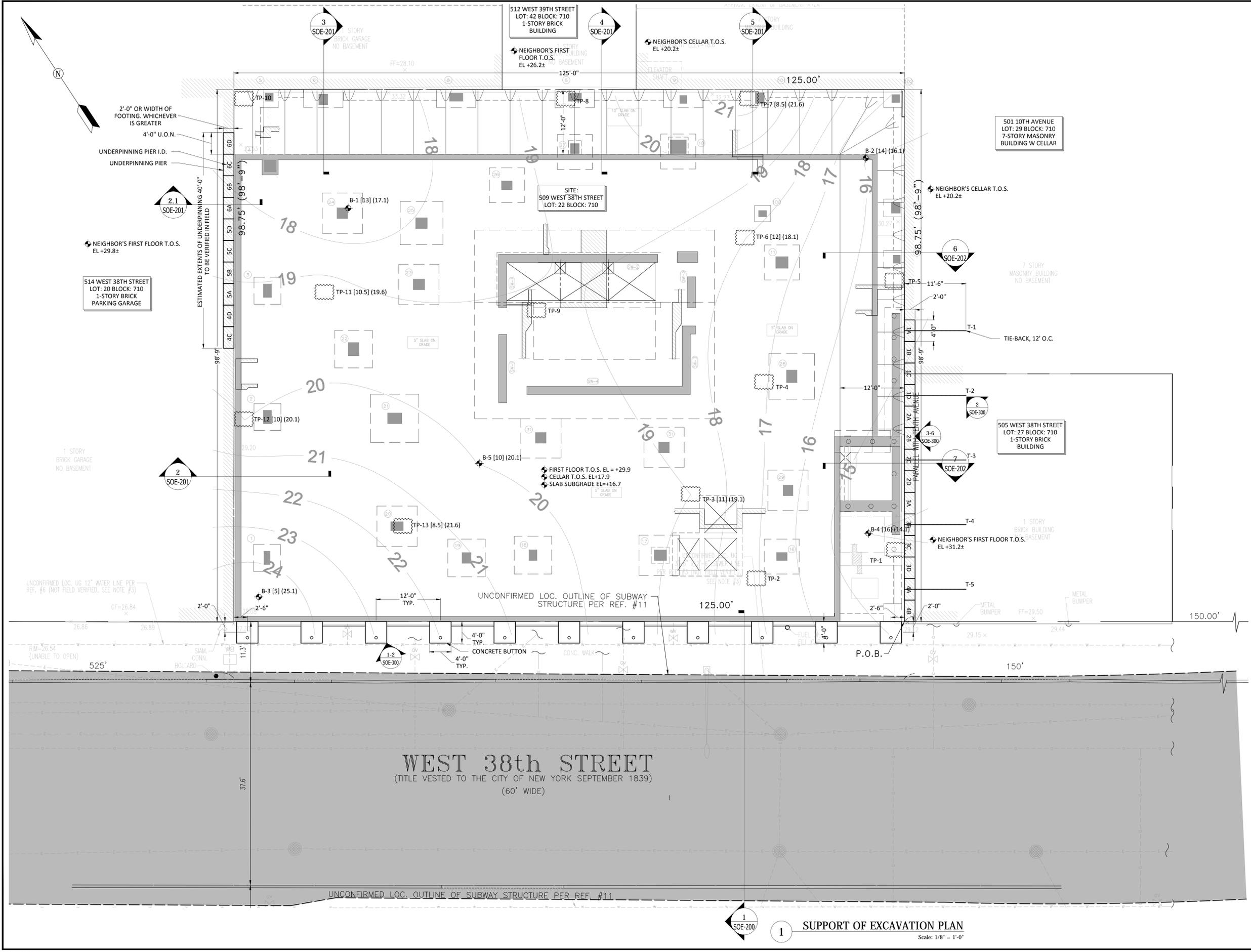
TITLE

SUPPORT OF EXCAVATION NOTES

 **RA CONSULTANTS LLC**
Geotechnical Engineering

512 SEVENTH AVENUE NEW YORK, NY 10018
[T] 646.484.3250 [F] 201.374.1795 WWW.RACLLO.COM

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	DRAWING: SOE-001.00
	SHEET: 1 OF 7



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 BLOCK 710
 LOT 22

- LEGEND:
- APPROXIMATE BORING LOCATION
 - APPROXIMATE TEST PIT LOCATION
 - [XX] APPROXIMATE DEPTH TO ROCK FROM SIDEWALK LEVEL
 - (XX) APPROXIMATE ELEVATION OF ROCK (NAVD88 DATUM)

- UNDERPINNING SEQUENCE:
1. UNDERPINNING SHALL BE CONSTRUCTED UNDER FULL TIME OBSERVATION OF RA CONSULTANTS LLC AND IN ACCORDANCE WITH PROCEDURES OUTLINED ON SOE-300.
 2. RA CONSULTANTS LLC MAY MODIFY THE SEQUENCE BASED ON FIELD CONDITIONS.
 3. CONSTRUCT "A" PIERS AND WAIT TO CURE.
 4. SHIM, WEDGE, AND DRYPACK "A" PIERS.
 5. CONSTRUCT "B" PIERS AND WAIT TO CURE.
 6. SHIM, WEDGE, AND DRYPACK "B" PIERS.
 7. CONSTRUCT "C" PIERS AND WAIT TO CURE.
 8. SHIM, WEDGE, AND DRYPACK "C" PIERS.
 9. CONSTRUCT "D" PIERS AND WAIT TO CURE.
 10. SHIM, WEDGE, AND DRYPACK "D" PIERS.

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PROJECT
**509 WEST 38TH STREET
 NEW YORK, NY**
 TITLE
SUPPORT OF EXCAVATION PLAN

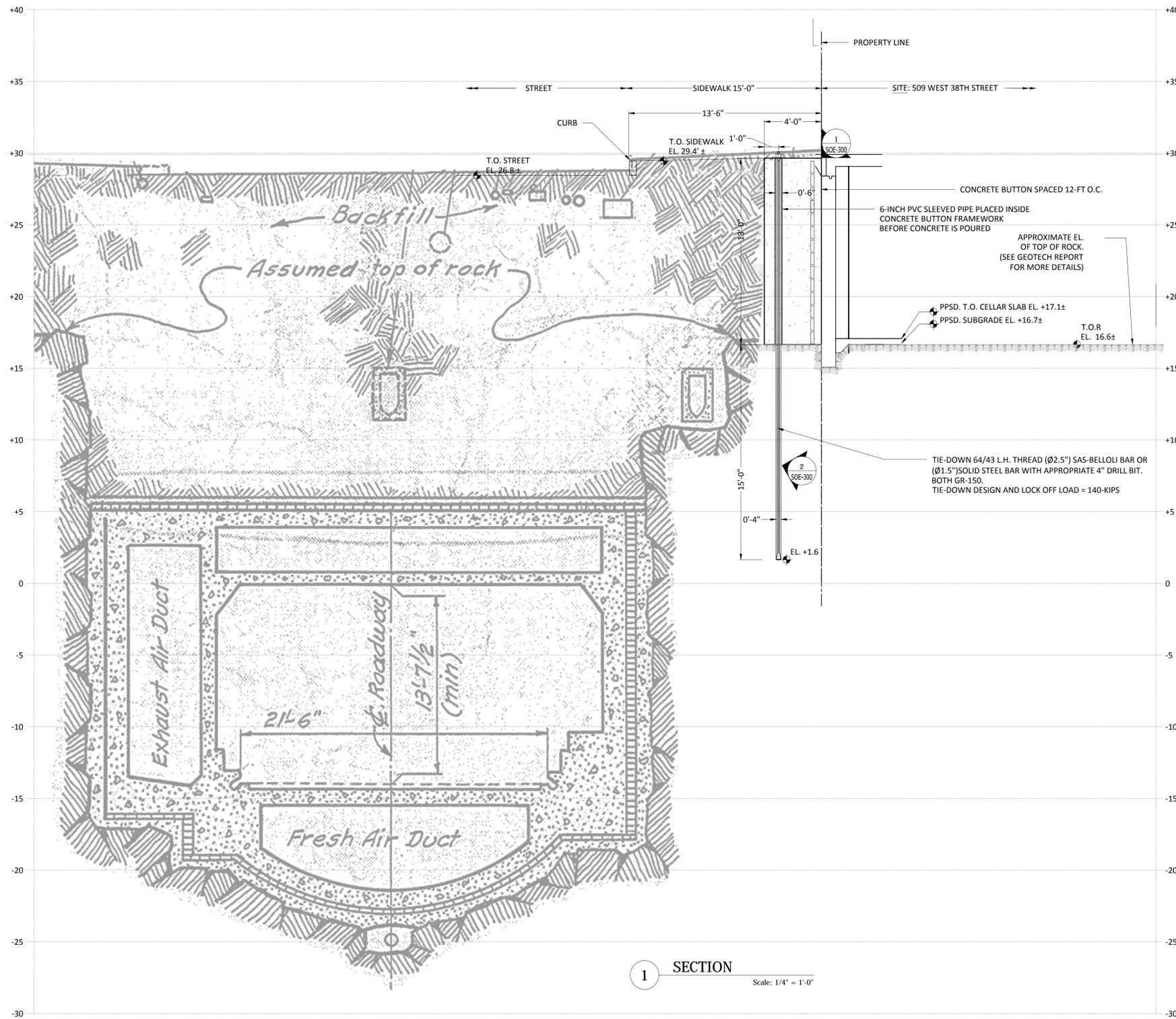
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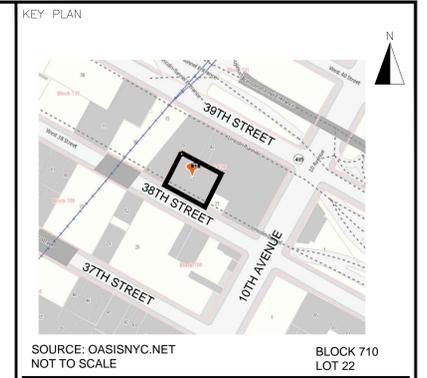
 DATE: APRIL 4 2014
 PROJ. NO.: 11C1115
 DRAWN BY: JH / JJC
 CHECKED BY: WJP
 DRAWING:
SOE-100.00
 SHEET: 2 OF 7

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 RA CONSULTANTS LLC

1 SUPPORT OF EXCAVATION PLAN
 Scale: 1/8" = 1'-0"



1 SECTION
Scale: 1/4" = 1'-0"



SOURCE: OASISNYC.NET
NOT TO SCALE

BLOCK 710
LOT 22

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PROJECT
**509 WEST 38TH STREET
NEW YORK, NY**

TITLE
SUPPORT OF EXCAVATION SECTION

RA CONSULTANTS LLC
Geotechnical Engineering

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PROJ. NO.: 11C1115

DRAWN BY: JH / JJC

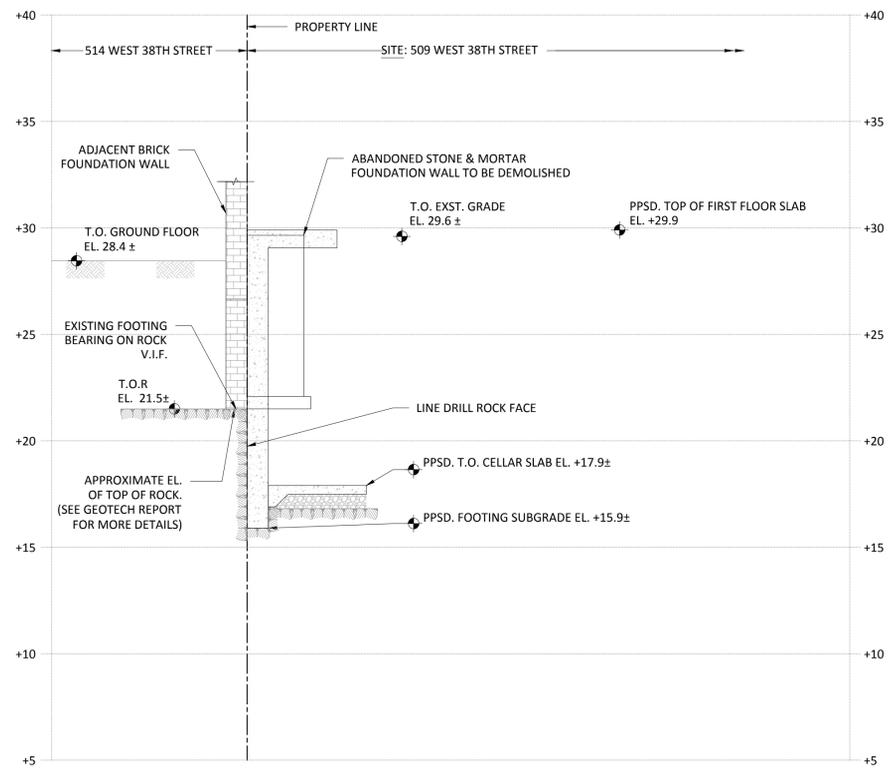
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SOE-200.00

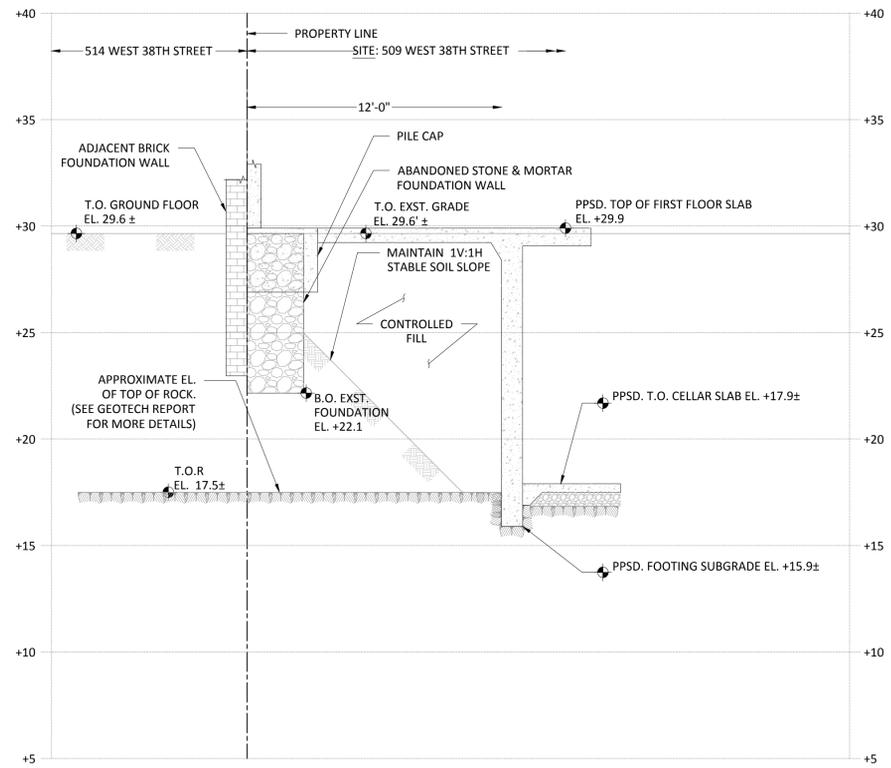
SHEET: 3 OF 7



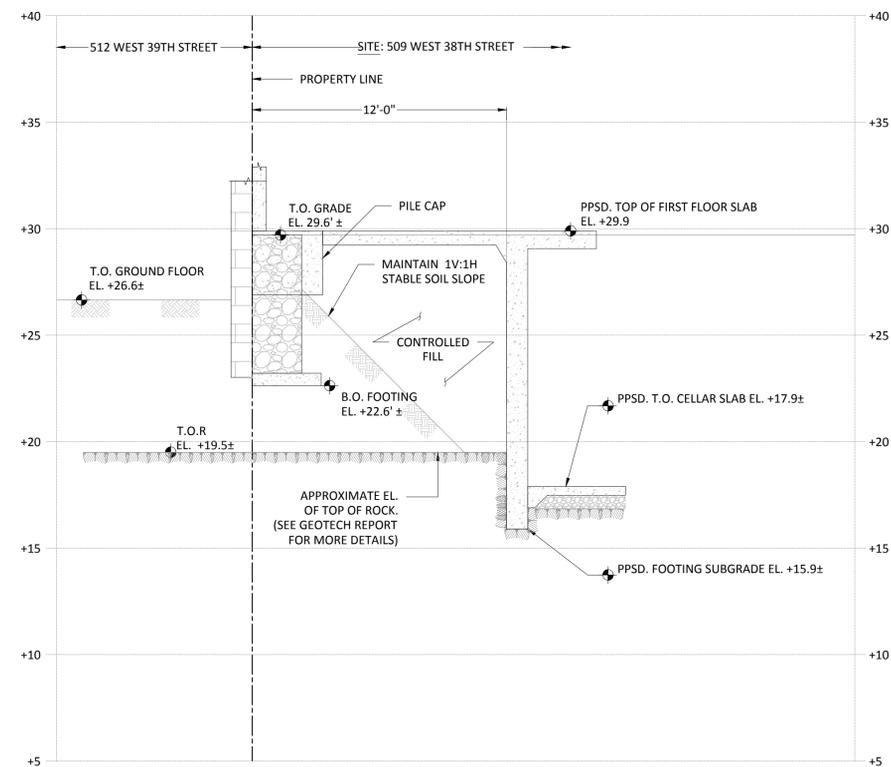
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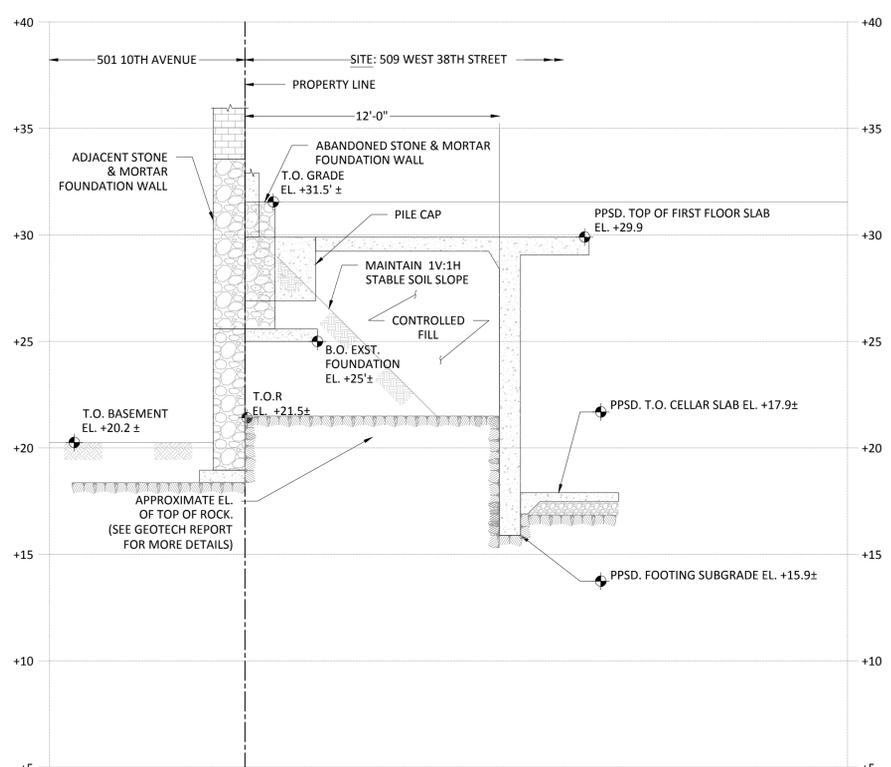
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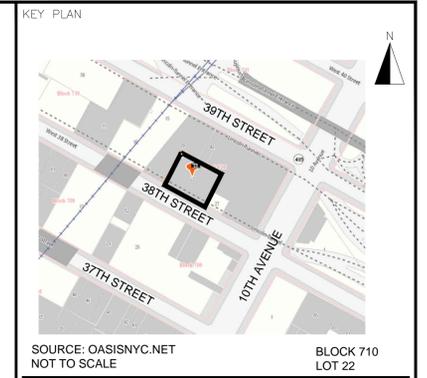
3 SECTION
Scale: 1/4" = 1'-0"



4 SECTION
Scale: 1/4" = 1'-0"



5 SECTION
Scale: 1/4" = 1'-0"



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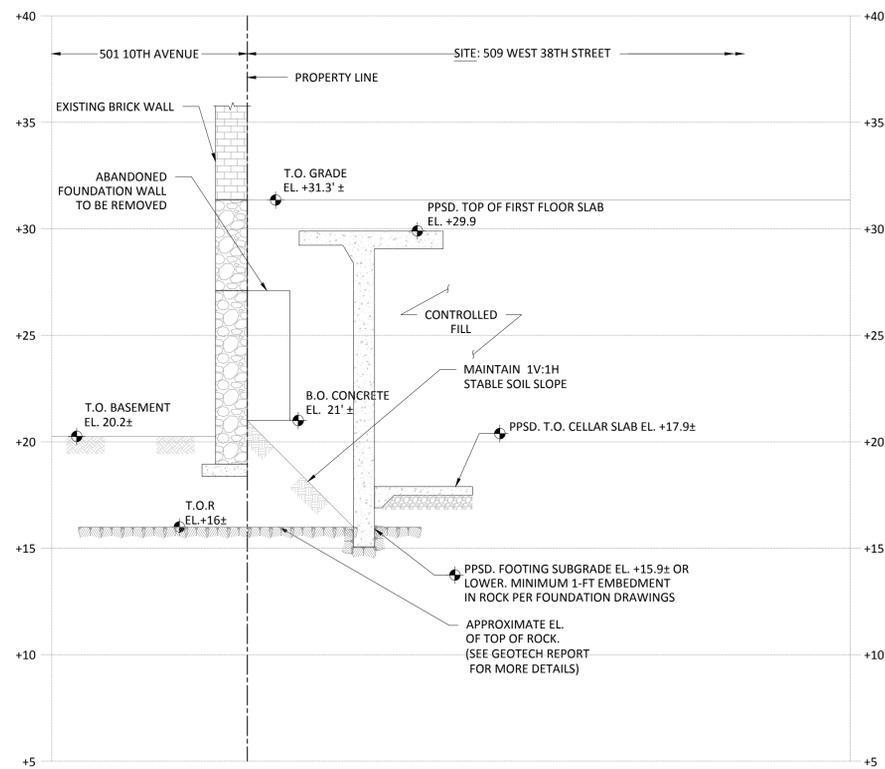
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PROJECT
**509 WEST 38TH STREET
NEW YORK, NY**
TITLE
**SUPPORT OF EXCAVATION
SECTIONS**

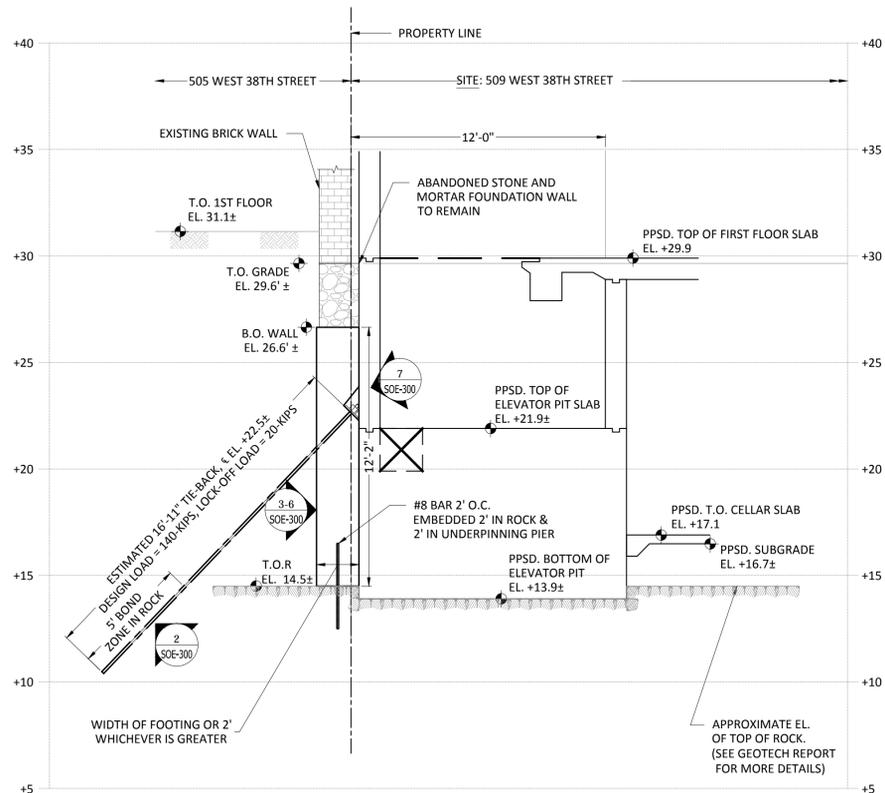
RA CONSULTANTS LLC
Geotechnical Engineering
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[T] 646.484.3250 [F] 201.374.1795 WWW.RACLCC.COM

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	DRAWN BY: JH / JJC
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	SHEET: 4 OF 7

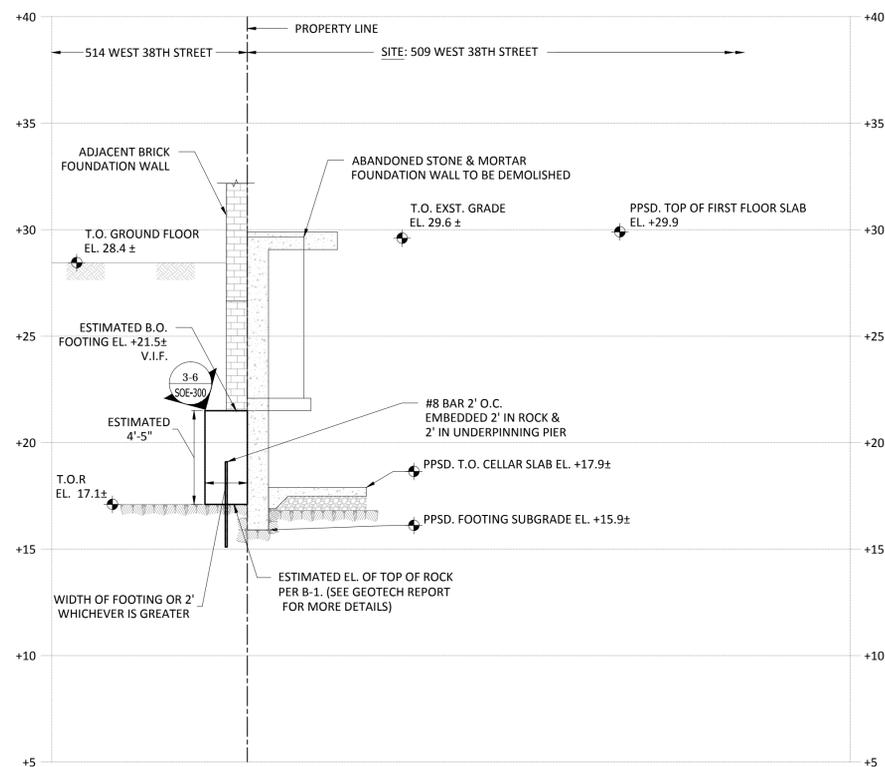
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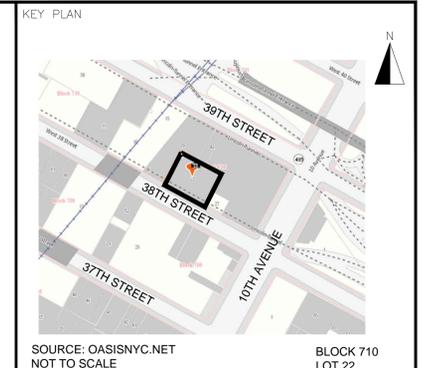
6 SECTION
Scale: 1/4" = 1'-0"



7 SECTION
Scale: 1/4" = 1'-0"



2.1 SECTION
Scale: 1/4" = 1'-0"



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NOT TO SCALE

BLOCK 710
LOT 22

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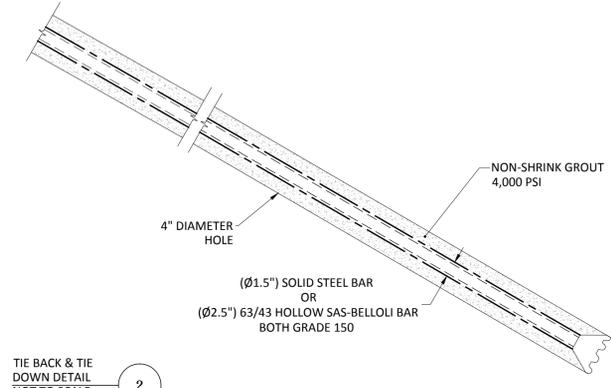
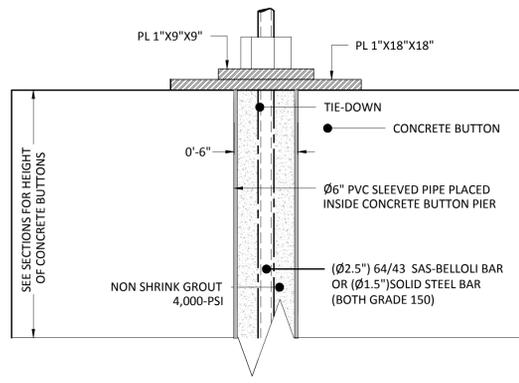
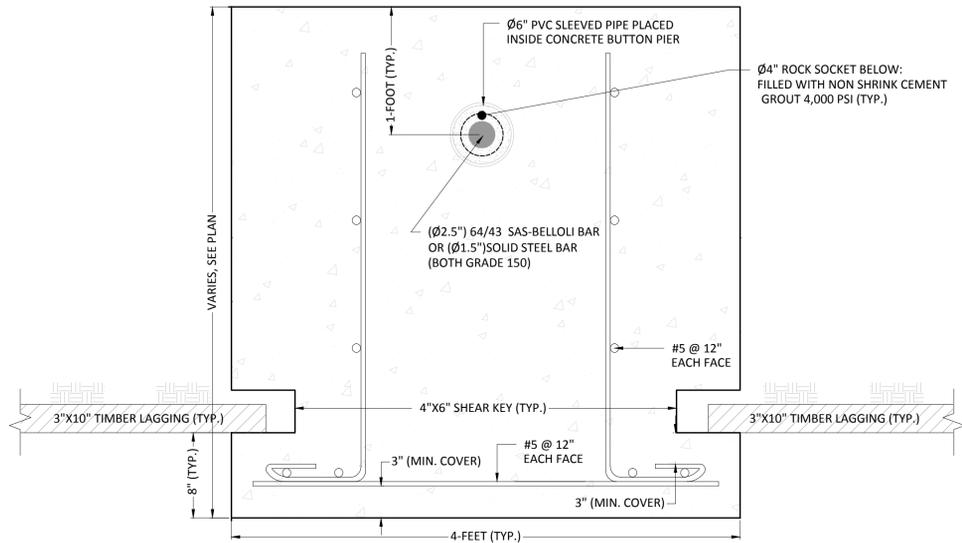
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	05/08/2014	ISSUED FOR COORDINATION

PROJECT
**509 WEST 38TH STREET
NEW YORK, NY**
TITLE
**SUPPORT OF EXCAVATION
SECTIONS**

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Geotechnical Engineering
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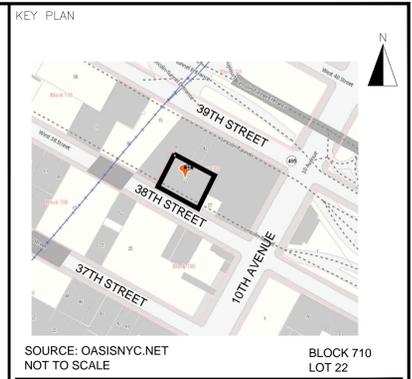
DATE: APRIL 4 2014
PROJ. NO.: 11C1115
DRAWN BY: JH / JJC
CHECKED BY: WJP
DRAWING:
SOE-202.00
SHEET: 5 OF 7



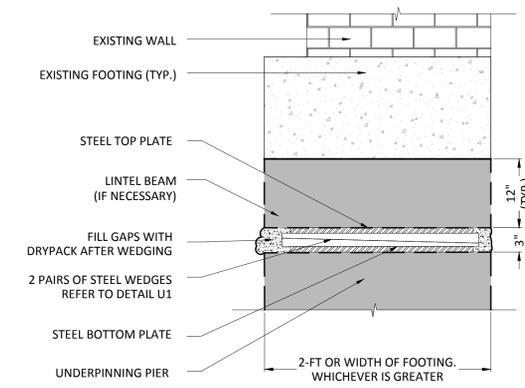
NOTES:
 1. REFER TO EXCAVATION SHORING UNDERPINNING AND BUTTONS NOTES (SOE-001) OR RA CONSULTANTS LLC FIELD RECOMMENDATIONS.
 2. USE TIMBER SHEETING TO FORM PIT. REFER TO DETAIL 5 ON SOE-300.

BUTTON PIER PLAN & SECTION
 NOT TO SCALE

TIE BACK & TIE DOWN DETAIL
 NOT TO SCALE



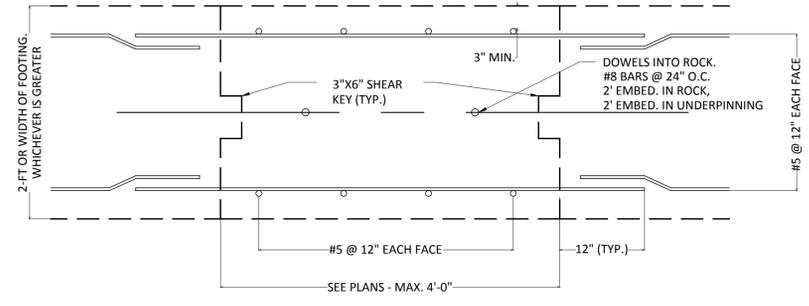
SOURCE: OASISNYC.NET
 NOT TO SCALE
 BLOCK 710
 LOT 22



- PIER CONSTRUCTION SEQUENCE:
- EXCAVATE PIT AND SIMULTANEOUSLY PLACE REQUIRED SHEETING AND BRACING. REFER TO DETAIL 6 ON SOE-300.
 - LOSS OF GROUND SHOULD BE KEPT TO A MINIMUM BY BACKFILLING BEHIND THE BOARDS WHERE AND WHEN POSSIBLE WITH GROUT PUMPED INTO THE VOIDS. PACK VOIDS BETWEEN SHEETING AND SOIL WITH SOIL CEMENT.
 - CLEAN BOTTOM OF EXISTING FOOTING. IF BOTTOM OF EXISTING FOOTING IS SMOOTH AND LEVEL, RA CONSULTANTS LLC MAY ACCEPT NOT CONSTRUCTING THE LINTEL BEAM.
 - PREPARE SUBGRADE FOR INSPECTION.
 - AFTER SUBGRADE INSPECTION, INSTALL REINFORCING STEEL AS REQUIRED.
 - FORM VOID FOR PLATES AND WEDGES USING STYROFOAM.
 - POUR CONCRETE UNDER PRESSURE HEAD AND VIBRATE. IF LINTEL BEAM IS CONSTRUCTED, PROVIDE FULL CONTACT WITH BOTTOM OF FOOTING.

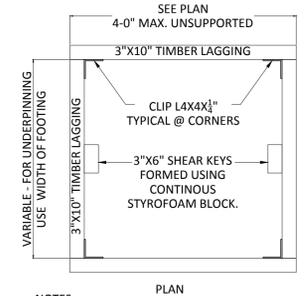
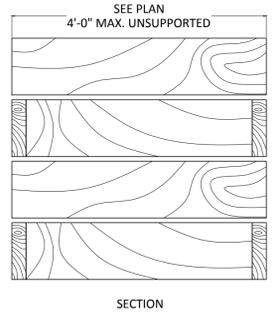
- CONCRETE SURFACES IN TOUCH WITH STEEL PLATES SHALL BE SMOOTH AND LEVEL.
- WAIT FOR CONCRETE TO CURE.
 - REMOVE STYROFOAM FOR PLATES AND WEDGES.
 - LEVELING GROUT SHALL CONSIST OF CEMENT AND WATER MIX.
 - INSTALL STEEL TOP PLATE (1"x20"x3'-8" VAR.) IN THE TOP OF THE POCKET. PROVIDE LEVELING GROUT AS NECESSARY BETWEEN TOP PLATE AND BOTTOM OF FOOTING OR LINTEL BEAM.
 - INSTALL STEEL BOTTOM PLATE (1/2"x20"x3'-10" VAR.) ADD STEEL PLATES AS NECESSARY TO MAKE HEIGHT.
 - PLACE AND DRIVE WEDGES BETWEEN STEEL TOP PLATE AND STEEL BOTTOM PLATE. WEDGES SHALL BE PLACES 2-FT ON CENTER AND SHALL BE CENTERED UNDER THE FOOTING OR LINTEL BEAM.
 - REPEAT PIER CONSTRUCTION SEQUENCE FOR ADJACENT PIERS.
 - DRY PACK VOID BETWEEN WEDGES.

UNDERPINNING DETAIL WITHOUT JACKING POCKET
 NOT TO SCALE



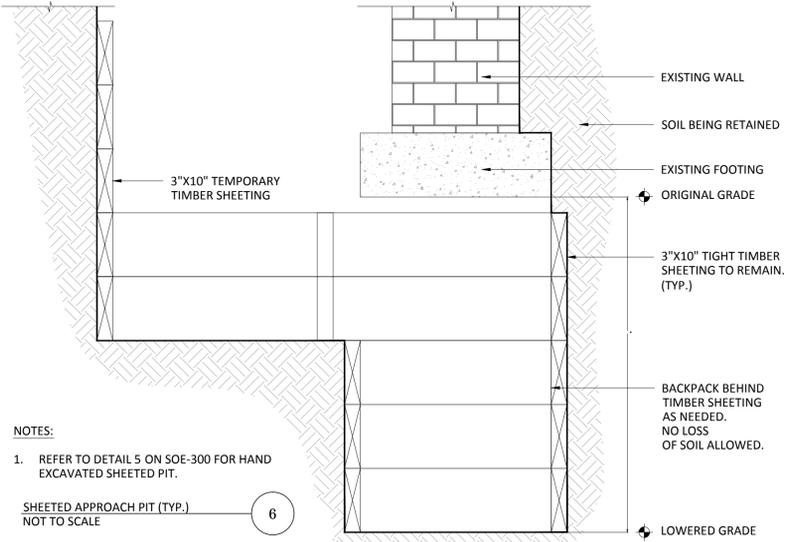
- NOTES:
 1. WEDGE OR JACK AND WEDGE BASED ON UNDERPINNING SEQUENCE (SOE-100) OR RA CONSULTANTS LLC FIELD RECOMMENDATIONS.
 2. USE TIMBER SHEETING TO FORM PIT.

UNDERPINNING PIER PLAN
 NOT TO SCALE



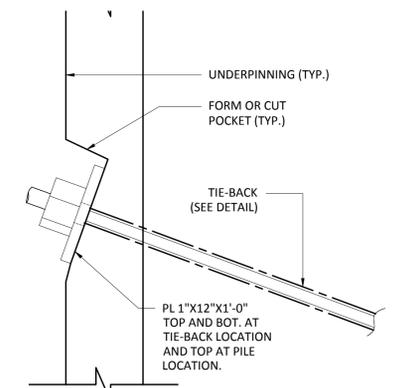
- NOTES:
 1. USE SHEAR KEYS FOR UNDERPINNING PITS ONLY.
 2. ALTERNATE SHEETING CONSTRUCTION IS ALLOWED IF APPROVED BY RA CONSULTANTS LLC.
 3. LUMBER SIZED IN ACCORDANCE WITH TABLE 3304.4.1.1 OF THE 2008 NEW YORK CITY BUILDING CODE.
 4. REFER TO DETAIL 6 ON SOE-300 FOR SHEETED APPROACH PIT.

HAND EXCAVATED SHEETED PIT (TYP.)
 NOT TO SCALE



- NOTES:
 1. REFER TO DETAIL 5 ON SOE-300 FOR HAND EXCAVATED SHEETED PIT.

SHEETED APPROACH PIT (TYP.)
 NOT TO SCALE



TIE-BACK TO UNDERPINNING CONNECTION DETAIL (TYP.)
 NOT TO SCALE

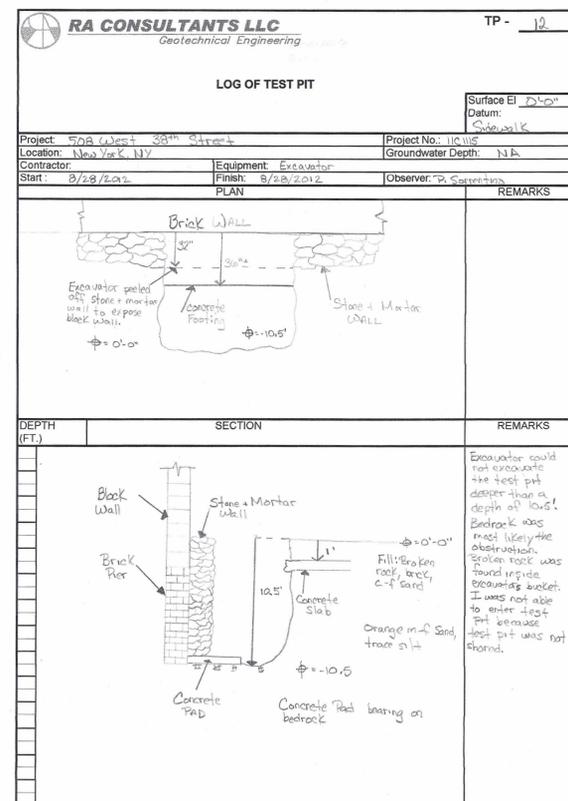
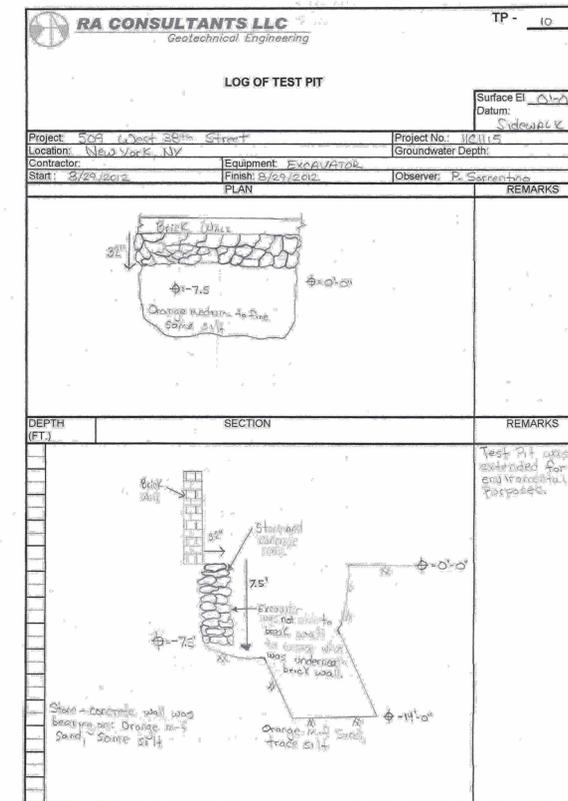
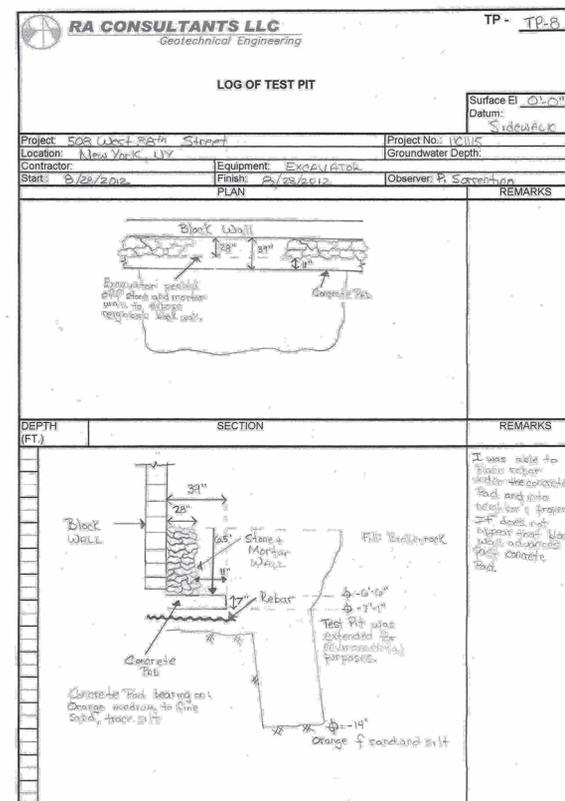
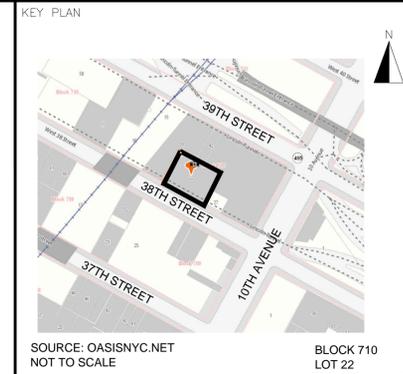
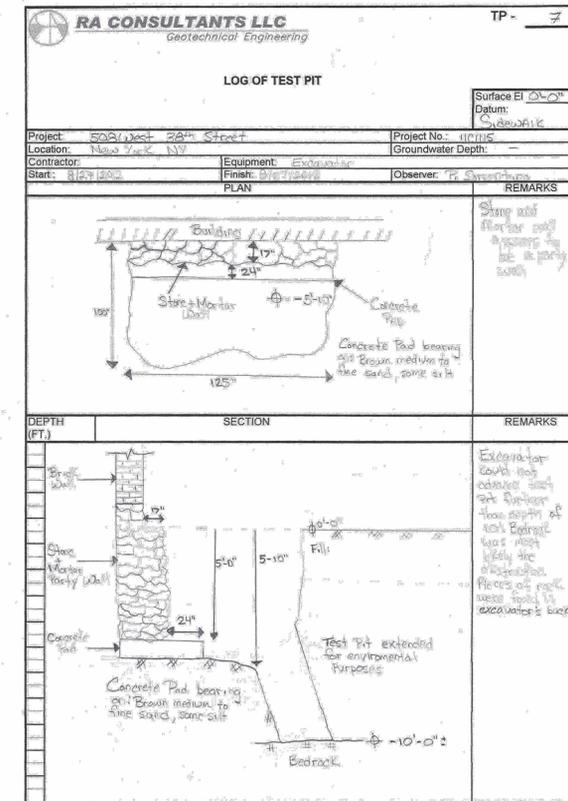
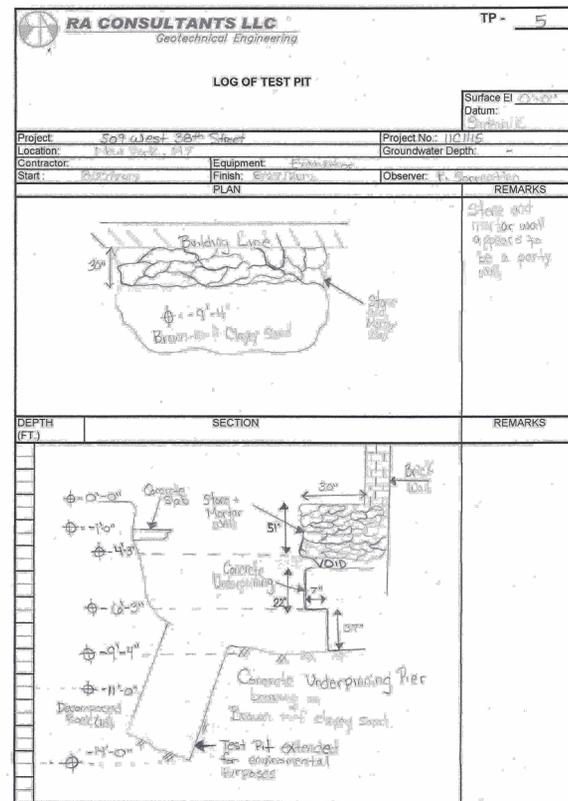
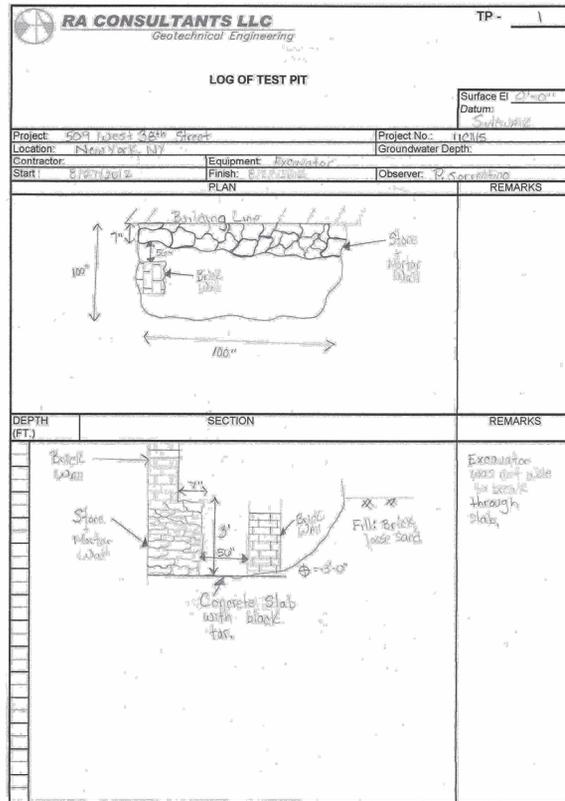
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PROJECT
509 WEST 38TH STREET
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DETAILS

RA CONSULTANTS LLC
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DATE: APRIL 4 2014
 PROJ. NO.: 11C1115
 DRAWN BY: JH / JJC
 CHECKED BY: WJP
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SOE-300.00
 SHEET: 6 OF 7



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REV.	DATE	DETAILS
	06/13/2014	FOUNDATION BID SET
	05/14/2014	ISSUED FOR FILING
	05/08/2014	ISSUED FOR COORDINATION

PROJECT

**509 WEST 38TH STREET
NEW YORK, NY**

TITLE

TEST PIT LOGS

RA CONSULTANTS LLC
Geotechnical Engineering

512 SEVENTH AVENUE
[T] 646.484.3250 [F] 201.374.1795

NEW YORK, NY 10018
WWW.RACLCC.COM

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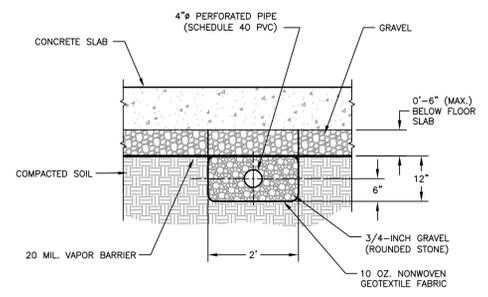
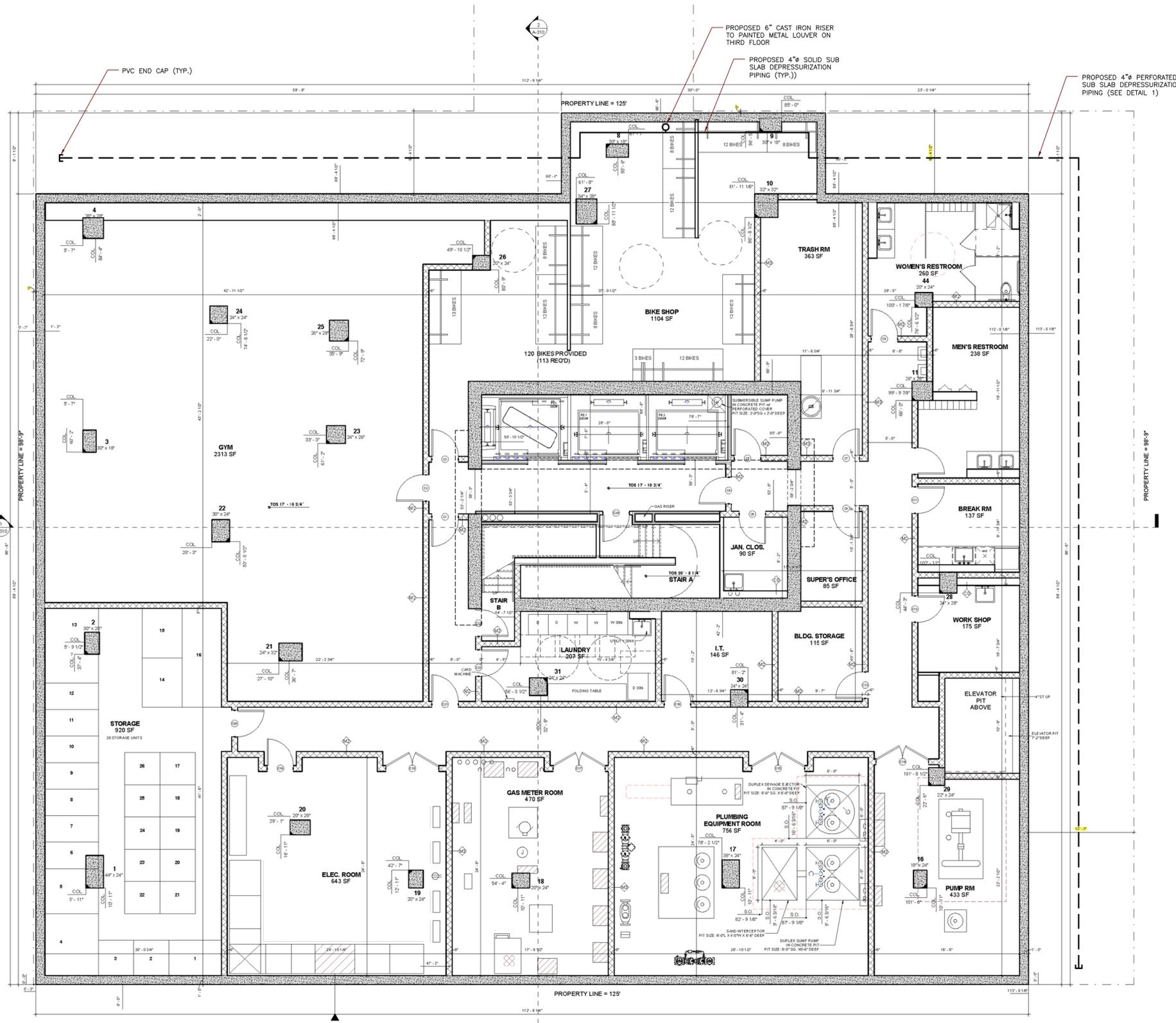
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SHEET: 7 OF 7

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Sub-Slab Depressurization System



1 SUB-SLAB DEPRESSURIZATION SYSTEM - PIPE DETAIL
SCALE: NOT TO SCALE

SUB SLAB DEPRESSURIZATION SYSTEM PLAN
SCALE: 1" = 6'

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Remedial
REMEDIAL ENGINEERING, P.C.
209 Shafter Street
Islonia, New York 11749 (631) 232-2600

PROJECT NAME:
509 W 38TH STREET
509 W 38TH STREET, NEW YORK, NY
PROJECT FOR:
ELB HOLDINGS HY 38 OWNER, LLC
745 5TH AVENUE, 3RD FLOOR, NEW YORK, NY

TITLE:
SUB-SLAB DEPRESSURIZATION SYSTEM

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NO.	DATE	REVISION DESCRIPTION	INT.

CLIENT/PROJECT HY 38 OWNER, LLC

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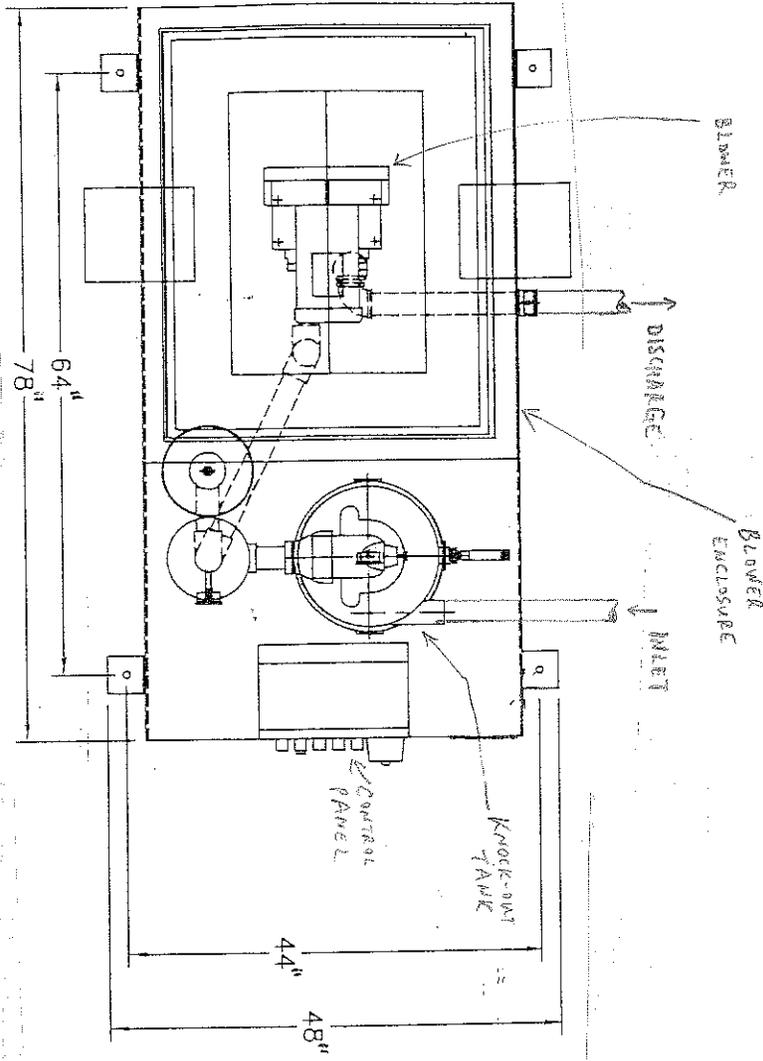
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PROJECT NO. 2414.000/1000

CHECKED BY _____ DATE _____

DESCRIPTION TYPICAL BLOWER SKID DETAILS

PLAN VIEW



CLIENT/PROJECT HY 38 OWNER, LLC

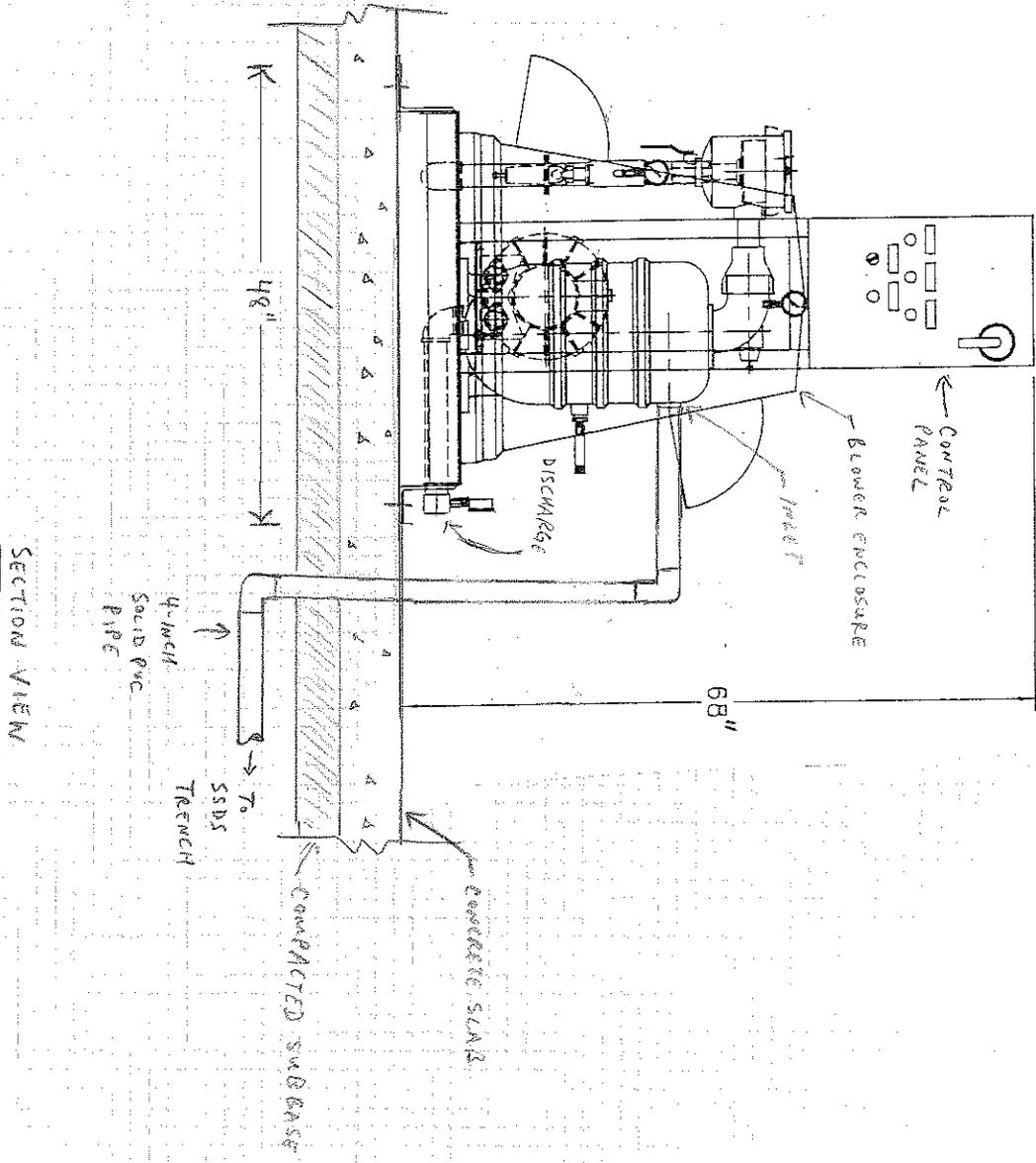
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BY _____ DATE _____

PROJECT NO. 2414.000/000

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DESCRIPTION TYPICAL BLOWER SKID DETAILS



1. Citizen Participation Plan
2. Sustainability Statement
3. Soil/Materials Management Plan
4. Construction Health and Safety Plan
5. Proposed Development Plans (see Figures 3, 7)
6. Sample Hazardous or Non-Hazardous Soil Disposal Manifest
7. Specifications for Vapor Barrier/Waterproofing Membrane
8. Specifications for Sub-Slab Depressurization System

Citizen Participation Plan

APPENDIX 1

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and HY 38 Owner, LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, HY 38 Owner, LLC, HY 39 Owner, LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Rebecca Bub, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 341-2073.

Project Contact List. OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. HY 38 Owner, LLC, HY 39 Owner, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Columbus Library

742 10th Avenue, New York, NY (between 50th and 51st Street)

Repository Telephone Number: (212) 586-5098

Repository Hours of Operation:

Monday: 10:00AM- 6:00PM

Tuesday: 10:00AM- 6:00PM

Wednesday: 10:00AM- 7:00PM

Thursday: 10:00AM- 6:00PM

Friday: 10:00AM- 5:00PM

Saturday: 10:00AM- 5:00PM

Sunday: CLOSED

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Identify Issues of Public Concern. There are no known issues of concern to stakeholders at this time.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository

information, and important phone and email contact information. All notices will be prepared by HY 38 Owner, LLC/ HY 39 Owner, LLC, reviewed and approved by OER prior to distribution and mailed by HY 38 Owner, LLC/ HY 39 Owner, LLC. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

Sustainability Statement

APPENDIX 2

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (0 tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (0 tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Storm-water Retention. Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Brownfield Cleanup Program. HY 38 Owner, LLC/ HY 39 Owner, LLC is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. HY 38 Owner, LLC/ HY 39 Owner, LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

Soil/Materials Management Plan

APPENDIX 3

SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 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 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 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.

1.3 Characterization of Excavated Materials

Soil/fill 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. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out and Departure

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

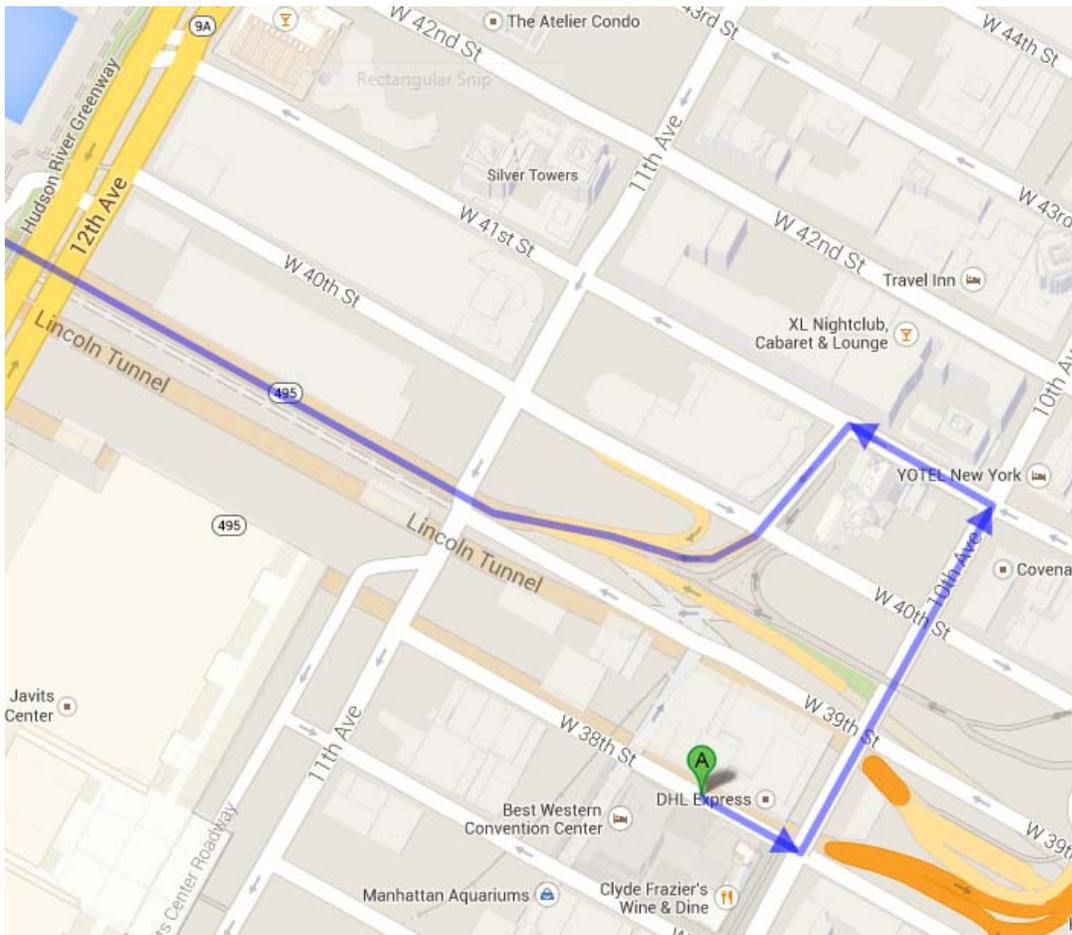
Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 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 will include proceeding north on Tenth Ave- turning left on to West 41st St. and then turning left into the Lincoln Tunnel entrance. 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.



1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the

PE/QEP or Enrollee 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 Manhattan, 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 Enrollee. The letter will include as an attachment a summary of all 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 RAR.

The Remedial Action Report 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 RAR.

All impacted soil/fill or other waste excavated and removed from the Site 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 RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Tables 1 through 5. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to

Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed. No soil is expected to be reused onsite.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 Demarcation

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill 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 soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover 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 RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 import of Backfill Soil from Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. Four hundred tons of imported fill material is anticipated to be brought onsite.

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:

- 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;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR 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 is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; 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 minimum frequency of one sample for every 500 cubic yards of 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 the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 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 (NYC DEP). The NYC DEP 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 NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 Storm-water 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 RAWP (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 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 toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 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 OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semivolatiles, TCL pesticides and PCBs, as appropriate.

1.13 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. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

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. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

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.

Construction Health and Safety Plan

September 12, 2014

CONSTRUCTION HEALTH AND SAFETY PLAN

**509 West 38th Street / 512 West 39th Street
New York, New York 10001**

Prepared for

**ELB HOLDINGS
745 Fifth Avenue
New York, New York 10151**

ROUX ASSOCIATES, INC.

Environmental Consulting & Management



209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

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1.0 INTRODUCTION

This Site-specific Construction Health and Safety Plan (construction HASP) has been prepared to address activities to be performed during the implementation of the Remedial Action Work Plan (RAWP) at the property identified as 509 38th Street/512 39th Street, in the Hell's Kitchen neighborhood of Manhattan, New York (Site). The Site is identified as Block 710, Lots 22 and 42 on the New York City tax maps. Relevant portions of Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 and 1926.62 were used as guidance while preparing this construction HASP.

The designated Site Health and Safety Officer (SHSO) will be responsible for implementing the construction HASP. Compliance with this construction HASP is required of all workers who may potentially encounter fill at the Site (hereinafter referred to as Site Workers), including the Contractor's employees, subcontractors to the Contractor, subcontractors to the Owner's representative, and onsite workers for the Construction Manager. In the event that a Site Worker does not follow these procedures, he or she will be required to leave the Site immediately. The content of this construction HASP may change or undergo revisions based upon changes in the technical scope of work, the results of monitoring, and/or additional information made available to health and safety personnel. Any proposed changes must be reviewed and approved by the Corporate Safety Supervisor, and the SHSO implementing the changes to the construction HASP.

Upon entering the Site, all visitors will be required to sign in and read and comply with the provisions of this construction HASP. In the event that a visitor does not follow these procedures, he or she will be required to leave the Site immediately.

1.1 Scope of Work

The planned redevelopment of the Site entails the construction of a mixed-use development that includes a thirty-story mixed use (commercial and residential) building with a cellar. It is anticipated that the Site will be excavated down to approximately 14 feet below grade (bg). The planned redevelopment consists of a residential tower rising over a five-story base comprised of retail, community facility, and residential amenity uses. The ground floor will contain retail and two lobbies. One lobby will serve as the residential amenity and tower and a separate lobby will

serve the three floor community facility and one floor commercial located on the floors two through five. The residential component will include 225 units.

The Site area is approximately 14,900 square feet with 125 square footage of frontage along 38th Street and 25 square footage along 39th Street. Excavation ranges from 2 feet in areas of proposed slab-on-grade to 25 feet in the proposed elevator pit area. The entire site will be excavated to a minimum of 12 feet with the exception of setbacks on the northern, eastern, and western property lines which will be setback 12 to 15 feet. The foundation design is not yet complete, but is expected to consist of spread footings bearing on rock. Based on preliminary estimates, approximately 6,850 cubic yards (CY) of soil removal is anticipated for the development cut of Lot 22. Lot 42, which is currently a one-story storage facility, has no development plans finalized at this point.

1.2 Emergency and Project Management Contact Information

Provided below is a list of telephone numbers for use in the event of an emergency onsite.

Emergency Medical Service	911
<u>Police</u> : New York City Police Department (NYPD)	911
<u>Hospital</u> : Bellevue Hospital	212-562-4141
First Care and Occupational Health Clinic (For non-emergency medical services).....	631-435-0110
National Response Center	800-424-8802
Poison Control Center	800-222-1222
Chemtrec	800-262-8200
<u>Fire</u> : New York City Fire Department (FDNY)	911
New York City Office of Emergency Management	911
Center for Disease Control	800-311-3435
USEPA (Region II)	212-637-5000
NYSDEC Emergency Spill Response	800-457-7362

The following table includes the contact information for Site management and health and safety personnel.

Title	Contact	Company Name	Business Phone	Cellular Phone
General Superintendent	TBD	TBD	TBD	TBD
Site Superintendent	TBD	TBD	TBD	TBD
Corporate Safety Supervisor	Joseph Gentile	Roux	TBD	TBD
Site Health and Safety Officer	Wendy Shen	Roux	TBD	TBD
Construction Manager	TBD	TBD	TBD	TBD
Owner's Onsite Representative	TBD	TBD	TBD	TBD
Owner's Representative	TBD	TBD	TBD	TBD

1.3 Address of Bellevue Hospital

462 1st Avenue
 New York, New York
 212-562-4141

Directions from Site to New York Hospital Queens

From 38th Street:

- Head southeast on 38th Street toward 10th Avenue.
- Turn right at the 2nd cross street onto 9th Avenue.
- Turn left onto W 23rd Street.
- Turn left onto 1st Avenue.

Directions to the hospital are included on Figure 2. Directions to the First Care and Occupational Health Clinic are provided on Figure 3.

1.4 Emergency Equipment

The following is a list of emergency equipment to be kept onsite at all times:

- First Aid Kit
- ABC Fire Extinguisher
- Absorbent Pads
- Air Horns
- Oil Dry
- Eye Wash

1.5 Spills

Spills associated with Site activities may be attributed to project-specific heavy equipment and include gasoline, diesel, and hydraulic oil. In the event of a leak or a release, Site personnel will inform their supervisor immediately, locate the source of spillage, and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to Site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of Site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure that equipment is functioning properly. In the event of a spill, Site personnel will immediately notify the NYSDEC (1-800-457-7362) and a spill number will be generated.

2.0 HEALTH AND SAFETY STAFF

This section briefly describes the health and safety responsibilities for the excavation work to be implemented at the Site. The following staff is responsible for ensuring compliance with the HASP.

2.1 General/Site Superintendent (GSS) – TBD

- Has the overall responsibility for the health and safety of Site Workers.
- Ensures that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below.

2.2 Corporate Safety Supervisor (CSS) – Joseph Gentile

- Implements the HASP.
- Performs or oversees Site-specific training and approves revised or new safety protocols or field operations.
- Coordinates revisions of this HASP with GSS.
- Responsible for the development of new task safety protocols and procedures and resolution of any outstanding safety issues which may arise during the completion of Site work.

2.3 Site Health and Safety Officer (SHSO) – Wendy Shen

- Directs and coordinates health and safety monitoring activities.
- Ensures that field teams utilize proper personal protective equipment (PPE).
- Conducts initial onsite specific training prior to Site Workers commencing work.
- Conducts and documents daily and periodic safety briefings.
- Ensures that field team members comply with this HASP.
- Immediately notifies the GSS and CSS of all accident/incidents.
- At the end of each day, communicates the tasks completed to the designated representatives, the next day's planned activities, any third party issues, changes of work plans, and/or changes in level of PPE.
- Determines upgrading or downgrading of PPE based on Site conditions and/or real time monitoring results.

- Ensures that monitoring instruments are calibrated daily or as the manufacturer's instructions determine.
- Reports to the GSS and CSS to provide summaries of field operations and progress.
- Submits and maintains all documentation required in this HASP and any other pertinent health and safety documentation.

2.4 Site Workers

- Reports any unsafe or potentially hazardous conditions to the SHSO.
- Maintains knowledge of the information, instructions, and emergency response actions contained in the HASP.
- Complies with rules, regulations, and procedures as set forth in this HASP, including any revisions that are instituted.
- Prevents admittance to work Site by unauthorized personnel.

3.0 SITE DESCRIPTION AND BACKGROUND

The Site is identified as Block 710, Lots 22 and 42 on the New York City tax maps. The Site is located on the west side of 10th Avenue between the corners of West 38th Street and West 39th Street.

Lot 22 has been improved with commercial developments since at least 1890 and was developed with the last building structure sometime prior to 1911. Past uses included a bakery, a dyeing facility, and other commercial uses including a dry cleaning facility from 1992 to 1997. The former building was renovated between 2000 and 2001 and has since been used as a music recording studio and equipment rental facility. Lot 22 was occupied by a three-story building with a partial cellar that was demolished in July 2012, and is currently bordered by one-and four-story brick or masonry structures. The former building included a partial basement with mechanical rooms and storage; ground floor with production studios, offices, reception area, equipment rental, and garage; second floor with storage and apartment; and third floor with a recording studio.

Based on previous Phase I and II Environmental Site Assessments (ESA) performed at Lot 22, five 275-gallon ASTs and an approximately 2,000-gallon vaulted AST were removed from the property in August 1998. Additionally, a 2,000-gallon UST was removed from the property in October 2012.

Lot 42 was previously a 5-story residence from at least 1890 until the 1930s. By 1950, the residential building had been replaced with a 1-story commercial building that was used for tire storage (1950), machine shop (1976-1993) and auto repair (1994-2005).

Building Department records indicate both Lots have an E-designation for underground storage tanks testing protocol (hazmat) and window wall attenuation and alternate ventilation (noise).

The AOCs identified for this site include:

1. Lot 22 was a former dry cleaner between 1992 and 1997.
2. Past use of lot 22 as a dyeing facility.
3. Evidence of former USTs and ASTs identified during the ESA. One historical 2,000-gallon fuel oil UST was removed from the former garage area in Lot 22 in

July 2012. Five historical 275-gallon ASTs and one historical 2,000-gallon vaulted AST were removed from the southwestern portion of Lot 22 in August 1998.

4. Past use of lot 42 as a machine shop and auto repair facility.
5. Historic fill material.

3.1 Summary of Environmental Conditions

1. Elevation of the property ranges from 24 to 29 feet.
2. Depth to groundwater ranges from 7 to 10 feet at the Site.
3. Groundwater flow is generally from west to southwest beneath the Site.
4. Depth to bedrock ranges from 6 to 20 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of 4 to 11 feet of historic fill containing varying amounts of gravel, boulders, brick, and concrete underlain by 5 to 10 feet of brown fine to medium sand with silt, gravel, some clay underlain by bedrock.
6. Soil/fill samples collected during the RI showed zones of petroleum contaminated material exhibiting staining, odor, and/or elevated total VOCs in selected test pits located in the southeastern portion of the Site (Lot 22). End point samples (# 1 through 4) collected at 14 feet bg indicate that no compounds exceeded the NYSDEC Part 375 Restricted Commercial Soil Cleanup Objectives (SCOs). Soil samples collected from two soil borings in Lot 42 of the Site exhibited concentrations of various SVOCs and metal (barium) exceeding NYSDEC Part 375 Restricted Commercial SCOs in the upper zone (0.5 to 5.5 feet bg).
7. No groundwater samples were collected during the 2012 RI. Groundwater samples collected during the 2014 RI were compared to NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). Laboratory analysis of groundwater indicated that some VOCs, SVOCs, and metals exceeded the AWQS in some locations. Total VOC concentrations in the wells ranged from 9.8 micrograms per liter ($\mu\text{g/L}$) in MW-4 to 1,240 $\mu\text{g/L}$ in MW-2.
8. Soil vapor samples collected were compared to the compounds listed in Table 3.1 Air Guideline Values in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion. Soil vapor samples collected during the 2012 RI (SV-1 through SV-4) indicated that chlorinated VOCs were present in all samples.

4.0 POTENTIAL HAZARDS RELATED TO FILL/SOIL/GROUNDWATER

This section provides a brief summary of the potential Compounds of Concern and related hazards at the Site.

4.1 General

The following information is presented in order to identify the types of materials that may be encountered at the Site. The detailed information on these materials was obtained from:

- Sax's Dangerous Properties of Industrial Materials – Lewis Eighth Edition;
- Chemical Hazards of the Workplace – Proctor/Hughes;
- Condensed Chemical Dictionary – Hawley;
- Rapid Guide to Hazardous Chemicals in the Workplace – Lewis 1990;
- NIOSH Pocket Guide to Chemical Hazards – 1996; and
- ACGIH TLV Values and Biological Exposure Indices, OSHA 29 CFR 1910.1000.

4.2 Compounds of Concern

Based on the sampling results, some VOCs, SVOCs, and metals were detected at concentrations above regulatory standards in soil and groundwater. A list of Material Safety Data Sheets for the respective compounds of concern is included in Appendix A. The Summary of Toxicological Data is found in Table 1 and is provided for review of chemicals that may be encountered. The Summary of Toxicological Data Sheets provides information such as the chemicals characteristics, health hazards, protection, and exposure limits. Material Safety Data Sheets (MSDSs) for products that have been identified at the Site are available for review by Site personnel (Appendix A).

4.3 Hazard Assessment

The potential to encounter hazards related to surficial soil and groundwater is dependent upon the type of work activity performed and the duration and location of the work activity. Since groundwater will be encountered (based on building plans) potential environmental hazards at the Site include ingestion and/or skin contact of groundwater and particulates containing surficial and native soil.

Prior to the beginning of each new phase of work, job safety analysis (JSA) (Appendix C) will be prepared by the SHSO with assistance from the GSS/CSS. The JSAs will address the hazards for each activity performed in the phase and will present the procedures and safeguards necessary to eliminate the hazards or reduce the risk.

The potential for Site Workers to be exposed to chemical hazards may occur during excavation, truck, and equipment cleaning activities.

4.4 Exposure Pathways and Assessment

Exposure to these compounds during ongoing activities may occur through inhalation of dust particles, inhalation of VOCs, SVOCs, metals by way of dermal absorption and accidental ingestion by either direct or indirect cross-contamination activities. For groundwater, the most common exposure may occur via accidental ingestion or dermal absorption. For chronic and acute toxicity data, refer to Summary of Toxicological Data Sheets (Table 1) and MSDSs (Appendix A) for further details on compound characteristics.

Inhalation of VOCs, SVOCs, metals, and dust particles can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation and loading of Fill or Site grading. Dust control measures such as applying water to roadways and excavations will be implemented when visible dust is generated, in accordance with this construction HASP. Where dust control measures are not feasible or effective, respiratory protection will be used (see Section 7.0 for monitoring procedures and action levels).

4.5 Additional Precautions

Dermal absorption or skin contact with Site soils is possible during intrusive activities at the Site. The use of PPE and proper vehicle and Site Worker cleaning procedures should significantly reduce the risk of skin contact. The potential for accidental ingestion of Site soils/groundwater is expected to be remote when good hygiene practices are used.

4.6 Physical Hazards

A variety of physical hazards may be present during Site activities. These hazards are similar to those associated with any construction-type project and include equipment operation and

hazardous walking and working surfaces. The referenced hazards are not unique and are generally familiar to most hazardous waste site workers at construction sites. Task-specific safety requirements for each phase will be covered during safety briefings.

4.6.1 Heat Stress

Heat stress is a significant potential hazard, associated with the use of protective equipment in a hot weather environment. The human body is designed to function at a certain internal temperature. When metabolism or external sources (fire or hot summer day) cause the body temperature to rise, the body seeks to protect itself by triggering cooling mechanisms. The SSO will monitor the air temperature (as described later in this section) to determine potential adverse effects the weather can cause onsite personnel. Excess heat is dissipated by two means:

- Changes in blood flow to dissipate heat by convection, which can be seen as "flushing" or reddening of the skin in extreme cases.
- Perspiration, the release of water through skin and sweat glands. While working in hot environments, evaporation of perspiration is the primary cooling mechanism.

Protective clothing worn to guard against chemical contact effectively stops the evaporation of perspiration. Thus the use of protective clothing increases heat stress problems.

The major disorders due to heat stress are heat cramps, heat exhaustion, and heat stroke. Heat cramps are painful spasms, which occur in the skeletal muscles of workers who sweat profusely in the heat and drink large quantities of water, but fail to replace the bodies lost salts or electrolytes. Drinking water while continuing to lose salt tends to dilute the body's extracellular fluids. Soon water seeps by osmosis into active muscles and causes pain. Muscles fatigued from work are usually most susceptible to cramps.

Extreme weakness or fatigue, dizziness, nausea, and headache characterize heat exhaustion. In serious cases, a person may vomit or lose consciousness. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. Treatment is rest in a cool place and replacement of body water lost by perspiration. Mild cases may recover spontaneously with this treatment; severe cases may require care for several days. There are no permanent effects. As first aid treatment, the person shall be moved to a cool place.

Body heat should be reduced artificially, but not too rapidly, by soaking the person's clothes in water and fanning them.

Heat stroke is considered a medical emergency and is caused by the breakdown of the body's regulating mechanisms. The skin is very dry and hot with red mottled or bluish appearance. Unconsciousness, mental confusion, or convulsions may occur. Without quick and adequate treatment, the result can be death or permanent brain damage.

Steps that can be taken to reduce heat stress are:

- Acclimate the body. Allow a period of adjustment to make further heat exposure endurable.
- Drink more liquids to replace the body water lost during sweating.
- Rest is necessary and should be conducted under the direction of the SSO.
- Wear personal cooling devices. These are two basic designs; units with pockets for holding frozen packets and units that circulate fluid from a reservoir through tubes to different parts of the body. Both designs can be in the form of a vest, jacket, or coverall. Some circulating units also have a cap for cooling the head.

Heat stress is a significant hazard associated with using protective equipment in hot weather environments. Local weather conditions may produce conditions, which will require restricted work schedules in order to protect employees.

Appendix D contains procedures for heat stress; these will be used as a guideline and to provide additional information.

4.6.2 Cold Stress

Cold temperatures are a significant potential hazard. Examples of cold temperature hazards are frostbite and hypothermia.

Frostbite is the most common injury resulting from exposure to cold. The extremities of the body are most often affected. The signs of frostbite are:

- The skin turns white or grayish-yellow.
- Pain is sometimes felt early but subsides later. Often there is no pain.
- The affected parts feel intensely cold and numb.

Hypothermia is characterized by shivering, numbness, drowsiness, muscular weakness, and a low internal body temperature when the body feels extremely warm. This can lead to unconsciousness and death. With both frostbite and hypothermia, the affected areas need to be warmed quickly. Immersion in warm water is an effective means of warming the affected areas quickly. In such cases, medical assistance will be sought.

To prevent these effects from occurring, persons working in the cold shall wear adequate clothing and reduce the time spent in the cold area. The field SSO is responsible for determining appropriate time personnel shall spend in adverse weather conditions and will monitor this.

Appendix D, which contains the Heat and Cold Stress Guidelines, provides additional information.

4.7 Biological Hazards

The biological hazards, which have the potential to cause adverse health effects, are from exposure to domestic flies, mosquitoes, insects, animals and animal wastes, mold and bloodborne pathogens.

4.7.1 Insect Stings

Stings from insects are often painful, cause swelling and can be fatal if a severe allergic reaction such as anaphylactic shock occurs. If a sting occurs, the stinger should be scraped out of the skin, opposite of the sting direction. The area should be washed with soap and water followed by application of an ice pack.

If the victim has a history of allergic reaction, he shall be taken to the nearest medical facility. If the victim has medication to reverse the effects of the sting, it should be taken immediately.

If the victim experiences a severe reaction, a constricting band should be placed between the sting and the heart. The bitten area should be kept below the heart if possible. A physician shall be contacted immediately for further instructions.

4.7.2 Animals and Animal Wastes

Due to the site currently being vacant, there lies the potential for various wildlife at the site, including, but not limited to, pigeons, bats, mice, rats, squirrels, raccoons, and feral cats. Certain

animals can represent significant sources (vectors) of disease transmission. Precautions to avoid or minimize potential contact with (biting) animals (such as some of the above listed) or animal waste and/or deceased animals should be considered prior to all field activities. Rats, squirrels, raccoons, feral cats, and other wild animals can inflict painful bites which can also cause disease (as in the case of rabid animals). Site personnel should avoid contact with any of the above.

If contact occurs, be sure to clean the area thoroughly with soap and water as soon as possible. If a bite occurs, the area shall be cleaned thoroughly immediately with soap and water and medical attention shall be sought.

4.7.3 Bloodborne Pathogens

The majority of the occupational tasks onsite will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any bloodborne pathogen for onsite employees will be following an injury. When administering first aid care, there are potential hazards associated with bloodborne pathogens that cause diseases such as Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), Hepatitis A (HAV), Hepatitis C (HCV), or the Herpes Simplex Virus (HSV). An employee who has not received the appropriate certification should never execute first aid and/or CPR.

In order to minimize any potential pathogen exposure, all employees should use the hand washing facilities on a regular basis. Additionally, the following universal precautions shall be followed to prevent further potential risk:

- Direct skin or mucous membrane contact with blood shall be avoided.
- Open skin cuts or sores shall be covered to prevent contamination from infectious agents.
- Body parts shall be washed immediately after contact with blood or body fluids that might contain blood, even when gloves or other barriers have been used.
- Gloves and disposable materials used to clean spilled blood shall be properly disposed of in an approved hazardous waste container.
- First aid responders shall wear latex or thin mil nitrile gloves when performing any procedure risking contact with blood or body substances.
- Safety glasses with attached side shields will be worn to protect the eyes from splashing or aerosolization of body fluids.

- A CPR mask will be worn when performing CPR to avoid mouth-to-mouth contact.
- Appropriate work gloves will be worn to minimize the risk of injury to the hands and fingers when working on all equipment with sharp or rough edges.
- Never pick up broken glass or possible contaminated material with your unprotected hands.
- Never handle wildlife (living or deceased) encountered onsite.

4.8 Hazard Assessment and Mitigation

Task	Hazards	Risk of Exposure	Action Taken
Mobilization/Demobilization	Inhalation/ Skin Contact	Low	Proper PPE will be worn. No eating or drinking will be permitted in active work areas.
Excavation and Loading of Soil	Inhalation/ Skin Contact	Low	Proper PPE will be worn and Site Workers will remain upwind of excavation or loading areas, if possible. No eating or drinking will be permitted in active work areas.
Dewatering	Skin Contact	Low	Proper PPE will be worn. No eating or drinking will be permitted in active work areas.
Vehicle/Equipment Cleaning	Inhalation/ Skin Contact	Low	Proper PPE will be worn during vehicle cleaning and worker shall remain upwind, if possible. No eating or drinking will be permitted in active work areas.

5.0 TRAINING

This section details the training requirement for Site Workers.

5.1 Site-Specific Training

Prior to the commencement of field activities, the SHSO, GSS, or CSS will provide Site-specific training to all Site Workers. Site Workers will receive training that will specifically address the activities, procedures, monitoring, and equipment for Site operations. It will include Site layout, hazards, fire prevention and response, first aid equipment locations and emergency services at the Site, and will highlight all provisions contained within this construction HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. This training may be conducted in conjunction with other Site training or meetings.

5.2 Onsite Safety Meetings

Safety meetings will take place to discuss potential safety concerns for the upcoming activities. At a minimum, the appropriate field supervisors or foremen for all workers will conduct at least one formal daily safety meeting in the morning; however, additional meetings or briefings may be necessary as a result of changing conditions or modifying tasks. Copies of the daily safety meeting sign in sheet and a description of items discussed will be provided to the CSS and will be kept at the Site.

The meetings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits by the Contractor or other involved parties. These meetings may be conducted in conjunction with other Site training or meetings.

Visitors must be made aware of the hazards onsite in a Site-specific safety briefing and sign a statement indicating that they will comply with the applicable requirements of this HASP.

5.3 First Aid and CPR

The SHSO will identify those individuals having first aid and CPR training to assist with emergency medical treatment during field activities, if necessary. The training will be consistent with the requirements of the American Red Cross. Certification and appropriate training documentation will be kept with the Site Workers' records by the SHSO.

6.0 SITE CONTROL AND PERSONAL PROTECTIVE EQUIPMENT

This section provides a detailed description of the Site control measures and personal PPE procedures to be implemented at the Site. It is important to note that this construction HASP has been drafted to apply to work in Level D or modified Level D only. If the monitoring results require Level C protection or higher, all Site work will immediately cease until activities can be completed with workers trained in accordance with 29 CFR 1910.120.

6.1 Site Control

Based on the Site history and results of Roux Associates' investigations, VOCs, SVOCs and metals have been identified in surficial soil onsite. As such, the Site, from land surface down to 14 feet below land surface, will be considered the work area with respect to this construction HASP.

6.2 Personal Protective Equipment

The level of protection worn by Site Workers will be enforced by the SHSO. The level of protection may be upgraded at the discretion of the SHSO. All decisions on the level of protection will be based upon a conservative interpretation by the SHSO of the information provided by air monitoring results and/or other appropriate information. Any changes in the level of protection shall be recorded in the health and safety field logbook. If the level of respiratory protection needs to be upgraded, the Contractor will immediately contact the Construction Manager and Owner's Representative.

The level of PPE for work on the Site is Level D PPE, which includes the following:

- Work uniform (long pants, sleeved shirt)
- Hard hat
- Steel-toed, steel-shanked work boots
- Safety glasses
- Boot covers (as needed)
- Hearing protection (as needed)
- Reflective safety vest
- Work gloves (leather or cut-resistant)

If required by the SHSO, modified Level D PPE may also be used at the Site during specific activities, consisting of the following:

- Regular Tyvek coveralls (Poly-coated Tyvek as required)
- Outer gloves: leather, cotton, neoprene or nitrile (as required)
- Inner gloves: latex or nitrile (doubled) as required
- Chemical resistant boots over work boots (as required)
- Steel-toed, steel-shanked work boots
- Hard hat
- Safety glasses
- Hearing protection, as needed
- Reflective safety vest

6.3 Site Control for Unexpected Conditions

In the event that unexpected conditions or hazardous waste is encountered, thereby requiring workers trained in accordance with 29 CFR 1910.120, the following four-zone approach will be employed in order to prevent the spread of the contamination from the area containing the unexpected condition and to protect Site Workers. The four-zones include the Exclusion Zone, the Contamination Reduction Zone, the Remediated Zone, and the Support Zone. A stepped remedial approach will be managed and the zones modified as the work progresses. Each of the areas will be defined through the use of control barricades and/or construction/hazard fencing. A clearly marked delineation between the zones will be maintained. Signage will be posted to further identify and delineate these areas.

The following subsections describe the four zones that will be utilized in the event that unexpected conditions or contamination is discovered at the Site.

6.3.1 Exclusion Zone

The area where the unexpected condition is discovered would be considered the Exclusion Zone (EZ). All excavation and handling of contaminated materials generated as a result of the discovery of an unexpected condition would take place within the EZ. This zone will be clearly delineated by hay bales, jersey barriers, and/or similar methods. Safety tape may be used as secondary delineation within the EZ. The zone delineation markings may be opened in areas for

varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Site Workers will not be allowed in the EZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification

6.3.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the EZ and the property limits. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of Site Workers and equipment. The CRZ will be used for general Site entry and egress, in addition to access for heavy equipment and emergency support services. Site Workers will not be allowed in the CRZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification

6.3.3 Remediated Zone

A Remediated Zone (RZ) will be established in portions of the Site where the remediation has been completed and only general construction work will be performed. Setup of the RZ will consist of implementing several measures designed to reduce the risk of workers' exposure and prevent non-trained workers from entering the non-remediated zone. Non-trained workers will work only in areas where the potential for exposure has been minimized by removal of all hazardous materials. The remediated zone will then be separated from the non-remediated zone by installing and maintaining temporary plywood or other construction fences along the boundary between the two zones. If potentially impacted material is uncovered in the RZ, all non-trained workers will be removed, and the SHSO will assess the potential risks. If, at any other time, the risk of exposure increases while non-trained workers are present in the RZ, the non-trained workers will be removed. At all times, when non-trained workers are present in the RZ, air

monitoring for the presence of VOCs will be conducted in the RZ, as well as at the fence line of the non-remediated zone.

6.3.4 Support Zone

The Support Zone (SZ) will be an uncontaminated area that will be the field support area for the Site operations. The SZ will contain the temporary project trailers and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated Site Workers or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. Meteorological conditions will be observed and noted from this zone, as well as those factors pertinent to heat and cold stress.

7.0 MONITORING PROCEDURES

A Community Air Monitoring Plan (CAMP) will be implemented onsite, in which particulates and VOCs will be monitored at the perimeter of the work area during ground intrusive activities. VOCs will be monitored since previous Site investigations identified the presence of VOCs in site soils and groundwater. The design of the CAMP is intended to provide a measure of protection for the downwind community and onsite workers not directly involved with the subject work activities from potential airborne contaminant releases as a direct result of remedial work activities. Additional information regarding the CAMP is provided in Appendix B. Monitoring will be performed to verify the adequacy of the Level D respiratory protection, to aid in Site layout, and to document monitoring results. If air monitoring in these areas indicates the presence of potentially hazardous materials, control measures will be implemented. All monitoring instruments shall be operated by qualified personnel only and will be calibrated prior to use daily or more often, as necessary. No excavation or truck loading activities will be performed without the presence of the SHSO or designated approved substitute at the Site, and without air monitoring. The SHSO is responsible for ensuring that appropriate monitoring, levels of protection, and safety procedures are followed.

7.1 Instrumentation

The following monitoring instruments supplied by the Contractor will be available for use during field operations, as necessary. There will be a minimum of one of each piece of equipment on the Site at all times:

- Photoionization Detector (PID): 10.6 EV probe, Flame Ionization Detector (FID), or equivalent.
- Dust/Particulate Monitor (DM): MIE Miniram, or equivalent.
- A PID and/or FID equipped organic vapor meter shall be used to monitor VOCs in and around active work areas during excavation and truck loading activities. VOCs shall also be measured upwind of the work areas to determine background concentrations.

A particulate monitor shall be used to measure concentrations of dust and particulate matter in and around the active work areas. Particulates shall also be measured upwind of the work areas to determine background concentrations.

All instruments shall be calibrated daily prior to use in accordance with the manufacturer's procedures. Calibration records shall be documented and recorded daily.

The frequency of monitoring should be determined by the SHSO after consultation with the CSS/GSS. The rationale for any modification must be documented and maintained by the SHSO in the onsite health and safety files.

7.2 Action Levels

Action levels for the upgrading of PPE requirements in the construction HASP will apply to all Site work during excavation and truck loading activities at the Site. These action levels are for known contaminants measured using direct reading instruments in the Breathing Zone (BZ) for VOCs and particulates. The BZ will be determined by the SHSO, but is typically 4 to 5 feet above the work area surface or elevation. A decision-making protocol for an upgrade in levels of protection and/or withdrawal of personnel from an area based on exposure levels is outlined in Table 2.

An air horn will be readily available in the Site trailer. An additional air horn will be located in the work area to alert Site Workers to an emergency situation. In the event of an emergency or the need to upgrade the level of personal protection, sharp blasts of the air horn will be sounded. If the level of respiratory protection needs to be upgraded, the Contractor will immediately contact the Construction Manager and Owner's Representative.

8.0 VEHICLE/SITE WORKER CLEANING AREAS AND DISPOSAL PROCEDURES

This section details the specific vehicle/Site Worker cleaning and waste disposal procedures to be implemented at the Site during the excavation and truck loading activities.

8.1 Contamination Prevention

Contamination prevention should minimize worker exposure and help to avoid spreading Site derived soil onto the public roadways. Procedures for prevention include:

Site Workers

- Do not walk through areas of soil.
- Do not directly handle or touch soil.
- No eating or drinking in the soil areas.
- Particular care should be taken to protect any skin injuries.
- Stay upwind of dust.
- Do not use cigarettes, cosmetics, gum, etc., in areas of soil.

Heavy Equipment

- Care should be taken to limit the amount of soil that comes in contact with heavy equipment (tires).
- If tools used in soil are to be placed on equipment for transport to an area where all soil has been removed or to be cleaned, plastic should be used to keep the equipment clean.
- Dust control measures, including water misting, will be used on roads inside the Site boundaries.

8.2 Site Worker Cleaning Procedures

All Site Workers shall pass through a cleaning procedure when exiting the active work areas in the Fill; including washing their hands and removing any loose soil from their clothing and boots. This will be accomplished in the designated Site Worker Cleaning Area to be located adjacent to active work areas in the soil. A field wash station for Site Workers, equipment, and PPE shall be set up and maintained by the Contractor. This will include a gross wash and rinse for boots worn in soil areas and, as necessary, equipment and facilities for Site Workers to wash their hands, arms, neck, and face after exiting areas of soil.

8.3 Vehicle Cleaning Area/Stabilized Construction Entrances

One or more temporary vehicle cleaning areas will be constructed to clean disposal trucks and other vehicles and equipment prior to leaving the Site. This area will reduce the amount of soil that disposal trucks and other vehicles spread onto the public roadway. The vehicle cleaning area will be constructed of gravel and will be of sufficient size to prevent vehicles from spreading Fill/Soils onto the public roads and/or previously excavated areas of the Site where all soil has been removed. Before any disposal truck or other vehicle leaves the Site, the sides and wheels will be inspected. If any soils are observed on the wheels or body of the truck, they will be removed and collected for disposal using a shovel, broom, and/or other hand tools in the designated vehicle cleaning area. This will reduce the potential for disposal trucks to spread Site-derived material onto the public streets. This vehicle cleaning area may be upgraded to include wet vehicle cleaning procedures (i.e., power washing or steam cleaning), if deemed necessary by the SHSO, CSS, and/or GSS.

In addition, all equipment used for excavation and other earthwork activities (i.e., excavators, bulldozers, backhoes, etc.) which comes in contact with Fill shall be cleaned at the vehicle cleaning area prior to:

- Crossing into areas of the Site where no soil is present; and
- Leaving the Site.

No equipment will be allowed to leave the Site prior to the SHSO or Site Superintendent's inspection and verification that the equipment was properly cleaned.

8.4 Disposal Procedures

A system of segregating all waste will be developed by the SHSO. All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading Fill, creating a sanitary hazard, or causing litter to be left onsite. If any potentially contaminated materials (e.g., clothing, gloves, etc.) are generated, they will be bagged or drummed, as necessary, labeled, and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as domestic waste.

9.0 HANDLING OF POTENTIAL HAZARDOUS MATERIALS

Based on the results of previously-conducted soil and groundwater investigations, hazardous materials are not expected to be encountered.

10.0 EMERGENCY PLAN

The emergency plan outlined in this section will be understood by all Site Workers prior to the start of work so that, should an emergency occur, all parties will know how to respond. During an emergency, the SHSO will perform air monitoring as needed and will assist responding emergency personnel with health and safety information related to the Site. Site Workers will endeavor to keep non-essential personnel away from the incident until the appropriate emergency personnel arrive. At that time, the emergency personnel will take control of the Site. Site Workers may be asked to lend assistance to emergency personnel such as during evacuations, help with the injured, etc.

10.1 Emergency Response Numbers

The following sections provide emergency response and project management phone numbers. Emergencies encountered on this Site will be responded to via offsite emergency services personnel and Site Workers. The following master phone list will be prominently posted at the Contractor's construction trailer designated as the Site command post.

Emergency Medical Service	911
<u>Police</u> : New York City Police Department (NYPD)	911
<u>Hospital</u> : Bellevue Hospital	212-562-4141
First Care and Occupational Health Clinic (For non-emergency medical services).....	631-435-0110
National Response Center	800-424-8802
Poison Control Center	800-222-1222
Chemtrec	800-262-8200
<u>Fire</u> : New York City Fire Department (FDNY)	911
New York City Office of Emergency Management	911
Center for Disease Control	800-311-3435
USEPA (Region II)	212-637-5000
NYSDEC Emergency Spill Response	800-457-7362
USEPA (Region II)	212-637-5000
NYSDEC Emergency Spill Response	800-457-7362

The table in Section 1.2 provides the contact information for Project Management and Health and Safety Personnel.

10.2 Emergency Evacuation

Evacuation procedures will be discussed prior to the start of work and periodically during safety meetings. In the event of an emergency situation such as fire or an explosion, an air horn or other appropriate device will be sounded for three (3) sharp blasts, indicating the initiation of evacuation procedures. The emergency evacuation route shall be clearly posted in the appropriate Site trailers. Under no circumstances will incoming Site Workers or visitors be allowed to proceed into the area once the emergency signal has been given. Once the alarm has been sounded, the SHSO or GSS must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down. All Site Workers will assemble outside of the active work areas and away from the area of danger and the fire department and other emergency response personnel will be notified by telephone of the emergency.

10.3 Injury to Site Workers

Emergency first aid shall be applied onsite as appropriate. In the event that additional medical attention is necessary, the injured worker should be brought to the emergency room at the hospital (adjacent to the Site). If the Site worker is unable to be brought to the hospital, 911 should be called and an ambulance sent to the Site.

10.4 Site Worker Exposure

The following describes the appropriate mitigation measures to be followed in the event that Site Workers are exposed to contaminants.

<u>Skin Contact:</u>	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then clean or remove PPE and provide appropriate medical attention, if necessary. Eyes should be rinsed for 15 minutes upon chemical contamination.
<u>Inhalation:</u>	Move to fresh air and/or, if necessary, clean or remove PPE and transport to emergency medical facility.
<u>Ingestion:</u>	Clean or remove PPE and transport to emergency medical facility, if necessary.
<u>Puncture Wound or Laceration:</u>	Clean or remove PPE and transport to emergency medical facility, if necessary.

SHSO CERTIFICATION OF HOSPITAL DIRECTIONS

Name of SHSO: Wendy Shen _____

Date: _____

This is to certify that on _____, I personally drove the route to Woodhull Hospital as listed in the HASP. The Map Routing and Directions were/were not as listed in the plan. Listed below were conditions that resulted in different directions.

Site Health and Safety Officer

1. Toxicological, Physical and Chemical Properties of Compounds Potentially Present at the Site
2. Action Levels for Worker Breathing Zone

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,2,4-Trimethylbenzene	95-63-6	None established	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 337°F FL.P: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable liquid
1,2,4-Trimethylbenzene	95-63-6	TWA 25 ppm (125 mg TWA 25 ppm (125 mg/m ³)	TWA 25 ppm (125 mg/m ³)	None established	N.D.	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 337°F FL.P: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable Liquid
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m ³)	C 50 ppm (300 mg/m ³)	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F FL.P: 151°F UEL: 9.2% LEL: 2.2% Class IIIA Combustible Liquid
1,2-Dichloroethane	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m ³) STEL 2 ppm (8 mg/m ³)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F FL.P: 56°F UEL: 16% LEL: 6.2% Class IB Flammable Liquid
1,2-Dichloroethene (total)	540-59-0	TWA 200 ppm (790 n TWA 200 ppm (790 mg/m ³)	TWA 200 ppm (790 mg/m ³)	TWA 200 ppm (790 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor BP: 118-140°F FL.P: 36-39°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid
1,3,5-Trimethylbenzene	108-67-8	None established	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 329°F FL.P: 122°F Class II Flammable liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,3,5-Trimethylbenzene	108-67-8	TWA 25 ppm (125 mg/m ³)	TWA 25 ppm (125 mg/m ³)	None established	N.D	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 329°F FLP: 122°F Class II Flammable Liquid
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m ³)	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F FLP: 150°F LEL: 2.5% Combustible Solid
2,4-Dimethylphenol	105-67-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system, mouth, throat, stomach; dizziness, weakness, fatigue, nausea, headache; systemic damage; moderate to severe eye injury.	Skin, CVS, eyes, CNS	Clear, colorless liquid with a faint ether or chloroform-like odor BP: 178°F
2-Butanone (MEK)	78-93-3	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. BP: 175°F FLP: 16°F UEL(200°F): 11.4% LEL(200°F): 1.4% Class IB Flammable Liquid
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Brown solid
Acetone	67-64-1	TWA 500 ppm STEL 50 ppm	TWA 250 ppm (590 mg/m ³)	TWA 1000 ppm (2400 mg/m ³)	2500 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F FLP: 0°F UEL: 12.8% LEL: 2.5% Class IB Flammable Liquid
Anthracene	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Antimony	7440-36-0	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	50 mg/m ³ (as Sb)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder. BP: 2975°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Asbestos	1332-21-4	TWA 0.1 f/cc	Ca 100,000 fibers/m3	TWA 0.1 fiber/cm3	Ca [IDLH value has not been determined]	Inhalation; ingestion; skin and/or eye contact	Asbestosis (chronic exposure), dyspnea, interstitial fibrosis, restricted pulmonary function, finger clubbing, irritation eyes, [potential occupational carcinogen]	Respiratory system, eyes,	White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite), fibrous, odorless solids. BP: decomposes
Asphalt fumes	8052-42-4	TWA 0.5 mg/m ³ (fumes)	Ca C 5 mg/m3 [15 min]	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; skin and/or eye contact	Irritation eyes, resp sys	Eyes, respiratory system	Black or dark brown cement-like substance Combustible solid
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm STEL 1 ppm	TWA 1 ppm STEL 5 ppm	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F FLPt = 12°F LEL: 1.2% UEL: 7.8% Class B Flammable liquid
Benzo[a]anthracene	56-55-3	None established	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing foetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C
Benzo[b]fluoranthene	205-99-2	None established	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Beryllium	7440-41-7 (metal)	TWA 0.002 mg/m ³	Ca C 0.0005 mg/m ³	TWA 0.002 mg/m ³ C 0.005 mg/m ³ (30 minutes) with a maximum peak of 0.025 mg/m ³	Ca [4 mg/m ³ (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
Bis(2-ethylhexyl) phthalate	117-81-7	TWA 5 mg/m ³	TWA 5 mg/m ³ STEL 10 mg/m ³ (do not exceed during any 15-minute work period)	TWA 5 mg/m ³	None established	inhalation, skin and/or eye contact	Irritation eyes, skin, nose, throat; affect the nervous system and liver; damage to male reproductive glands	Eyes, skin, nose, respiratory system, nervous system, reproductive system, liver	Colorless to light colored, thick liquid with slight odor
Butane	106-97-8	TWA 1000 ppm	TWA 800 ppm (1900 mg/m ³)	None established	None established	inhalation, skin and/or eye contact (liquid)	Drowsiness, narcosis, asphyxia; liquid: frostbite	central nervous system	Colorless gas with a gasoline-like or natural gas odor. BP: 31°F UEL: 8.4% LEL: 1.6% Flammable Gas
Carbon Disulfide	75-15-0	TWA 1 ppm	TWA 1 ppm (3 mg/m ³) STEL 10 ppm (30 mg/m ³) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. BP: 116°F FLP: -22°F UEL: 50.0% LEL: 1.3% Class IB Flammable Liquid
Chlorobenzene	108-90-7	TWA 10 ppm	None established	TWA 75 ppm (350 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond- like odor BP: 270°F FLP: 82°F UEL: 9.6% LEL: 1.3%
Chloroethane	75-00-3	TWA 100ppm	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m ³)	3800 ppm [10%LEL]	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. BP: 54°F FLP: NA (Gas) -58°F (Liquid) UEL: 15.4% LEL: 3.8%
Chromium	7440-47-3	TWA 0.5 mg/m ³ (metal and Cr III compounds) TWA 0.05 mg/m ³ (water-soluble Cr IV compounds) TWA 0.01 mg/m ³ (insoluble Cr IV compounds)	TWA 0.5 mg/m ³	TWA 1 mg/m ³	250 mg/m ³ (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
cis-1,2-Dichloroethene	158-59-2	TWA 200 ppm	TWA 200 ppm	TWA 200 ppm	None established	inhalation, skin absorption, ingestion	Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen	Skin	Colorless liquid BP: 60 C FLP: 4 C UEL: 12.8% LEL: 9.7 %
Copper	7440-50-8	TWA 0.2mg/m ³ (fume) 1 mg/m ³ (dusts and mists)	TWA 1 mg/m ³	TWA 1 mg/m ³	100 mg/m ³ (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing	Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)	Noncombustible Solid in bulk form, but powdered form may ignite. BP: 4703°F
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder BP: 524°C
Diesel Fuel #2	68476-34-6	None established	None established	Designated as an OSHA Select Carcinogen	None established	ingestion, skin and/or eye contact	Kidney damage; potential lung damage; suspected carcinogen; irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain.	Eyes, skin, kidneys	Clear yellow brown combustible liquid; floats on water; distinct diesel petroleum hydrocarbon odor. BP: 356-716°F FLP: 154.4-165.2°F LEL: 0.6% UEL: 7.0%
Ethylbenzene	100-41-4	TWA 100 ppm STEL 125 ppm	TWA 100 ppm (435 mg/m ³) STEL 125 ppm (545 mg/m ³)	TWA 100 ppm (435 mg/m ³)	800 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F FLP: 55°F UEL: 6.7% LEL: 0.8% Class IB Flammable Liquid
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.
Fluorene	86-73-7	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation skin, digestive tract	Skin	White crystals BP: 563°F
Fuel Oil #2	68476-30-2	TWA 100mg/m ³ (aerosol and vapor, as total hydrocarbons)	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS effects; nausea, vomiting, headache, cramping, dizziness, weakness, loss of coordination., drowsiness; kidney, liver damage	Eyes, skin, CNS	Clear or yellow to red oily liquid, kerosene-like odor BP: 347 - 689 °F UEL:5-6% LEL: 0.7-1.0%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Gasoline	8006-61-9	TWA 300 ppm STEL 500 ppm	Carcinogen	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; ingestion; skin and/or eye contact	Eyes and skin irritation, mucous membrane; dermatitis; headache; listlessness, blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis; possible liver, kidney damage [Potential occupational carcinogen]	Eyes, skin, respiratory system, CNS, Liver, Kidneys	Clear liquid with a characteristic odor, aromatic Fl.Pt = -45°F LEL = 1.4% UEL = 7.6% Class 1B Flammable Liquid
Hexachlorobutadiene	87-68-3	TWA 0.02 ppm	Ca TWA 0.02 ppm (0.24 mg/m ³) [skin]	None established	Ca [N.D.]	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: irritation eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, kidneys	Clear, colorless liquid with a mild, turpentine-like odor. BP: 419°F
Hydrogen Sulfide	7783-06-4	TWA (1 ppm) STEL (5 ppm) (adopted values for which changes are proposed in the NIC)	C 10 ppm (15 mg/m ³) [10-minute]	C 20 ppm 50 ppm [10-minute maximum peak]	100 ppm	inhalation, skin and/or eye contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, central nervous system	Colorless gas with a strong odor of rotten eggs. BP: -77°F UEL: 44.0% LEL: 4.0% Flammable Gas
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Fluorescent green-yellow crystalline solid BP: 536 C
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Yellowish crystal solid BP: 536 C
Isopropylbenzene	98-82-8	TWA 50 ppm	TWA 50 ppm (245 mg/m ³) [skin]	TWA 50 ppm (245 mg/m ³) [skin]	900 ppm [10%LEL]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor. BP: 306°F Fl.P: 96°F UEL: 6.5% LEL: 0.9%
Kerosene	8008-20-6	TWA 200 mg/m ³	TWA 100 mg/m ³	None established	IDLH value has not been determined	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system	Colorless to yellowish, oily liquid with a strong, characteristic odor. BP: 347-617°F Fl.P: 100-162°F UEL: 5% LEL: 0.7% Class II Combustible Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Lead	7439-92-1	TWA 0.05 mg/m ³	TWA (8-hour) 0.050 mg/m ³	TWA 0.050 mg/m ³	100 mg/m ³ (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. BP: 3164°F Noncombustible Solid in bulk form
Manganese	7439-96-5 (metal)	TWA 0.2 mg/m ³	TWA 1 mg/m ³ STEL 3 mg/m ³	C 5 mg/m ³	500 mg/m ³ (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever; dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid. BP: 3564°F
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ C 0.04 mg/m ³	2 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m ³ (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m ³ [skin] Other: C 0.1 mg/m ³ [skin]	TWA 0.1 mg/m ³	10 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methyl tert-butyl ether (MTBE)	1634-04-4	TWA 50 ppm	No established REL	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, mucous membrane, respiratory; dizziness, nausea, headache, intoxication	Eyes, skin, mucous membrane, respiratory system, central nervous system	Colorless liquid BP: 55.2 C
Methylene Chloride	75-09-2	TWA 50 ppm, A3 - suspected human carcinogen	Ca	TWA 25 ppm STEL 125 ppm	Ca [2300 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor BP: 104°F UEL: 23% LEL: 13%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Naphthalene	91-20-3	TWA 10 ppm STEL 15 ppm	TWA 10 ppm (50 mg/m ³) STEL 15 ppm (75 mg/m ³)	TWA 10 ppm (50 mg/m ³)	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. BP: 424°F FLP: 174°F UEL: 5.9% LEL: 0.9%
n-Butylbenzene	104-51-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS depression, lung damage; nausea, vomiting, headache, dizziness, weakness, loss of coordination, blurred vision, drowsiness, confusion, disorientation	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet odor BP: 183 C FLP: 59 C UEL: 5.8% LEL: 0.8%
Nickel	7440-02-0 (Metal)	TWA 1.5 mg/m ³ (elemental) TWA 0.1 mg/m ³ (soluble inorganic compounds) TWA 0.2 mg/m ³ (insoluble inorganic compounds) TWA 0.1 mg/m ³ (Nickel subsulfide)	Ca TWA 0.015 mg/m ³	TWA 1 mg/m ³	Ca [10 mg/m ³ (as Ni)]	inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Metal: Lustrous, silvery, odorless solid. BP: 5139°F
Nitrobenzene	98-95-3	TWA 1 ppm	TWA 1 ppm (5 mg/m ³) [skin]	TWA 1 ppm (5 mg/m ³) [skin]	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; in animals: liver, kidney damage; testicular effects	Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system	Yellow, oily liquid with a pungent odor like paste shoe polish. BP: 411°F FLP: 190°F LEL(200°F): 1.8%
n-Propylbenzene	103-65-1	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Harmful if swallowed, Irritation eyes, skin, digestive tract, respiratory tract, central nervous system	Eyes, skin, central nervous system, respiratory system	colorless or light yellow liquid BP: 159 C FLP: 47 C UEL: 6% LEL: 0.8%
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m ³ C 1800 mg/m ³ [15 min]	TWA 500 ppm (2000 mg/m ³)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Phenol	108-95-2	TWA 5 ppm	TWA 5 ppm (19 mg/m ³) C 15.6 ppm (60 mg/m ³) [15-minute] [skin]	TWA 5 ppm (19 mg/m ³) [skin]	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching	Eyes, skin, respiratory system, liver, kidneys	Colorless to light-pink, crystalline solid with a sweet, acrid odor. BP: 359°F UEL: 8.6% LEL: 1.8%
p-Isopropyltoluene	99-87-6	None established	None established	None established	None established	inhalation, skin absorption, eye contact	Irritation skin	CNS, skin	Colorless, clear liquid, sweetish aromatic odor BP: 350.8°F Class III Flammable liquid
sec-Butylbenzene	135-98-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, upper airway; central nervous system, headache, dizziness; gastrointestinal disturbance	Respiratory system, central nervous system, eyes, skin;	Colorless liquid BP: 344°F Fl.P: 126 °F UEL: 6.9% LEL: 0.8% Combustible liquid
Selenium	7782-49-2	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	1 mg/m ³ (as Se)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m ³	TWA 1 mg/m ³	TWA 1 mg/m ³	15 mg/m ³	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid. BP: 554°F Noncombustible Liquid
tert-Butylbenzene	98-06-6	None established	None established	None established	None established	inhalation, skin absorption, ingestion,	Eye and respiratory irritant; CNS depression; liver or kidney damage	Respiratory system, central nervous system, eyes, liver, kidney	Colorless liquid with an aromatic odor BP: 168 - 169 C Fl.P: 34 C UEL:5.6 % LEL: 0.8 %
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm (STEL) listed as A3, animal carcinogen	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor. BP: 250°F Noncombustible Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Toluene	108-88-3	TWA 20 ppm	TWA 100 ppm (375 mg/m ³) STEL 150 ppm (560 mg/m ³)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F FLP: 40°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 100 ppm (435 mg/m ³) STEL 150 ppm	TWA 100 ppm (435 mg/m ³)	TWA 100 ppm (435 mg/m ³)	900 ppm	Skin absorption, inhalation, ingestion, skin, and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class C Flammable Liquid
Zinc	7440-66-6	TWA 10 mg/m ³ (Inhalable fraction)	None established	TWA 10 mg/m ³ (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system	Bluish gray solid BP: 1664.6°F Flammable

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 509 West 38th Street/512 West 39th Street, New York, New York

References

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Sax, N.I. and R.J. Lewis. 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
Guide to Occupational Exposure Values. 2008. American Conference of Governmental Industrial Hygienists (ACGIH).
NIOSH Pocket Guide to Chemical Hazards. 2005. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health

Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
Ca - considered by NIOSH to be a potential occupational carcinogen
CAS# Chemical Abstracts Service registry number which is unique for each chemical.
Fl. Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m³ – Milligrams of substance per cubic meter of air
NIOSH -National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
STEL – Short-term exposure limit
TLV -ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)

TABLE 2
ACTION LEVELS FOR WORKER BREATHING ZONE

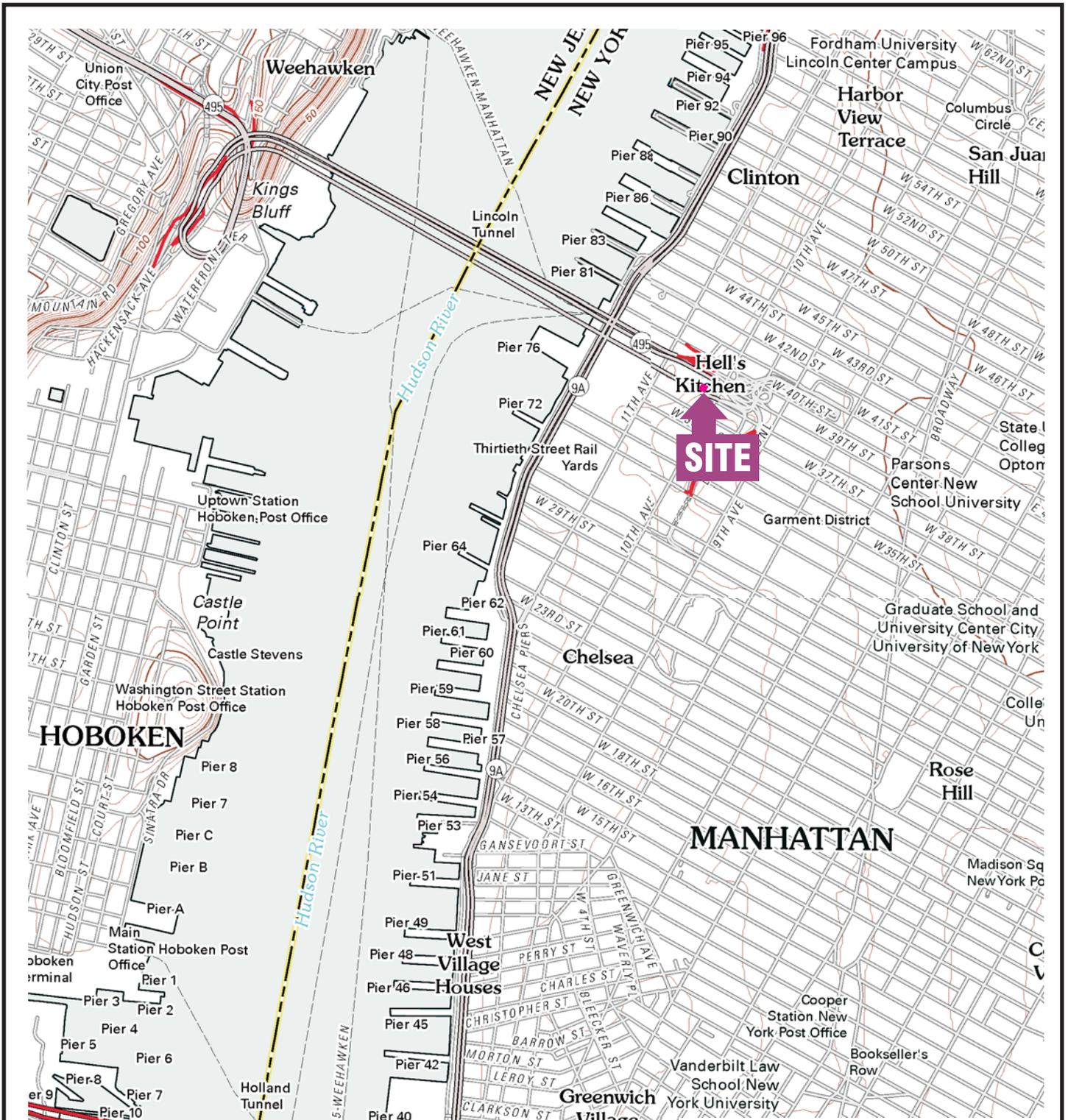
Instrument	Action Level *	Level of Respiratory Protection/Action
PID	0 to <5 ppm (one minute sustained)	Level D *
PID	>5 to <50 ppm (one minute sustained)	Utilize APR (Level C)
PID	>50 to <100 ppm (one minute sustained)	Level B
PID	>100 ppm	Stop work** (ventilate, apply foam)
CGI/H2S Meter	<5 ppm	Level D
CGI/H2S Meter	>5% to <25 ppm	Level B
CGI/H2S Meter	>25 ppm	Stop work**
CGI/CO Meter	>25 ppm	Level B
CGI/CO Meter	>50 ppm	Stop work** (ventilate area)
CGI/O2 Meter	<10% LEL, in excavation 19.5% oxygen – 23.5%	Level D Level D
CGI/O2 Meter	>10% LEL, in excavation <19.5% or >23.5% oxygen	Allow to vent, apply foam** Stop work, Oxygen Deficient or Enriched ATM**
CGI/CO Meter	>25 to <35 ppm (five minutes sustained) >35 ppm	Allow to vent ** (five minutes sustained) Stop work **

Note:

Action levels are based on above background levels.

- * Instrument readings will be taken in the breathing zone of the workers, unless otherwise indicated.
- ** Suspend work in immediate area. Conduct air monitoring periodically to determine when work can continue. Implement mitigative measures.

1. Site Map
2. Hospital Route Map
3. Clinic Route Map



QUADRANGLE LOCATION



SOURCE:
 USGS; Brooklyn, NY (2010),
 Central Park, NY-NJ (2011),
 Weehawken, NJ-NY (2011),
 and Jersey City, NJ-NY (2011)
 7.5 Minute Topographic Quadrangles



Title:

SITE LOCATION MAP

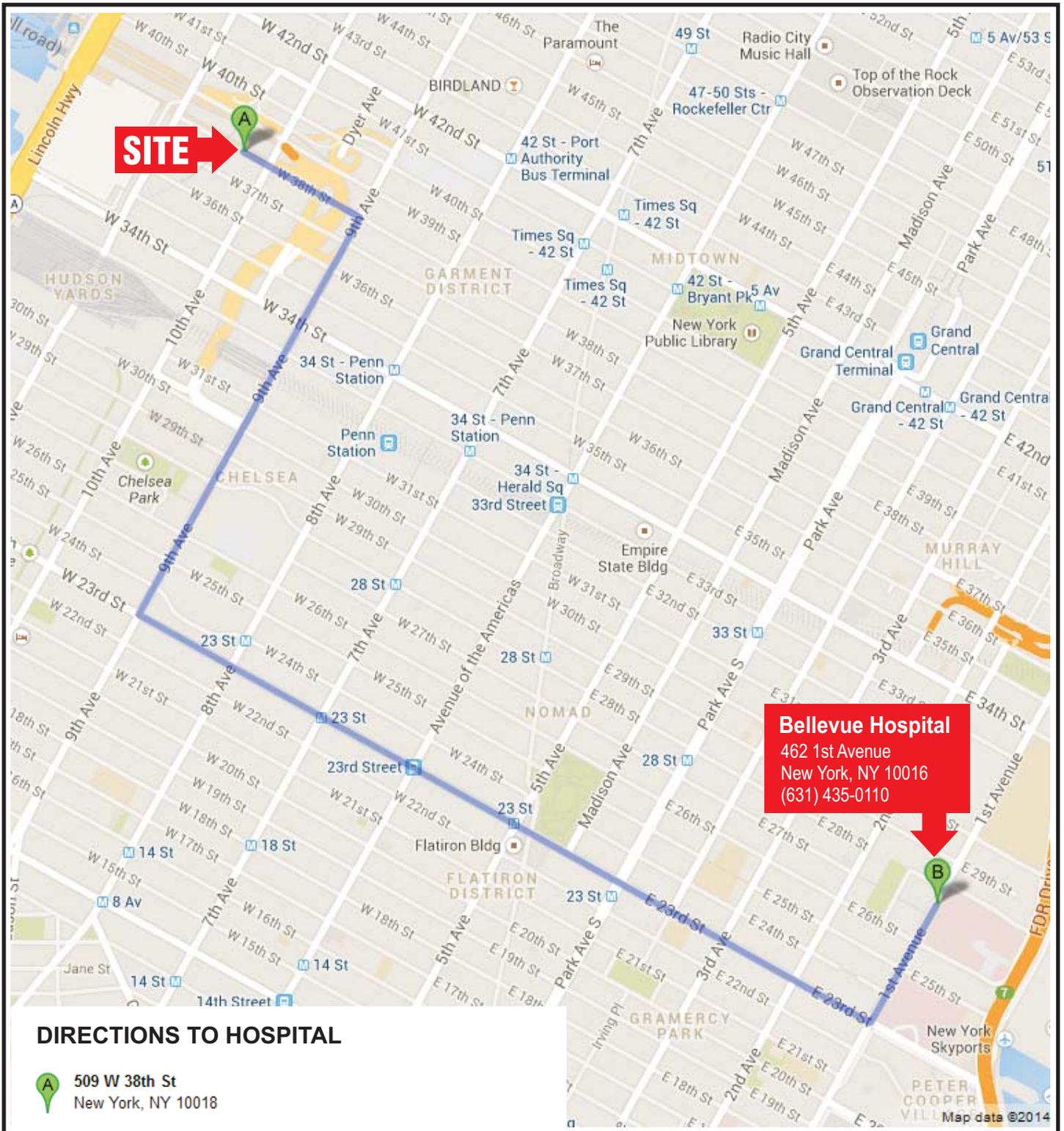
509 W 38TH STREET
 NEW YORK, NEW YORK

Prepared for:

ELB HOLDINGS

ROUX
 ROUX ASSOCIATES, INC.
 Environmental Consulting
 & Management

Compiled by: W.S.	Date: 31MAR14	FIGURE 1
Prepared by: B.H.C.	Scale: AS SHOWN	
Project Mgr.: W.S.	Project No.: 2414.0001Y000	
File: 2414.0001Y101.01.CDR		



SITE →

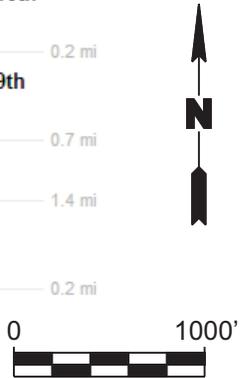
Bellevue Hospital
 462 1st Avenue
 New York, NY 10016
 (631) 435-0110

DIRECTIONS TO HOSPITAL

A 509 W 38th St
 New York, NY 10018

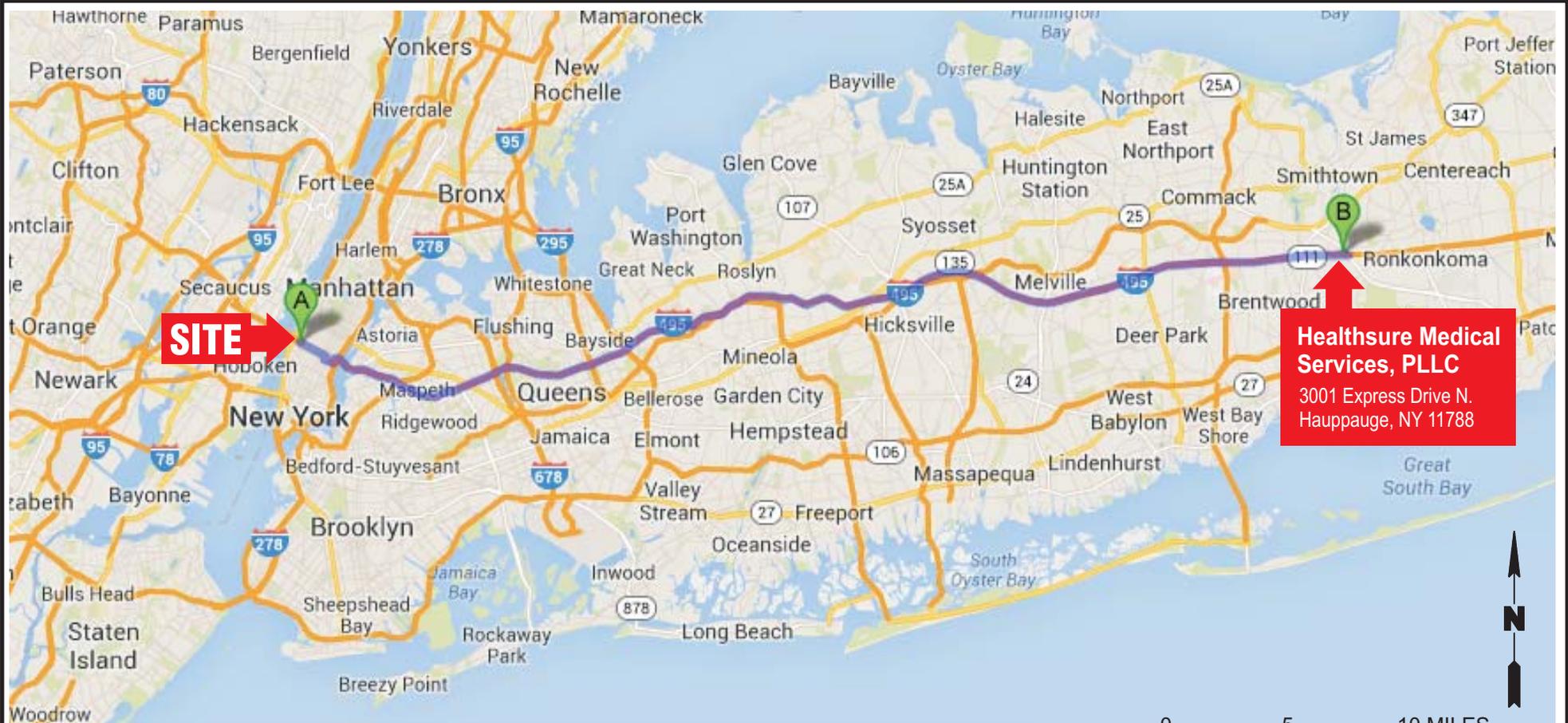
1. Head southeast on W 38th St toward 10th Ave
2. Turn right at the 2nd cross street onto 9th Ave
3. Turn left onto W 23rd St
4. Turn left onto 1st Avenue
 Destination will be on the right

B 462 1st Ave
 New York, NY 10016



Title:			HOSPITAL ROUTE MAP
509 W 38TH STREET NEW YORK, NEW YORK			
Prepared for:			ELB HOLDINGS
ROUX ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.S.	Date: 31MAR14	FIGURE 1
	Prepared by: B.H.C.	Scale: AS SHOWN	
	Project Mgr.: W.S.	Project No.: 2414.0001Y000	
	File: 2414.0001Y101.01.CDR		

12414Y0001Y10112414.0001Y101.01.CDR



Healthsure Medical Services, PLLC
 3001 Express Drive N.
 Hauppauge, NY 11788

DIRECTIONS:

- A** 509 W 38th St
New York, NY 10018
- 1. Head **southeast** on **W 38th St** toward **10th Ave** 1.2 mi
- 2. Turn **right** onto **Lexington Ave** 0.1 mi
- 3. Turn **left** at the 2nd cross street onto **E 36th St** 0.2 mi
- 4. Slight **left** to merge onto **I-495 E**
Partial toll road 43.6 mi
- 5. Take **exit 57** toward **NY-454/Commack/ Patchogue** 0.1 mi
- 6. Merge onto **Express Dr S/Long Island Expressway South Service Rd** 0.6 mi
- 7. Turn **left** onto **NY-454 W** 0.1 mi
- 8. Take the 1st **left** onto **Long Island Expressway North Service Rd** 0.2 mi
- 9. Turn **right** 148 ft
- B** Expy Drive N



Title:

FIRST CARE & OCCUPATIONAL HEALTH CLINIC ROUTE

509 W 38TH STREET
NEW YORK, NEW YORK

Prepared for: **ELB HOLDINGS**

ROUX ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.S.	Date: 31MAR14	FIGURE 3
	Prepared by: B.H.C.	Scale: AS SHOWN	
	Project Mgr.: W.S.	Project No.: 2414.0001Y000	
	File: 2414.0001Y101.01.CDR		

- A. Material Safety Data Sheets
- B. Community Air Monitoring Plan (CAMP)
- C. Job Safety Analyses (JSAs)
- D. Heat and Cold Stress Guidelines
- E. Health and Safety Briefing Tailgate Form
- F. Concentra Medical Data Form
- G. Near Loss Reporting Form

Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

Date Printed: 05/11/2006

Date Updated: 01/31/2006

Version 1.8

Section 1 - Product and Company Information

Product Name CHROMIUM
Product Number 12219
Brand RIEDEL

Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US

Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
CHROMIUM (POWDERS)	7440-47-3	Yes

Formula Cr
Synonyms Chrome * Chromium, metal (ACGIH)
RTECS Number: GB4200000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Target organ(s): Liver. Kidneys. Possible sensitizer.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious

amounts of water.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Exercise appropriate precautions to minimize direct contact with skin or eyes and prevent inhalation of dust.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

SPECIAL REQUIREMENTS

Air sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). 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.

Hand: Protective gloves.

Stable: Stable.
Conditions of Instability: May decompose on exposure to air.
Materials to Avoid: Strong acids, Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Nature of decomposition products not known.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

SENSITIZATION

Sensitization: Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

TARGET ORGAN(S) OR SYSTEM(S)

Kidneys. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE

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

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat

Route of Application: Intravenous

Dose: 2160 UG/KG

Exposure Time: 6W

Frequency: I

Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Rat

Route of Application: Implant

Dose: 1200 UG/KG

Exposure Time: 6W

Frequency: I

Result: Blood:Lymphomas including Hodgkin's disease. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Rabbit

Route of Application: Implant

Dose: 75 MG/KG

Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

IARC CARCINOGEN LIST

Rating: Group 3

ACGIH CARCINOGEN LIST

Rating: A4

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

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. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA

Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

US CLASSIFICATION AND LABEL TEXT

US Statements: Target organ(s): Liver. Kidneys. Possible sensitizer.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes
DEMINIMIS: 0.1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

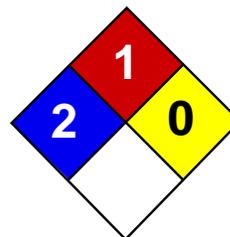
DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

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 Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2006 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

Toxicological Data on Ingredients: Copper LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1 (mg/m³) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

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

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:

LD50: Not available. LC50: Not available.

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

Other Toxic Effects on Humans:

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

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

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 04:58 PM

Last Updated: 11/06/2008 12:00 PM

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MATERIAL SAFETY DATA SHEET

Date Printed: 04/26/2007

Date Updated: 01/29/2006

Version 1.4

Section 1 - Product and Company Information

Product Name (+)-IRON(II) L-ASCORBATE
Product Number A0207
Brand SIGMA

Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US

Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
(+)-IRON (II) L-ASCORBATE	24808-52-4	No
Formula	C12H14FeO12	

Section 3 - Hazards Identification

HMIS RATING

HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear protective equipment.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). 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.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Color: Deep brown
	Form: Powder

Property	Value	At Temperature or Pressure
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Molecular Weight	406.1 AMU	
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pH	N/A	
----	-----	--

BP/BP Range	N/A	
-------------	-----	--

MP/MP Range	N/A	
-------------	-----	--

Freezing Point	N/A	
----------------	-----	--

Vapor Pressure	N/A	
----------------	-----	--

Vapor Density	N/A	
---------------	-----	--

Saturated Vapor Conc.	N/A	
-----------------------	-----	--

SG/Density	N/A	
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Bulk Density	N/A
Odor Threshold	N/A
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point	N/A
Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Conditions of Instability: Moisture.

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Iron oxides.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Eye Contact: May cause eye irritation.

Inhalation: Material may be irritating to mucous membranes and upper respiratory tract.

Multiple Routes: May be harmful by inhalation, ingestion, or skin absorption.

SIGNS AND SYMPTOMS OF EXPOSURE

Overdose of iron compounds may have a corrosive effect on the gastrointestinal mucosa and be followed by necrosis, perforation, and stricture formation. Several hours may elapse before symptoms that can include epigastric pain, diarrhea, vomiting, nausea, and hematemesis occur. After apparent recovery a person may experience metabolic acidosis, convulsions, and coma hours or days later. Further complications may develop leading to acute liver necrosis that can result in death due to hepatic coma. Chronic ingestion of large doses may cause gastrointestinal disturbances including nausea and diarrhea, urinary effects involving urine acidification, oxalate and uric crystallization in the bladder and kidney, and decreased reaction times and psychomotor coordination. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Section 12 - Ecological Information

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA

Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: No

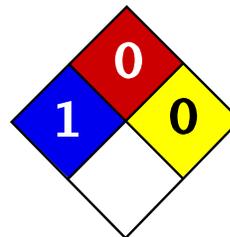
Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

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 Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2007 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



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

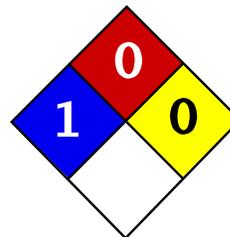
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 11/06/2008 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

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
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to blood, lungs, brain, 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. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Moderate fire potential, in the form of dust or powder, when exposed to flame.

When manganese is heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence.

Concentrated nitric acid reacts with powdered manganese with incandescence and explosion.

Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to flame.

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:

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

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: 0.1 (mg/m³) from ACGIH (TLV) [United States]

TWA: 5 (mg/m³) [Canada]

TWA: 1 STEL: 3 (mg/m³) from NIOSH [United States]

TWA: 5 (mg/m³) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

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

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Superficially oxidized on exposure to air.

Reacts with aqueous solutions of sodium or potassium bicarbonate.

Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts.

Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively.

In the form of powder, it reduces most metallic oxides on heating.

On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic.

Also incompatible with hydroxides, cyanides, carbonates.

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): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of inhalation.

Slightly hazardous in case of skin contact (irritant), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Manganese can cross the placenta.

May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation

Eyes: Dust may cause mechanical irritation.

Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressiveness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation).

Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism.

Ingestion: May cause digestive tract irritation. There is a low gastrointestinal absorption of manganese.

Chronic Potential Health Effects:

Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degenerative changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice)

Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Manganese

Rhode Island RTK hazardous substances: Manganese

Pennsylvania RTK: Manganese

Minnesota: Manganese

Massachusetts RTK: Manganese

New Jersey: Manganese

New Jersey spill list: Manganese

Louisiana spill reporting: Manganese

California Director's List of Hazardous Substances: Manganese

TSCA 8(b) inventory: Manganese

SARA 313 toxic chemical notification and release reporting: Manganese

Other Regulations:

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

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

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.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:03 PM

Last Updated: 11/06/2008 12:00 PM

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MATERIAL SAFETY DATA SHEET

Date Printed: 05/12/2006

Date Updated: 02/02/2006

Version 1.3

Section 1 - Product and Company Information

Product Name 10.00 G MERCURY FIXANAL AS MERCURY(II)
CHLORIDE
Product Number 38915
Brand RIEDEL
Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US
Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313	
Mercury 10,00 g Hg as mercury(II) chloride, FIXANAL	None	Yes	
Ingredient Name	CAS #	Percent	SARA 313
HYDROCHLORIC ACID >=25%	7647-01-0	> 1 < 5	No
MERCURIC CHLORIDE	7487-94-7	> 5 < 10	Yes

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Highly Toxic (USA) Very Toxic (EU). Dangerous for the environment.
Very toxic in contact with skin and if swallowed. Causes burns.
Toxic: danger of serious damage to health by prolonged exposure
through inhalation and if swallowed. Toxic to aquatic organisms,
may cause long-term adverse effects in the aquatic environment.
Calif. Prop. 65 reproductive hazard. Target organ(s): Kidneys.
Nerves.

HMIS RATING

HEALTH: 4*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 4
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure. Do not breathe vapor.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Liquid Color: Colorless	
Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	1 g/cm ³	20 °C
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Mercury/mercury oxides.,
Hydrogen chloride gas

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be fatal if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Kidneys. Nerves. G.I. System.

SIGNS AND SYMPTOMS OF EXPOSURE

Mercury accumulates in almost all tissues, especially in the brain, liver, and kidneys. Ingestion can cause: tremors, incoordination, insomnia, irritability, fatigue, anxiety, anorexia, hallucinations, headache, depression, severe stomatitis, nausea, vomiting, diarrhea, metallic taste, muscle weakness, loosening of the teeth, pain and numbness in the extremities, nephritis, peripheral neuropathy, collapse, and possibly death. Prolonged exposure can cause: Stomach pains, vomiting, diarrhea. Exposure to mercury compounds can cause tremors, loss of appetite, weight loss, anuria, and uremia.

CONDITIONS AGGRAVATED BY EXPOSURE

May cause nervous system disturbances.

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Result: Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

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. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Toxic liquid, corrosive,

inorganic, n.o.s.
UN#: 3289
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA

Proper Shipping Name: Toxic liquid, corrosive,
inorganic, n.o.s.
IATA UN Number: 3289
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION

Symbol of Danger: T+-N
Indication of Danger: Very toxic. Dangerous for the environment.
R: 28-36/38-48/21/22-51/53
Risk Statements: Very toxic if swallowed. Irritating to eyes and skin. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 26-28-36/37-45-61
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Highly Toxic (USA) Very Toxic (EU).
Dangerous for the environment.
Risk Statements: Very toxic in contact with skin and if swallowed. Causes burns. Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Calif. Prop. 65 reproductive hazard. Target organ(s): Kidneys. Nerves.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes
NOTES: This product is or contains a component that is subject to SARA313 reporting requirements.

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause developmental toxicity.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

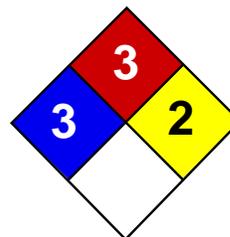
Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

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 Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2006 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



Health	3
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

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
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

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

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. 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. Do not use an eye ointment. Seek medical attention.

Skin Contact:

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

Serious Skin Contact:

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

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

Serious Inhalation:

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

Ingestion:

Do not induce vomiting. 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: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product. 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. Keep away from incompatibles such as oxidizing agents, acids, moisture.

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: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

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

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:

Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

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

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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MATERIAL SAFETY DATA SHEET

Date Printed: 05/17/2006

Date Updated: 01/28/2006

Version 1.4

Section 1 - Product and Company Information

Product Name 10.00 G ZINC FIXANAL AS ZINC SULFATE
Product Number 38950
Brand RIEDEL

Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US

Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #		SARA 313
ZINC STANDARD CONCENTRATE	None		No
Ingredient Name	CAS #	Percent	SARA 313
WATER	7732-18-5	84	No
ZINC SULFATE HEPTAHYDRATE	7446-20-0	16	Yes

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Dangerous for the environment. Harmful.
Harmful if swallowed. Irritating to eyes and skin. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target organ(s): Liver. Kidneys.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult,

call a physician.

DERMAL EXPOSURE

In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

METHODS FOR CLEANING UP

Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Respiratory protection is not required. Where protection is desired, use multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges.

Hand: Protective gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Liquid	
Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Zinc/zinc oxides, Sulfur oxides.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Skin Absorption: May be harmful if absorbed through the skin.

Eye Contact: May cause eye irritation.

Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.

Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Kidneys. Pancreas. Liver. Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE

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

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

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. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Environmentally hazardous substances, liquid, n.o.s.
UN#: 3082
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA

Proper Shipping Name: Environmentally hazardous substance, liquid, n.o.s.
IATA UN Number: 3082
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION

Symbol of Danger: Xi-N
Indication of Danger: Irritant. Dangerous for the environment.
R: 41-50/53
Risk Statements: Risk of serious damage to eyes. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 26-39-61
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear eye/face protection. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Dangerous for the environment. Harmful.
Risk Statements: Harmful if swallowed. Irritating to eyes and skin. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Avoid contact with eyes. Wear suitable protective clothing. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

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 Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2006 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



Safety Data Sheet
Material Name: AROCLOR 1248
SDS ID: OHS01910
Issue Date: 2010-09-07
Revision: 1.0300

Other Sections

[02](#) [03](#) [04](#) [05](#) [06](#) [07](#) [08](#) [09](#) [10](#) [11](#) [11B](#) [12](#) [13](#) [14](#) [15](#) [16](#)

***** Section 1 - PRODUCT AND COMPANY IDENTIFICATION *****

Material Name: AROCLOR 1248

ChemADVISOR, Inc.

Stone Quarry Crossing

811 Camp Horne Road, Suite 220

Pittsburgh, PA 15237

E-mail: info@chemadvisor.com

MSDS is for reference use only; please contact manufacturer for emergency response information, routine product inquiries and orders.

Chemical Family

halogenated, aromatic

Synonyms

CHLORODIPHENYL (48% CL); POLYCHLORINATED BIPHENYLS; PCB; CHLOROBIPHENYLS; PCBS; UN 2315

***** Section 2 - HAZARDS IDENTIFICATION *****

EMERGENCY OVERVIEW

Color: yellow to green

Physical Form: oil

Health Hazards: respiratory tract irritation, skin irritation, eye irritation, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS**Inhalation**

Short Term: irritation, liver damage

Long Term: rash, itching, hair loss, nausea, vomiting, stomach pain, headache, dizziness, impotence, coma, cancer

Skin Contact

Short Term: irritation, liver damage

Long Term: same as effects reported in long term inhalation, hair loss, reproductive effects

Eye Contact**Short Term:** irritation**Long Term:** same as effects reported in short term exposure**Ingestion****Short Term:** liver damage**Long Term:** same as effects reported in long term inhalation, hyperactivity, menstrual disorders, reproductive effects, cancer***** Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS *****

CAS	Component / EC#	Percent	Symbol(s)	Risk Phrase(s)
12672-29-6	AROCLOR 1248 215-648-1	100.0	N	R:33-50-53

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Polychlorinated biphenyls (1336-36-3).

Contaminants

MAY CONTAIN 0-2 PPM CHLORINATED DIBENZOFURANS

***** Section 4 - FIRST AID MEASURES *******Inhalation**

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

Skin

Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eyes

Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

If a large amount is swallowed, get medical attention.

***** Section 5 - FIRE FIGHTING MEASURES *****

See Section 9 for Flammability Properties

NFPA Ratings:**Health: 2 Fire: 1 Reactivity: 0**

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Flammable Properties

Slight fire hazard.

Extinguishing Media

regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

Fire Fighting Measures

Move container from fire area if it can be done without risk. Do not scatter spilled material with high-pressure water streams. Dike for later disposal. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

***** Section 6 - ACCIDENTAL RELEASE MEASURES *****

Soil Release

Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

Water Release

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers. Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment.

Occupational spill/release

Stop leak if possible without personal risk. **Small spills:** Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

***** Section 7 - HANDLING AND STORAGE *****

Storage Procedures

Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

***** Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION *****

Component Exposure Limits

AROCLOR 1248 (12672-29-6)

NIOSH: 0.001 mg/m³ TWA

Exposure Limits for Chemicals which may be generated during processing

This material has no components listed.

Ventilation

Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eyes/Face

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Protective Clothing

Wear appropriate chemical resistant clothing.

Glove Recommendations

Wear appropriate chemical resistant gloves.

Respiratory Protection

The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Escape -

Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister having an N100, R100, or P100 filter.

Any appropriate escape-type, self-contained breathing apparatus.

***** Section 9 - PHYSICAL AND CHEMICAL PROPERTIES *****

Physical State: Liquid	Appearance: Not available
Color: yellow to green	Physical Form: oil
Odor: Not Available	Odor Threshold: Not available
Texture: free-flowing	pH: Not available
Melting Point: Not available	Boiling Point: 340 - 375 °C
Evaporation Rate: Not available	Flash Point: >340 °C
OSHA Flammability Class: IIIB	Vapor Pressure: negligible
Vapor Density (air = 1): Not available	Density: Not available
Specific Gravity (water = 1): 1.45 - 1.47	Water Solubility: very slightly soluble
Coeff. Water/Oil Dist: Not available	Viscosity: 185 - 240 SUS
Pour Point: -6 °C	Volatility: Not available

Solvent Solubility

Soluble: oils, organic solvents

Insoluble: glycerol, glycols

***** Section 10 - STABILITY AND REACTIVITY *****

Chemical Stability

Stable at normal temperatures and pressure.

Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials.

Incompatible Materials

oxidizing materials, combustible materials

POLYCHLORINATED BIPHENYLS:

CHLORINE (LIQUID): Exothermic reaction.

OXIDIZERS (STRONG): Fire and explosion hazard.

PLASTICS, RUBBER, COATINGS: Attacks.

Hazardous Decomposition Products

acid halides, chlorine, oxides of carbon, halogenated compounds

Thermal decomposition products: hydrogen chloride, chlorine, carbon monoxide, chlorinated dibenzofurans.

Possibility of Hazardous Reactions

Will not polymerize.

***** Section 11 - TOXICOLOGICAL INFORMATION *****

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

AROCLOR 1248 (12672-29-6)

Oral LD50 Rat 11 g/kg

RTECS Acute Toxicity (selected)

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1248 (12672-29-6)

Oral: 11 gm/kg Oral Rat LD50

Acute Toxicity Level**AROCLOR 1248 (12672-29-6)**

Moderately Toxic: ingestion.

Toxic:

Slightly Toxic: ingestion.

Toxic:

Component Carcinogenicity**AROCLOR 1248 (12672-29-6)**

IARC: Supplement 7 [1987]; Monograph 18 [1978] (Group 2A (probably carcinogenic to humans))

NTP: Reasonably Anticipated To Be A Human Carcinogen

OSHA: Present

RTECS Irritation

The components of this material have been reviewed and RTECS publishes no data as of the date on this document.

Local Effects**AROCLOR 1248 (12672-29-6)**

Irritant: inhalation, skin, eye.

Target Organs**AROCLOR 1248 (12672-29-6)**

liver.

Epidemiologic data provide evidence of a relationship between exposure to polychlorinated biphenyls and the development of cancer, especially the consistent emergence of hepatobiliary cancer in different studies. Certain polychlorinated biphenyls produced benign and malignant liver neoplasms in mice and rats after their oral administration. The incidences of preneoplastic lesions and of neoplasms of the liver and lung tumors induced in rodents by N-nitrosodiethylamine or 2-acetylaminofluorene were increased by administration of polychlorinated biphenyls.

Medical Conditions Aggravated by Exposure

liver disorders, skin disorders and allergies

RTECS Tumorigenic

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1248 (12672-29-6)

2.5 mg/kg Intraperitoneal Mouse TDLo; 1250 mg/kg Oral Mouse TDLo (25 week); 1250 mg/kg Oral Rat TD (25 week); 16800 mg/kg Oral Rat TDLo (2 year(s))

RTECS Reproductive Effects

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1248 (12672-29-6)

32 mg/kg Oral Monkey TDLo (pregnant 1-23 week, post 91 day(s)); 2.25 mg/kg Oral Monkey TDLo (prior to copulation 30 week); 2.25 mg/kg Oral Monkey TDLo (prior to copulation 30 week); 26.75 mg/kg Oral Monkey TDLo (prior to copulation 30 week); 53.5 mg/kg Oral Monkey TDLo (prior to copulation 30 week); 26.75 mg/kg Oral Monkey TDLo (prior to copulation 30 week); 83 mg/kg Oral Monkey TDLo (prior to copulation 58 week, post 13 week, continuous); 24 mg/kg Oral Monkey TDLo (prior to copulation 17 week); 35 mg/kg Oral Monkey TDLo (prior to copulation 26 week); 17 mg/kg Oral Monkey TDLo (prior to copulation 26 week); 55 mg/kg Oral Monkey TDLo (prior to copulation 26 week, post 13 week, continuous); 165 mg/kg Oral Rabbit TDLo (pregnant 1-31 day(s))

Concurrent exposure to carbon tetrachloride may enhance the hepatotoxic effect of polychlorinated biphenyls.

Inhalation - Acute Exposure

POLYCHLORINATED BIPHENYLS: Inhalation of vapors of polychlorinated biphenyls may cause respiratory tract irritation. They may be absorbed and retained in body tissue.

Inhalation - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Eczema, skin burning, and systemic effects have been reported to occur when air levels of polychlorinated biphenyls were less than 1 mg/m³. The skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems may be affected. Dermatologic effects include erythematous eruptions with pruritis, discoloration of fingernails, skin thickening, swelling of the eyelids, face, and hands, excessive

eye discharge, distinctive hair follicles, alopecia, and chloracne. Mucous membranes of the eyes and mouth may become pigmented. Gastrointestinal effects may include nausea, vomiting, abdominal pain, and anorexia. Liver damage may be indicated by jaundice. Adverse effects on the liver that have been reported in humans include cirrhosis, fatty degenerative necrosis, and yellow atrophy. Coma and death may follow severe liver damage. Neurologic effects may include headache, dizziness, irritability, depression, fatigue, impotence, and joint and muscle pain. Enzyme activity may be induced or inhibited resulting in upset of normal biological processes. Upper respiratory tract irritation, decreased forced vital capacity, chest tightness, and persistent body odor have also been reported. Polychlorinated biphenyls will accumulate in tissues and organs, especially those rich in lipids. They cross the placenta and are excreted in breast milk and may exert toxic effects on the fetus or infant. Low mean birth weights and mean gestational ages were observed in infants born to women with a history of high exposure to polychlorinated biphenyls. Epidemiological studies provide suggestive evidence of a relationship between occupational exposure to polychlorinated biphenyls and the development of hepatobiliary cancer, melanoma, and cancer of the digestive system and of the lymphatic and hematopoietic tissue.

Inhalation - Other Toxicity Information

AROCLOR 1248: See information on polychlorinated biphenyls.

Skin Contact - Acute Exposure

POLYCHLORINATED BIPHENYLS: Direct contact with polychlorinated biphenyls may cause irritation and defat the skin. They may be absorbed through intact skin and retained in body tissue.

Skin Contact - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Repeated contact with polychlorinated biphenyls may cause chloracne. Liver damage may be indicated by jaundice. The skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems may be affected as detailed in chronic inhalation exposure. An increased incidence of spontaneous abortions and stillbirths were induced in rhesus monkeys following extended dermal contact. Maternal toxicity was indicated by alopecia, erythema and edema of the eyelids, and nonspecific metabolic abnormalities.

Skin Contact - Other Toxicity Information

AROCLOR 1248: See information on polychlorinated biphenyls.

Eye Contact - Acute Exposure

POLYCHLORINATED BIPHENYLS: Vapors and liquid may cause irritation, and may possibly be absorbed.

Eye Contact - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Prolonged or repeated exposure to irritants may result in conjunctivitis. Excessive eye discharge and swelling of the eyelids may result from systemic poisoning.

Eye - Other Toxicity Information

AROCLOR 1248: See information on polychlorinated biphenyls.

Ingestion - Acute Exposure

POLYCHLORINATED BIPHENYLS: Polychlorinated biphenyls may be absorbed through the gastrointestinal tract and retained in body tissue. A large single dose produced hepatic microsomal activity in rats. Animals receiving lethal doses may not die acutely. Death may be delayed up to three months.

Ingestion - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Repeated ingestion of polychlorinated biphenyls may affect the skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems as detailed in chronic inhalation exposure. Additional effects were reported in humans following ingestion of polychlorinated biphenyls contaminated with polychlorinated dibenzofurans including fever, hearing difficulties, immunosuppression, menstrual disorders in females, and a significantly increased risk of all cancers. Intrauterine exposure resulted in a fetal syndrome with clinical symptomatology including stillbirths, "cola colored" skin, low birth weight, elevated bilirubin, conjunctivitis, enlarged meibomian glands, chloracne, hypoplastic nails, scalp calcification, natal teeth, retarded growth and neurologic signs. Growth retardation and neurologic signs persisted for several years. Additional effects that have been

induced in animals following repeated ingestion of polychlorinated biphenyls include adrenal gland toxicity, benign and malignant liver tumors in rats and mice, and an increased incidence of spontaneous abortions and stillbirths in monkeys. Transplacental transfer coupled with exposure through lactation caused locomotor, hyperactivity, and learning errors in monkeys which correlated with polychlorinated biphenyl body burdens.

Ingestion - Other Toxicity Information

AROCLOR 1248: See information on polychlorinated biphenyls.

*** Section 12 - ECOLOGICAL INFORMATION ***

Component Analysis - Aquatic Toxicity

AROCLOR 1248 (12672-29-6)

Invertebrate: 24 Hr EC50 water flea: 420 µg/L

*** Section 13 - DISPOSAL CONSIDERATIONS ***

Disposal Methods

Dispose in accordance with all applicable regulations.

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

*** Section 14 - TRANSPORT INFORMATION ***

US DOT Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN/NA #: UN2315

Packing Group: II

Required Label(s): 9

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	Minimum Concentration
AROCLOR 1248	12672-29-6	DOT regulated severe marine pollutant

TDG Information

Shipping Name: Polychlorinated biphenyls (PCB)

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

Component Marine Pollutants (TDG)

This material contains one or more of the following chemicals required by CA TDG to be identified as marine pollutants.

AROCLOR 1248 (12672-29-6)

UN2315

ADR Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

ADR Tunnel Code Restrictions

This list contains tunnel restriction codes for those substances and/or chemically related entries which are found in chapter 3.2 of the ADR regulations.

AROCLOR 1248 (12672-29-6)

Restriction(s): D/E [UN2315, UN3432]

RID Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

IATA Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

ICAO Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

IMDG Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Component Marine Pollutants (IMDG)

This material contains one or more of the following chemicals required by IMDG to be identified as marine pollutants.

AROCLOR 1248 (12672-29-6)

IMDG regulated marine pollutant

***** Section 15 - REGULATORY INFORMATION *****

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

AROCLOR 1248 (12672-29-6)

SARA 313: 0.1 % Supplier notification limit

CERCLA: 1 lb final RQ; 0.454 kg final RQ

TSCA 12b: Section 6, 50 ppm [see 40 CFR 761]

SARA Section 311/312 (40 CFR 370 Subparts B and C)

Acute Health: Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
AROCLOR 1248 (related to: Polychlorinated biphenyls)	12672-29-6	Yes	Yes	Yes ¹	Yes ¹	Yes	Yes ¹

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis**AROCLOR 1248 (12672-29-6)**

Carc: carcinogen, initial date 10/1/89

Repro/Dev. developmental toxicity, initial date 1/1/91

Tox:

Canadian WHMIS Ingredient Disclosure List (IDL)

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL.

AROCLOR 1248 (12672-29-6)

0.1 %

Germany Water Classification**AROCLOR 1248 (12672-29-6)**

Number 471, hazard class 3 - severe hazard to waters (footnote 34)

EU Marking and Labelling

EC-No. 215-648-1

Symbols

N Dangerous for the environment

Risk Phrases

R33 Danger of cumulative effects.

R50 Very toxic to aquatic organisms.

R53 May cause long-term adverse effects in the aquatic environment.

Safety Phrases

S2 Keep out of the reach of children.

S24 Avoid contact with skin.

S25 Avoid contact with eyes.

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S46 If swallowed, seek medical advice immediately and show this container or label.

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
AROCLOR 1248	12672-29-6	No								

Globally Harmonized System of Classification and Labelling (GHS)

The listed component(s) of this material have been checked for country-specific published classifications according to the Globally Harmonized System of Classification and Labelling (GHS). The results of the queries are displayed below. Please see the individual country listings, as additional interpretations or reference information may be available. For a reference list of H- or P-statements, please visit ChemADVISOR's website at www.chemadvisor.com/sdsoncommand\ghs_H&Pphrases.html.

Australia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

EU GHS Classifications

Classifications below according to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP).

AROCLOR 1248 (12672-29-6)

STOT Repeated Exposure: STOT RE 2 Hazard_Statement: H373 Notes: C (Minimum classification, No information to prove exclusion of certain routes of exposure)

Aquatic (Acute): Aquatic Acute 1 Statement: H400 Additional_Info: C

Aquatic (Chronic): Aquatic Chronic 1 Statement: H410 Additional_Info: C

EU Labelling: Pictogram: GHS08, GHS09 Signal_Word: Wng Hazard_Statement: H373, H410 Notes: C (H373: No information to prove exclusion of certain routes of exposure)

EU Specific Concentration Limits: Category: STOT RE 2 Class: Specific Target Organ Toxicity - Repeated Exposure Statement: H373 : C>=0.005% Additional_Info: C

Indonesia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

Japan GHS Classifications

Classifications below published under Japan's Chemicals Classification Program according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

AROCLOR 1248 (12672-29-6)

Acute Category: 4 Symbol: Exclamation mark Signal: Warning Statement:

**Toxicity-
Oral:** Harmful if swallowed

**Acute
Toxicity-
Dermal:** Category: 3 Symbol: Skull and crossbones Signal: Danger Statement: Toxic in contact with skin

Carcinogenicity: Category: 1B Symbol: Health hazard Signal: Danger Statement: May cause cancer

**Reproductive
Toxicity:** Category: 1A Symbol: Health hazard Signal: Danger Statement: May damage fertility or the unborn child

**STOT
Single
Exposure:** Category: 3 Symbol: Exclamation mark Signal: Warning Statement: May cause respiratory irritation

**STOT
Repeated
Exposure:** Category: 1 Symbol: Health hazard Signal: Danger Statement: Causes damage to organs through prolonged or repeated exposure Targets: immune system, liver, skin

**Hazards to
the Aquatic
Environment:** Category: 1 Symbol: Environment Signal: Warning Statement: Very toxic to aquatic life

Category: 1 Symbol: Environment Signal: Warning Statement: Very toxic to aquatic life with long lasting effects

Korea GHS Classifications

Classifications below published by Korea's Ministry of Labor (MOL) or Office of National Emergency Management (NEMA, physical hazards only).

AROCLOR 1248 (12672-29-6)

**Acute
Toxicity-
Oral:** Acute_Tox. 4 Symbol: Exclamation mark Signal_Word: Warning Hazard_Statement: H302 Precautionary_Statement_Prevention: P264, P270 Precautionary_Statement_Response: P301+P312, P330 Precautionary_Statement_Disposal: P501

**Acute
Toxicity-
Dermal:** Acute_Tox. 3 Symbol: Skull and crossbones Signal_Word: Danger Hazard_Statement: H311 Precautionary_Statement_Prevention: P280 Precautionary_Statement_Response: P302+P352, P312, P322, P361, P363 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

Carcinogenicity: Carc. 1B Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H350 Precautionary_Statement_Prevention: P201, P202, P281 Precautionary_Statement_Response: P308+P313 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

**Reproductive
Toxicity:** Repr. 1A Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H360 Precautionary_Statement_Prevention: P201, P202, P281 Precautionary_Statement_Response: P308+P313 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

**STOT
Single
Exposure:** Single 3 Respiratory Tract Irritation Symbol: Exclamation mark Signal_Word: Warning Hazard_Statement: H335 Precautionary_Statement_Prevention: P261, P271

Precautionary_Statement_Response: P304+P340, P312
 Precautionary_Statement_Storage: P403+P233, P405
 Precautionary_Statement_Disposal: P501

STOT Repeated Exposure: Rep. 1 Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H372
 Precautionary_Statement_Prevention: P260, P264, P270
 Precautionary_Statement_Response: P314
 Precautionary_Statement_Disposal: P501

Hazards to the Aquatic Environment: Aquatic_Acute 1 Symbol: Environment Signal_Word: Warning
 Hazard_Statement: H400 Precautionary_Statement_Prevention: P273
 Precautionary_Statement_Response: P391
 Precautionary_Statement_Disposal: P501

Aquatic_Chronic 1 Symbol: Environment Signal_Word: Warning
 Hazard_Statement: H410 Precautionary_Statement_Prevention: P273
 Precautionary_Statement_Response: P391
 Precautionary_Statement_Disposal: P501

New Zealand GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

South Africa GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

Taiwan GHS Classifications

Information below presented according to Taiwan's Bureau of Standards, Metrology and Inspection (BSMI) of the Ministry of Economic Affairs. This agency has published a series of standards (CNS 15030 1-27 Chemical Classification and Labelling) which provide guidance on classification and labelling of chemicals according to GHS.

AROCLOR 1248 (12672-29-6)

Listing: Acute toxicity (Dermal) - Category 3, Acute toxicity (Oral) - Category 4, Carcinogenicity - Category 1, Hazardous to the aquatic environment (Chronic) - Category 1, Reproductive toxicity - Category 1, Specific target organ systemic toxicity (repeated exposure) - Category 2 Environment, Health hazard, Skull and crossbones, Danger Harmful if swallowed; May cause cancer; May cause damage to organs through prolonged or repeated exposure; May damage fertility or the unborn child; Toxic in contact with skin; Very toxic to aquatic life with long lasting effects Avoid release to the environment; Dispose contents/container as disposal of hazardous materials; Remove/take off immediately all contaminated clothing; This substance and its container must be disposed safely; Wear suitable protective clothing

*** Section 16 - OTHER INFORMATION ***

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO -

International Civil Aviation Organization; IDL - Ingredient Disclosure List; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Full text of R phrases in Section 3

R33 Danger of cumulative effects.

R50 Very toxic to aquatic organisms.

R53 May cause long-term adverse effects in the aquatic environment.

Other Information

Reasonable care has been taken in the preparation of this information, but the manufacturer makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The manufacturer makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use.

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Safety Data Sheet
Material Name: AROCLOR 1260
SDS ID: OHS01930
Issue Date: 2010-09-07
Revision: 1.0300

Other Sections

[02](#) [03](#) [04](#) [05](#) [06](#) [07](#) [08](#) [09](#) [10](#) [11](#) [11B](#) [12](#) [13](#) [14](#) [15](#) [16](#)

***** Section 1 - PRODUCT AND COMPANY IDENTIFICATION *****

Material Name: AROCLOR 1260

ChemADVISOR, Inc.

Stone Quarry Crossing

811 Camp Horne Road, Suite 220

Pittsburgh, PA 15237

E-mail: info@chemadvisor.com

MSDS is for reference use only; please contact manufacturer for emergency response information, routine product inquiries and orders.

Chemical Family

halogenated, aromatic

Synonyms

PCB 1260; CHLORODIPHENYL (60% CL); POLYCHLORINATED BIPHENYL (AROCLOR 1260); POLYCHLORINATED BIPHENYL; CHLOROBIPHENYLS; PCB; PCBs; UN 2315; STCC 4861666

***** Section 2 - HAZARDS IDENTIFICATION *****

EMERGENCY OVERVIEW

Color: yellow

Physical Form: semi-solid

Health Hazards: respiratory tract irritation, skin irritation, eye irritation, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS**Inhalation**

Short Term: irritation, liver damage

Long Term: rash, itching, hair loss, nausea, vomiting, stomach pain, headache, dizziness, impotence, coma, cancer

Skin Contact

Short Term: irritation, liver damage

Long Term: same as effects reported in long term inhalation, hair loss, reproductive effects

Eye Contact**Short Term:** irritation**Long Term:** same as effects reported in short term exposure**Ingestion****Short Term:** liver damage**Long Term:** same as effects reported in long term inhalation, hyperactivity, menstrual disorders, reproductive effects, cancer***** Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS *****

CAS	Component / EC#	Percent	Symbol(s)	Risk Phrase(s)
11096-82-5	AROCLOR 1260 215-648-1	100.0	N	R:33-50-53

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Polychlorinated biphenyls (1336-36-3).

Contaminants

MAY CONTAIN 0-2 PPM CHLORINATED DIBENZIFURANS.

***** Section 4 - FIRST AID MEASURES *******Inhalation**

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

Skin

Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eyes

Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

If a large amount is swallowed, get medical attention.

***** Section 5 - FIRE FIGHTING MEASURES *****

See Section 9 for Flammability Properties

NFPA Ratings:**Health: 2 Fire: 1 Reactivity: 0**

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Flammable Properties

Slight fire hazard.

Extinguishing Media

regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

Fire Fighting Measures

Move container from fire area if it can be done without risk. Do not scatter spilled material with high-pressure water streams. Dike for later disposal. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

***** Section 6 - ACCIDENTAL RELEASE MEASURES *****

Soil Release

Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

Water Release

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers. Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment.

Occupational spill/release

Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

***** Section 7 - HANDLING AND STORAGE *****

Storage Procedures

Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

***** Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION *****

Component Exposure Limits

AROCLOR 1260 (11096-82-5)

NIOSH: 0.001 mg/m³ TWA

Exposure Limits for Chemicals which may be generated during processing

This material has no components listed.

Ventilation

Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eyes/Face

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Protective Clothing

Wear appropriate chemical resistant clothing.

Glove Recommendations

Wear appropriate chemical resistant gloves.

Respiratory Protection

The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Escape -

Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister having an N100, R100, or P100 filter.

Any appropriate escape-type, self-contained breathing apparatus.

***** Section 9 - PHYSICAL AND CHEMICAL PROPERTIES *****

Physical State: Solid	Appearance: Not available
Color: yellow	Physical Form: semi-solid
Odor: Not Available	Odor Threshold: Not available
Melting Point: Not available	Boiling Point: 385 - 420 °C
Flash Point: >385 °C	Vapor Pressure: negligible
Vapor Density (air = 1): Not applicable	Density: Not available
Specific Gravity (water = 1): 1.58	Water Solubility: very slightly soluble
Coeff. Water/Oil Dist: Not available	

Solvent Solubility

Soluble: oils, organic solvents

Insoluble: glycerol, glycols

***** Section 10 - STABILITY AND REACTIVITY *****

Chemical Stability

Stable at normal temperatures and pressure.

Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials.

Incompatible Materials

oxidizing materials, combustible materials

POLYCHLORINATED BIPHENYLS:

CHLORINE (LIQUID): Exothermic reaction.
OXIDIZERS (STRONG): Fire and explosion hazard.
PLASTICS, RUBBER, COATINGS: Attacks.

Hazardous Decomposition Products

acid halides, chlorine, oxides of carbon, halogenated compounds

Thermal decomposition products: hydrogen chloride, chlorine, carbon monoxide, chlorinated dibenzofurans.

Possibility of Hazardous Reactions

Will not polymerize.

*** Section 11 - TOXICOLOGICAL INFORMATION ***

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

AROCLOR 1260 (11096-82-5)

Oral LD50 Rat 1315 mg/kg

RTECS Acute Toxicity (selected)

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1260 (11096-82-5)

Oral: 1315 mg/kg Oral Rat LD50

Acute Toxicity Level

AROCLOR 1260 (11096-82-5)

Moderately ingestion.

Toxic:

Component Carcinogenicity

AROCLOR 1260 (11096-82-5)

IARC: Supplement 7 [1987]; Monograph 18 [1978] (Group 2A (probably carcinogenic to humans))

NTP: Reasonably Anticipated To Be A Human Carcinogen

OSHA: Present

RTECS Irritation

The components of this material have been reviewed and RTECS publishes no data as of the date on this document.

Local Effects

AROCLOR 1260 (11096-82-5)

Irritant: inhalation, skin, eye.

Target Organs

AROCLOR 1260 (11096-82-5)

liver.

Epidemiologic data provide evidence of a relationship between exposure to polychlorinated biphenyls and the development of cancer, especially the consistent emergence of hepatobiliary cancer in different studies. Certain polychlorinated biphenyls produced benign and malignant liver neoplasms in mice and rats after their oral administration. The incidences of preneoplastic lesions and of neoplasms of the liver and lung tumors induced in rodents by N-nitrosodiethylamine or 2-acetylaminofluorene were increased by administration of polychlorinated biphenyls.

Medical Conditions Aggravated by Exposure

liver disorders, skin disorders and allergies

RTECS Tumorigenic

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1260 (11096-82-5)

4992 mg/kg Oral Rat TD (2 year(s)); 360 mg/kg Oral Rat TD (17 week);
4380 mg/kg Oral Rat TDLo (83 week)

RTECS Mutagenic

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1260 (11096-82-5)

1080 mg/kg/26 week continuous rat

RTECS Reproductive Effects

The components of this material have been reviewed, and RTECS publishes the following endpoints:

AROCLOR 1260 (11096-82-5)

20 mg/kg Intraperitoneal Mouse TDLo (prior to copulation 1 day(s)); 74 mg/kg Oral Mouse TDLo (prior to copulation 62 day(s), pregnant 1-10 day(s)); 143 mg/kg Subcutaneous Mouse TDLo (post 21 day(s)); 10 mg/kg Intraperitoneal Rat TDLo (male 1 day(s)); 400 ug/kg Intratesticular Rat TDLo (male 1 day(s)); 1675 mg/kg Oral Rat TDLo (Multigeneration); 210 mg/kg Oral Rat TDLo (pregnant 14-20 day(s))

Concurrent exposure to carbon tetrachloride may enhance the hepatotoxic effects of polychlorinated biphenyls.

Inhalation - Acute Exposure

POLYCHLORINATED BIPHENYLS: Inhalation of vapors of polychlorinated biphenyls may cause respiratory tract irritation. They may be absorbed and retained in body tissue.

Inhalation - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Eczema, skin burning, and systemic effects have been reported to occur when air levels of polychlorinated biphenyls were less than 1 mg/m³. The skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems may be affected. Dermatologic effects include erythematous eruptions with pruritis, discoloration of fingernails, skin thickening, swelling of the eyelids, face, and hands, excessive eye discharge, distinctive hair follicles, alopecia, and chloracne. Mucous membranes of the eyes and mouth may become pigmented. Gastrointestinal effects may include nausea, vomiting, abdominal pain, and anorexia. Liver damage may be indicated by jaundice. Adverse effects on the liver that have been reported in humans include cirrhosis, fatty degenerative necrosis, and yellow atrophy. Coma and death may follow severe liver damage. Neurologic effects may include headache, dizziness, irritability, depression, fatigue, impotence, and joint and muscle pain. Enzyme activity may be induced or inhibited resulting in upset of normal biological processes. Upper respiratory

tract irritation, decreased forced vital capacity, chest tightness, and persistent body odor have also been reported. Polychlorinated biphenyls will accumulate in tissues and organs, especially those rich in lipids. They cross the placenta and are excreted in breast milk and may exert toxic effects on the fetus or infant. Low mean birth weights and mean gestational ages were observed in infants born to women with a history of high exposure to polychlorinated biphenyls. Epidemiological studies provide suggestive evidence of a relationship between occupational exposure to polychlorinated biphenyls and the development of hepatobiliary cancer, melanoma, and cancer of the digestive system and of the lymphatic and hematopoietic tissue.

Inhalation - Other Toxicity Information

AROCLOR 1260: See information on polychlorinated biphenyls.

Skin Contact - Acute Exposure

POLYCHLORINATED BIPHENYLS: Direct contact with polychlorinated biphenyls may cause irritation and defat the skin. They may be absorbed through intact skin and retained in body tissue.

Skin Contact - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Repeated contact with polychlorinated biphenyls may cause chloracne. Liver damage may be indicated by jaundice. The skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems may be affected as detailed in chronic inhalation exposure. An increased incidence of spontaneous abortions and stillbirths were induced in rhesus monkeys following extended dermal contact. Maternal toxicity was indicated by alopecia, erythema and edema of the eyelids, and nonspecific metabolic abnormalities.

Skin Contact - Other Toxicity Information

AROCLOR 1260: See information on polychlorinated biphenyls.

Eye Contact - Acute Exposure

POLYCHLORINATED BIPHENYLS: Vapors and liquid may cause irritation, and may possibly be absorbed.

Eye Contact - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Prolonged or repeated exposure to irritants may result in conjunctivitis. Excessive eye discharge and swelling of the eyelids may result from systemic poisoning.

Eye - Other Toxicity Information

AROCLOR 1260: See information on polychlorinated biphenyls.

Ingestion - Acute Exposure

POLYCHLORINATED BIPHENYLS: Polychlorinated biphenyls may be absorbed through the gastrointestinal tract and retained in body tissue. A large single dose produced hepatic microsomal activity in rats. Animals receiving lethal doses may not die acutely. Death may be delayed up to three months.

Ingestion - Chronic Exposure

POLYCHLORINATED BIPHENYLS: Repeated ingestion of polychlorinated biphenyls may affect the skin, mucous membranes, gastrointestinal tract, liver, nervous system, and various enzyme systems as detailed in chronic inhalation exposure. Additional effects were reported in humans following ingestion of polychlorinated biphenyls contaminated with polychlorinated dibenzofurans including fever, hearing difficulties, immunosuppression, menstrual disorders in females, and a significantly increased risk of all cancers. Intrauterine exposure resulted in a fetal syndrome with clinical symptomatology including stillbirths, "cola colored" skin, low birth weight, elevated bilirubin, conjunctivitis, enlarged meibomian glands, chloracne, hypoplastic nails, scalp calcification, natal teeth, retarded growth and neurologic signs. Growth retardation and neurologic signs persisted for several years. Additional effects that have been induced in animals following repeated ingestion of polychlorinated biphenyls include adrenal gland toxicity, benign and malignant liver tumors in rats and mice, and an increased incidence of spontaneous abortions and stillbirths in monkeys. Transplacental transfer coupled with exposure through lactation caused locomotor, hyperactivity, and learning errors in monkeys which correlated with polychlorinated biphenyl body burdens.

Ingestion - Other Toxicity Information

AROCLOR 1260: See information on polychlorinated biphenyls.

***** Section 12 - ECOLOGICAL INFORMATION *****

Component Analysis - Aquatic Toxicity

AROCLOR 1260 (11096-82-5)

Invertebrate: 24 Hr EC50 water flea: 420 µg/L

***** Section 13 - DISPOSAL CONSIDERATIONS *****

Disposal Methods

Dispose in accordance with all applicable regulations.

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

***** Section 14 - TRANSPORT INFORMATION *****

US DOT Information

Shipping Name: Polychlorinated biphenyls, solid

Hazard Class: 9

UN/NA #: UN3432

Packing Group: II

Required Label(s): 9

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	Minimum Concentration
AROCLOR 1260	11096-82-5	DOT regulated severe marine pollutant

TDG Information: No Classification assigned.

Component Marine Pollutants (TDG)

This material contains one or more of the following chemicals required by CA TDG to be identified as marine pollutants.

AROCLOR 1260 (11096-82-5)

UN2315

ADR Information

Shipping Name: Polychlorinated biphenyls, solid

Hazard Class: 9

UN #: UN3432

Packing Group: II

Required Label(s): 9

ADR Tunnel Code Restrictions

This list contains tunnel restriction codes for those substances and/or chemically related entries which are found in chapter 3.2 of the ADR regulations.

AROCLOR 1260 (11096-82-5)

Restriction(s): D/E [UN2315, UN3432]

RID Information

Shipping Name: Polychlorinated biphenyls, liquid

Hazard Class: 9

UN #: UN2315

Packing Group: II

Required Label(s): 9

IATA Information

Shipping Name: Polychlorinated biphenyls, solid

Hazard Class: 9

UN #: UN3432

Packing Group: II

Required Label(s): 9

ICAO Information

Shipping Name: Polychlorinated biphenyls, solid

Hazard Class: 9

UN #: UN3432

Packing Group: II

Required Label(s): 9

IMDG Information

Shipping Name: Polychlorinated biphenyls, solid

Hazard Class: 9

UN #: UN3432

Packing Group: II

Component Marine Pollutants (IMDG)

This material contains one or more of the following chemicals required by IMDG to be identified as marine pollutants.

AROCLOR 1260 (11096-82-5)

IMDG regulated marine pollutant

***** Section 15 - REGULATORY INFORMATION *****

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 311/312 (40 CFR 370.21), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

AROCLOR 1260 (11096-82-5)

SARA 313: 0.1 % Supplier notification limit

CERCLA: 1 lb final RQ; 0.454 kg final RQ

TSCA 12b: Section 6, 50 ppm [see 40 CFR 761]

SARA Section 311/312 (40 CFR 370 Subparts B and C)**Acute Health:** Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No**U.S. State Regulations**

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
AROCLOR 1260 (related to: Polychlorinated biphenyls)	11096-82-5	Yes	Yes	Yes ¹	Yes ¹	Yes	Yes ¹

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis**AROCLOR 1260 (11096-82-5)****Carc:** carcinogen, initial date 1/1/88 (containing ≥ 60 % Chlorine by molecular weight)**Repro/Dev.** developmental toxicity, initial date 1/1/91**Tox:****Canadian WHMIS Ingredient Disclosure List (IDL)**

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL.

AROCLOR 1260 (11096-82-5)

0.1 %

Germany Water Classification**AROCLOR 1260 (11096-82-5)**

Number 471, hazard class 3 - severe hazard to waters (footnote 34)

EU Marking and Labelling**EC-No.** 215-648-1**Symbols**

N Dangerous for the environment

Risk Phrases**R33** Danger of cumulative effects.**R50** Very toxic to aquatic organisms.**R53** May cause long-term adverse effects in the aquatic environment.**Safety Phrases****S2** Keep out of the reach of children.**S13** Keep away from food, drink and animal feedingstuffs.**S24** Avoid contact with skin.**S25** Avoid contact with eyes.**S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.**S36** Wear suitable protective clothing.

S46 If swallowed, seek medical advice immediately and show this container or label.

Component Analysis - Inventory

Component	CAS	US	CA	EU	AU	PH	JP	KR	CN	NZ
AROCLOR 1260	11096-82-5	No								

Globally Harmonized System of Classification and Labelling (GHS)

The listed component(s) of this material have been checked for country-specific published classifications according to the Globally Harmonized System of Classification and Labelling (GHS). The results of the queries are displayed below. Please see the individual country listings, as additional interpretations or reference information may be available. For a reference list of H- or P-statements, please visit ChemADVISOR's website at www.chemadvisor.com/sdsoncommand\ghs_H&Pphrases.html.

Australia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

EU GHS Classifications

Classifications below according to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP).

AROCLOR 1260 (11096-82-5)

STOT Repeated Exposure: STOT RE 2 Hazard_Statement: H373 Notes: C (Minimum classification, No information to prove exclusion of certain routes of exposure)

Aquatic (Acute): Aquatic Acute 1 Statement: H400 Additional_Info: C

Aquatic (Chronic): Aquatic Chronic 1 Statement: H410 Additional_Info: C

EU Labelling: Pictogram: GHS08, GHS09 Signal_Word: Wng Hazard_Statement: H373, H410 Notes: C (H373: No information to prove exclusion of certain routes of exposure)

EU Specific Concentration Limits: Category: STOT RE 2 Class: Specific Target Organ Toxicity - Repeated Exposure Statement: H373 : C>=0.005% Additional_Info: C

Indonesia GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

Japan GHS Classifications

Classifications below published under Japan's Chemicals Classification Program according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

AROCLOR 1260 (11096-82-5)

Acute Toxicity-Oral: Category: 4 Symbol: Exclamation mark Signal: Warning Statement: Harmful if swallowed

Acute Toxicity-Dermal: Category: 3 Symbol: Skull and crossbones Signal: Danger Statement: Toxic in contact with skin

Carcinogenicity: Category: 1B Symbol: Health hazard Signal: Danger Statement: May cause cancer

Reproductive Toxicity: Category: 1A Symbol: Health hazard Signal: Danger Statement: May damage fertility or the unborn child

STOT Single Exposure: Category: 3 Symbol: Exclamation mark Signal: Warning Statement: May cause respiratory irritation

STOT Repeated Exposure: Category: 1 Symbol: Health hazard Signal: Danger Statement: Causes damage to organs through prolonged or repeated exposure Targets: immune system, liver, skin

Hazards to the Aquatic Environment: Category: 1 Symbol: Environment Signal: Warning Statement: Very toxic to aquatic life

Category: 1 Symbol: Environment Signal: Warning Statement: Very toxic to aquatic life with long lasting effects

Korea GHS Classifications

Classifications below published by Korea's Ministry of Labor (MOL) or Office of National Emergency Management (NEMA, physical hazards only).

AROCLOR 1260 (11096-82-5)

Acute Toxicity- Oral: Acute_Tox. 4 Symbol: Exclamation mark Signal_Word: Warning Hazard_Statement: H302 Precautionary_Statement_Prevention: P264, P270 Precautionary_Statement_Response: P301+P312, P330 Precautionary_Statement_Disposal: P501

Acute Toxicity- Dermal: Acute_Tox. 3 Symbol: Skull and crossbones Signal_Word: Danger Hazard_Statement: H311 Precautionary_Statement_Prevention: P280 Precautionary_Statement_Response: P302+P352, P312, P322, P361, P363 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

Carcinogenicity: Carc. 1B Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H350 Precautionary_Statement_Prevention: P201, P202, P281 Precautionary_Statement_Response: P308+P313 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

Reproductive Toxicity: Repr. 1A Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H360 Precautionary_Statement_Prevention: P201, P202, P281 Precautionary_Statement_Response: P308+P313 Precautionary_Statement_Storage: P405 Precautionary_Statement_Disposal: P501

STOT Single Exposure: Single 3 Respiratory Tract Irritation Symbol: Exclamation mark Signal_Word: Warning Hazard_Statement: H335 Precautionary_Statement_Prevention: P261, P271 Precautionary_Statement_Response: P304+P340, P312 Precautionary_Statement_Storage: P403+P233, P405 Precautionary_Statement_Disposal: P501

STOT Repeated Exposure: Rep. 1 Symbol: Health hazard Signal_Word: Danger Hazard_Statement: H372 Precautionary_Statement_Prevention: P260, P264, P270 Precautionary_Statement_Response: P314 Precautionary_Statement_Disposal: P501

Hazards to Aquatic_Acute 1 Symbol: Environment Signal_Word: Warning

the Aquatic Environment: Hazard_Statement: H400 Precautionary_Statement_Prevention: P273
 Precautionary_Statement_Response: P391
 Precautionary_Statement_Disposal: P501

Aquatic_Chronic 1 Symbol: Environment Signal_Word: Warning
 Hazard_Statement: H410 Precautionary_Statement_Prevention: P273
 Precautionary_Statement_Response: P391
 Precautionary_Statement_Disposal: P501

New Zealand GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

South Africa GHS Classifications

No published information available. This material may be hazardous according to published criteria for classification.

Taiwan GHS Classifications

Information below presented according to Taiwan's Bureau of Standards, Metrology and Inspection (BSMI) of the Ministry of Economic Affairs. This agency has published a series of standards (CNS 15030 1-27 Chemical Classification and Labelling) which provide guidance on classification and labelling of chemicals according to GHS.

AROCLOR 1260 (11096-82-5)

Listing: Acute toxicity (Dermal) - Category 3, Acute toxicity (Oral) - Category 4, Carcinogenicity - Category 1, Hazardous to the aquatic environment (Chronic) - Category 1, Reproductive toxicity - Category 1, Specific target organ systemic toxicity (repeated exposure) - Category 2 Environment, Health hazard, Skull and crossbones, Danger Harmful if swallowed; May cause cancer; May cause damage to organs through prolonged or repeated exposure; May damage fertility or the unborn child; Toxic in contact with skin; Very toxic to aquatic life with long lasting effects Avoid release to the environment; Dispose contents/container as disposal of hazardous materials; Remove/take off immediately all contaminated clothing; This substance and its container must be disposed safely; Wear suitable protective clothing

*** Section 16 - OTHER INFORMATION ***

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation

of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Full text of R phrases in Section 3

R33 Danger of cumulative effects.

R50 Very toxic to aquatic organisms.

R53 May cause long-term adverse effects in the aquatic environment.

Other Information

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SAFETY DATA SHEET

Based on Directive 2001/58/EC et seq. of the Commission of the European Communities

BENZO[b]FLUORANTHENE

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Synonyms: benz[e]acephenanthrylene

CAS No.	: 205-99-2	BCR number	: BCR-47
EC index No.	: 601-034-00-4	NFPA code	: N.D.
EINECS No.	: 205-911-9	Molecular weight	: 252.32
RTECS No.	: CU1400000	Formula	: C ₂₀ H ₁₂

1.2 Use of the substance or the preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel. : +32 14 57 12 11
Fax : +32 14 58 42 73

1.4 Telephone number for emergency:

+32 70 245 245
Antigifcentrum
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
benzo[b]fluoranthene	205-99-2 205-911-9	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

4. First aid measures

4.1 Eye contact:

- Consult a doctor/medical service if irritation persists
- Rinse immediately with water
- Do not apply neutralizing agents

4.2 Skin contact:

- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Remove clothing before washing
- Do not apply (chemical) neutralizing agents

4.3 After inhalation:

- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

4.4 After ingestion:

- Consult a doctor/medical service if you feel unwell

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MSDS established :
Reference number : BIG\18244GB
Reason for revision : Directive 2001/58/EC

Revision date : 28-02-2002
Revision number : 001

BENZO[b]FLUORANTHENE

- Immediately give lots of water to drink
- Never give water to an unconscious person
- Do not induce vomiting

BENZO[b]FLUORANTHENE

5. Fire-fighting measures

5.1 Suitable extinguishing media:

- Water spray
- Polymer foam
- ABC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:

- Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

- Not easily combustible
- Upon combustion CO and CO₂ are formed

5.4 Instructions:

- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

5.5 Special protective equipment for firefighters:

- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal protection/precautions: see 8.1/8.3/10.3

6.2 Environmental precautions:

- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

6.3 Methods for cleaning up:

- Stop dust cloud by covering with sand/earth
- Carefully collect the spill/leftovers
- Scoop solid spill into closing containers
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Clean contaminated clothing

7.2 Storage:

- Keep container tightly closed.
- Store in a cool area
- Store in a dry area
- Store in a dark area
- Keep away from: heat sources, ignition sources, oxidizing agents, acids

Storage temperature : N.D. °C
Quantity limits : N.D. kg
Storage life : N.D.
Materials for packaging : N.D.

7.3 Specific uses: N.D.

BENZO[b]FLUORANTHENE

8. Exposure controls/Personal protection

8.1 Exposure limit values:

TLV-TWA	: not listed
TLV-STEL	: not listed
TLV-Ceiling	: not listed
OES-LTEL	: not listed
OES-STEL	: not listed
MEL-LTEL	: not listed
MEL-STEL	: not listed
MAK	: not listed
TRK	: not listed
MAC-TGG 8 h	: not listed
MAC-TGG 15 min.	: not listed
MAC-Ceiling	: not listed
VME-8 h	: not listed
VLE-15 min.	: not listed
GWBB-8 h	: not listed
GWK-15 min.	: not listed
Momentary value	: not listed

Sampling methods:

- Benzo(b)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5515
- Benzo(b)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5506

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see 13

8.3 Personal protection:

8.3.1 respiratory protection:

- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

8.3.2 hand protection:

- Gloves
Suitable materials: No data available
- Breakthrough time: N.D.

8.3.3 eye protection:

- Safety glasses
- In case of dust production: protective goggles

8.3.4 skin protection:

- Protective clothing
- In case of dust production: head/neck protection
Suitable materials: No data available

BENZO[b]FLUORANTHENE

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C) : Crystalline solid / Needles
Odour : Odourless
Colour : Colourless to off-white

9.2 Important health, safety and environmental information:

pH value : N.D.
Boiling point/boiling range : N.D. °C
Flashpoint : N.D. °C
Explosion limits : N.D. vol% (°C)
Vapour pressure (at 20°C) : 0.00000067 hPa
Vapour pressure (at 50°C) : N.D. hPa
Relative density (at 20°C) : N.D.
Water solubility : 0.00000012 g/100 ml
Soluble in : Acetone, oils/fats
Relative vapour density : N.D.
Viscosity : N.D. Pa.s
Partition coefficient n-octanol/water : 6.57
Evaporation rate
ratio butyl acetate : N.D.
ratio ether : N.D.

9.3 Other information:

Melting point/melting range : 168 °C
Auto-ignition point : N.D. °C
Saturation concentration : N.D. g/m³

10. Stability and reactivity

10.1 Conditions to avoid/reactivity:

- Stable under normal conditions

10.2 Materials to avoid:

- Keep away from: heat sources, ignition sources, oxidizing agents, acids

10.3 Hazardous decomposition products:

- Upon combustion CO and CO₂ are formed
- Reacts violently with (strong) oxidizers
- Decomposes on exposure to (strong) acids

BENZO[b]FLUORANTHENE

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat	: N.D.	mg/kg
LD50 dermal rat	: N.D.	mg/kg
LD50 dermal rabbit	: N.D.	mg/kg
LC50 inhalation rat	: N.D.	mg/l/4 h
LC50 inhalation rat	: N.D.	ppm/4 h

11.2 Chronic toxicity:

benzo[b]fluoranthene

EC carc. cat.	: 2
EC muta. cat.	: not listed
EC repr. cat.	: not listed

Carcinogenicity (TLV)	: A2
Carcinogenicity (MAC)	: K
Carcinogenicity (VME)	: not listed
Carcinogenicity (GWBB)	: not listed

Carcinogenicity (MAK)	: 2
Mutagenicity (MAK)	: not listed
Teratogenicity (MAK)	: -

IARC classification	: 2B
---------------------	------

11.3 Routes of exposure: ingestion, inhalation, eyes and skin
Caution! Substance is absorbed through the skin

11.4 Acute effects/symptoms:

- AFTER SKIN CONTACT
Slight irritation

11.5 Chronic effects:

- Probably human carcinogenic
- Not classified as toxic to reproduction (EC)
- ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
- SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Cracking of the skin
Skin rash/inflammation
Photoallergy
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

BENZO[b]FLUORANTHENE

12. Ecological information

12.1 Ecotoxicity:

- - No data available

12.2 Mobility:

- Volatile organic compounds (VOC): 0%
- Photolysis in water
- Forming sediments in water
- Insoluble in water

For other physicochemical properties see heading 9.

12.3 Persistence and degradability:

- biodegradation BOD₅ : N.D. % ThOD
- water : - Not readily biodegradable in water
- test: E 1/2 > 100 d.
- soil : T ½: > 87 days

12.4 Bioaccumulative potential:

- log P_{ow} : 6.57
- BCF : 168 h : 2800 (LAMELLIBRANCHIATA)
- Highly bioaccumulative

12.5 Other adverse effects:

- WGK : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- Effect on the ozone layer : Not dangerous for the ozone layer (Council Regulation (EC) No 3093/94, O.J. L333 of 22/12/94)
- Greenhouse effect : no data available
- Effect on waste water purification : no data available

13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision 201/118/EC, O.J. L47 of 16/2/2001): 16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council Decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

BENZO[b]FLUORANTHENE

14. Transport information

90
3077

- 14.1 Classification of the substance in compliance with UN Recommendations
- | | |
|----------------------|--|
| UN number | : 3077 |
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| PROPER SHIPPING NAME | : UN 3077, Environmentally hazardous substance, solid, n.o.s. (benz[e]acephenanthrylene) |
- 14.2 ADR (transport by road)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.3 RID (transport by rail)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.4 ADNR (transport by inland waterways)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.5 IMDG (maritime transport)
- | | |
|------------------|-------|
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| MFAG | : - |
| EMS | : - |
| MARINE POLLUTANT | : P |
- 14.6 ICAO (air transport)
- | | |
|---|-------|
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| PACKING INSTRUCTIONS PASSENGER AIRCRAFT | : |
| PACKING INSTRUCTIONS CARGO AIRCRAFT | : |
- 14.7 Special precautions in connection with transport : none

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:
each package shall display a diamond-shaped figure with the following inscription:
- 'UN 3077'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'

BENZO[b]FLUORANTHENE

15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens



Toxic



Dangerous for the environment

- R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
- S53 : Avoid exposure - obtain special instructions before use
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)
S60 : This material and/or its container must be disposed of as hazardous waste
S61 : Avoid release to the environment. Refer to special instructions/safety data sheets.

16. Other information

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
* = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

- R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Exposure limits:

TLV : Threshold Limit Value - ACGIH USA 2000
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
MAC : Maximale aanvaarde concentratie - The Netherlands 2002
VME : Valeurs limites de Moyenne d'Exposition - France 1999
VLE : Valeurs limites d'Exposition à court terme - France 1999
GWBB : Grenswaarde beroepsmatige blootstelling - Belgium 1998
GWK : Grenswaarde kortstondige blootstelling - Belgium 1998
EC : Indicative occupational exposure limit values - directive 2000/39/EC

Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002

SAFETY DATA SHEET

Based on Directive 2001/58/EC of the Commission of the European Communities

BENZO[k]FLUORANTHENE

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Synonyms: none
CAS No. : 207-08-9 BCR number : BCR-48R
EC index No. : 601-036-00-5 NFPA code : N.D.
EINECS No. : 205-916-6 Molecular weight : 252.32
RTECS No. : DF6350000 Formula : C20H12

1.2 Use of the substance or the preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
2440 Geel
Tel. : +32 14 57 12 11
Fax : +32 14 59 04 06

1.4 Telephone number for emergency:

+32 70 245 245
Antigifcentrum
p/a Militair Hospitaal Koningin Astrid, Bruynstraat, B-1120 Brussel

2. Composition/information on ingredients

Hazardous ingredients	CAS No. EINECS No.	Conc. in %	Hazard symbol	Risks (R-phrases)
benzo[k]fluoranthene	207-08-9 205-916-6	100	T;N	45-50/53 (1)

(1) For R-phrases in full: see heading 16

3. Hazards identification

- May cause cancer
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

4. First aid measures

4.1 Eye contact:

- Consult a doctor/medical service if irritation persists
- Rinse immediately with water
- Do not apply neutralizing agents

4.2 Skin contact:

- Consult a doctor/medical service if irritation persists
- Wash with water and soap
- Wipe off dry product from skin
- Remove clothing before washing

4.3 After inhalation:

- Consult a doctor/medical service if breathing problems develop
- Remove the victim into fresh air
- Unconscious: maintain adequate airway and respiration

4.4 After ingestion:

- Consult a doctor/medical service if you feel unwell
- Immediately give lots of water to drink

Printing date : 07-2002
Compiled by : Brandweerinformatiecentrum voor Gevaarlijke Stoffen vzw (BIG)
Technische Schoolstraat 43 A, B-2440 Geel
☎ +32 14 58 45 47 http://www.big.be E-mail: info@big.be

MSDS established :
Reference number : BIG\18245GB
Reason for revision : Directive 2001/58/EC

Revision date : 27-03-2002
Revision number : 001

BENZO[k]FLUORANTHENE

- Never give water to an unconscious person
- Do not induce vomiting

BENZO[k]FLUORANTHENE

5. Fire-fighting measures

5.1 Suitable extinguishing media:

- Water spray
- Polyvalent foam
- ABC powder
- Carbon dioxide

5.2 Unsuitable extinguishing media:

- No data available

5.3 Special exposure hazards:

- Not easily combustible
- Upon combustion CO and CO₂ are formed

5.4 Instructions:

- Take account of toxic firefighting water
- Use firefighting water moderately and contain it

5.5 Special protective equipment for firefighters:

- Heat/fire exposure: compressed air/oxygen apparatus
- Dust cloud production: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal protection/precautions: see heading 8.1/8.3/10.3

6.2 Environmental precautions:

- Prevent soil and water pollution
- Substance must not be discharged into the sewer
- Dam up the solid spill

6.3 Methods for cleaning up:

- Prevent dust cloud formation
- Carefully collect the spill/leftovers
- Take collected spill to manufacturer/competent authority
- Clean contaminated surfaces with an excess of water
- Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

- Observe strict hygiene
- Avoid prolonged and repeated contact with skin
- Avoid raising dust
- Do not discharge the waste into the drain
- Remove contaminated clothing immediately

7.2 Storage:

- Keep container tightly closed. Store in a cool area. Store in a dry area.
- Store in a dark area.
- Keep away from: heat sources, ignition sources, oxidizing agents

Storage temperature	: N.D.	°C
Quantity limits	: N.D.	kg
Storage life	: N.D.	
Materials for packaging	:	
- suitable	:no data available	
- to avoid	:no data available	

7.3 Specific uses:

- See information supplied by the manufacturer

BENZO[k]FLUORANTHENE

8. Exposure controls/Personal protection

8.1 Exposure limit values:

TLV-TWA	: not listed
TLV-STEL	: not listed
TLV-Ceiling	: not listed
OES-LTEL	: not listed
OES-STEL	: not listed
MEL-LTEL	: not listed
MEL-STEL	: not listed
MAK	: not listed
TRK	: not listed
MAC-TGG 8 h	: not listed
MAC-TGG 15 min.	: not listed
MAC-Ceiling	: not listed
VME-8 h	: not listed
VLE-15 min.	: not listed
GWBB-8 h	: not listed
GWK-15 min.	: not listed
Momentary value	: not listed
EC	: not listed
EC-STEL	: not listed

Sampling methods:

- Benzo(k)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5515
- Benzo(k)fluoranthene (Polynuclear aromatic hydrocarbons) NIOSH 5506

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

- Measure the concentration in the air regularly
- Work under local exhaust/ventilation

8.2.2 Environmental exposure controls: see heading 13

8.3 Personal protection:

8.3.1 respiratory protection:

- Dust production: dust mask with filter type P3
- High dust production: compressed air/oxygen apparatus

8.3.2 hand protection:

- Gloves
- Suitable materials: No data available
- Breakthrough time: N.D.

8.3.3 eye protection:

- Safety glasses
- In case of dust production: protective goggles

8.3.4 skin protection:

- Protective clothing
- In case of dust production: head/neck protection
- Suitable materials: No data available

BENZO[k]FLUORANTHENE

9. Physical and chemical properties

9.1 General information:

Appearance (at 20°C) : Crystalline solid / Needles
Odour : N.D.
Colour : Light yellow

9.2 Important health, safety and environmental information:

pH value : N.D.
Boiling point/boiling range : 480 °C
Flashpoint : N.D. °C
Explosion limits : N.D. vol% (°C)
Vapour pressure (at 20°C) : 0.00000067 hPa
Vapour pressure (at 50°C) : N.D. hPa
Relative density (at 20°C) : N.D.
Water solubility : 0.000000076 g/100 ml
Soluble in : Ethanol, oils/fats, acetic acid
Relative vapour density : N.D.
Viscosity : N.D. Pa.s
Partition coefficient n-octanol/water : 6.84
Evaporation rate
ratio to butyl acetate : N.D.
ratio to ether : N.D.

9.3 Other information:

Melting point/melting range : 217 °C
Auto-ignition point : N.D. °C
Saturation concentration : N.D. g/m³

10. Stability and reactivity

10.1 Conditions to avoid/reactivity:

- No data available

10.2 Materials to avoid:

- Keep away from: heat sources, ignition sources, oxidizing agents

10.3 Hazardous decomposition products:

- Upon combustion CO and CO₂ are formed
- Reacts violently with (strong) oxidizers

11. Toxicological information

11.1 Acute toxicity:

LD50 oral rat : N.D. mg/kg
LD50 dermal rat : N.D. mg/kg
LD50 dermal rabbit : N.D. mg/kg
LC50 inhalation rat : N.D. mg/l/4 h
LC50 inhalation rat : N.D. ppm/4 h

BENZO[k]FLUORANTHENE

11.2 Chronic toxicity:

EC carc. cat. : 2
EC muta. cat. : not listed
EC repr. cat. : not listed

Carcinogenicity (TLV) : not listed
Carcinogenicity (MAC) : K
Carcinogenicity (VME) : not listed
Carcinogenicity (GWBB) : not listed

Carcinogenicity (MAK) : 2
Mutagenicity (MAK) : not listed
Teratogenicity (MAK) : -

IARC classification : 2B

11.3 Routes of exposure: ingestion, inhalation, eyes and skin
Caution! Substance is absorbed through the skin

11.4 Acute effects/symptoms:

AFTER SKIN CONTACT
- Slight irritation

11.5 Chronic effects:

- Probably human carcinogenic

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
- No specific information available

SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
- Feeling of weakness
- Cracking of the skin
- Skin rash/inflammation
- Photoallergy
- Skin cancer
- Lung tissue affection/degeneration
- Enlargement/affection of the liver
- Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

- LC50 (23 h) : 0.0048 mg/l (DAPHNIA MAGNA)

12.2 Mobility:

- Volatile organic compounds (VOC): 0%
- Ozonation in water
- Forming sediments in water
- Insoluble in water

For other physicochemical properties see heading 9.

12.3 Persistence and degradability:

- biodegradation BOD₅ : N.D. % ThOD
- water : - Not readily biodegradable in water
- soil : T ½: 65/1400 days

12.4 Bioaccumulative potential:

- log P_{ow} : 6.84
- BCF : 8750 (PISCES)
- Highly bioaccumulative

BENZO[k]FLUORANTHENE

12.5 Other adverse effects:

- **WGK** : 3 (Classification based on the R-phrases in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 17 May 1999)
- **Effect on the ozone layer** : Not dangerous for the ozone layer (Council Regulation (EC) 3093/94)
- **Greenhouse effect** : no data available
- **Effect on waste water purification** : no data available

13. Disposal considerations

13.1 Provisions relating to waste:

- Waste material code (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 16 05 06 (laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory)
- Waste material code (Flanders): 001, 045, 691
- Waste code (Germany): 59302
- Hazardous waste (91/689/EEC)

13.2 Disposal methods:

- Dissolve or mix with a combustible solvent
- Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber
- Do not discharge into surface water (2000/60/EEC, Council Decision 2455/2001/EC)

13.3 Packaging/Container:

- Waste material code packaging (91/689/EEC, Council Decision 2001/118/EC, O.J. L47 of 16/2/2001): 15 01 10 (packaging containing residues of or contaminated by dangerous substances)

BENZO[k]FLUORANTHENE

14. Transport information

90
3077

- 14.1 Classification of the substance in compliance with UN Recommendations
- | | |
|----------------------|--|
| UN number | : 3077 |
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| PROPER SHIPPING NAME | : UN 3077, Environmentally hazardous substance, solid, n.o.s. (benzo[k]fluoranthene) |
- 14.2 ADR (transport by road)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.3 RID (transport by rail)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.4 ADNR (transport by inland waterways)
- | | |
|-----------------------|-------|
| CLASS | : 9 |
| PACKING | : III |
| DANGER LABEL TANKS | : 9 |
| DANGER LABEL PACKAGES | : 9 |
- 14.5 IMDG (maritime transport)
- | | |
|------------------|-------|
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| MFAG | : - |
| EMS | : - |
| MARINE POLLUTANT | : P |
- 14.6 ICAO (air transport)
- | | |
|---|-------|
| CLASS | : 9 |
| SUB RISKS | : - |
| PACKING | : III |
| PACKING INSTRUCTIONS PASSENGER AIRCRAFT | : |
| PACKING INSTRUCTIONS CARGO AIRCRAFT | : |
- 14.7 Special precautions in connection with transport : none
- 14.8 Limited quantities (LQ) :

When substances and their packaging meet the conditions established by ADR/RID/ADNR in chapter 3.4, **only** the following prescriptions shall be complied with:
each package shall display a diamond-shaped figure with the following inscription:
- 'UN 3077'
or, in the case of different goods with different identification numbers within a single package:
- the letters 'LQ'

BENZO[k]FLUORANTHENE

15. Regulatory information

Enumerated in substance list Annex I of directive 67/548/EEC et sequens



Toxic



Dangerous for the environment

- R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
- S53 : Avoid exposure - obtain special instructions before use
S45 : In case of accident or if you feel unwell, seek medical advice (show the label where possible)
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16. Other information

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N.A. = NOT APPLICABLE
N.D. = NOT DETERMINED
* = INTERNAL CLASSIFICATION

Full text of any R-phrases referred to under heading 2:

- R45 : May cause cancer
R50/53 : Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Exposure limits:

TLV : Threshold Limit Value - ACGIH USA 2000
OES : Occupational Exposure Standards - United Kingdom 1999
MEL : Maximum Exposure Limits - United Kingdom 1999
MAK : Maximale Arbeitsplatzkonzentrationen - Germany 2001
TRK : Technische Richtkonzentrationen - Germany 2001
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Chronic toxicity:

K : List of the carcinogenic substances and processes - The Netherlands 2002

MSDS Number: **B7222** * * * * * *Effective Date: 05/26/09* * * * * * *Supersedes: 07/06/06*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL TERT-BUTYL ETHER

1. Product Identification

Synonyms: 2-Methoxy-2-methylpropane; tert-Butyl methyl ether; Methyl 1,1-dimethyl ethyl ether; MTBE

CAS No.: 1634-04-4

Molecular Weight: 88.15

Chemical Formula: C₅H₁₂O

Product Codes:

J.T. Baker: 9034, 9042, 9043

Mallinckrodt: 5398

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl tert-butyl Ether	1634-04-4	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY AFFECT CENTRAL NERVOUS SYSTEM, BLOOD, AND KIDNEYS. A CENTRAL NERVOUS SYSTEM DEPRESSANT. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate (Life)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES;
CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

Inhalation of vapor can irritate respiratory tract. Causes central nervous system effects. Breathing high concentrations in air can cause lightheadedness, dizziness, weakness, nausea, headache.

Ingestion:

May cause nausea, vomiting. Other symptoms similar to inhalation may occur. Laryngeal, ocular, and respiratory muscles are affected in severe poisoning.

Skin Contact:

A mild skin irritant which causes loss of natural oils. May be a route of absorption into the body.

Eye Contact:

Vapors can irritate eyes; splashes may cause damage to eye tissue.

Chronic Exposure:

Symptoms noted above may be produced by cumulative exposure.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Flash point: -27C (-17F)

Autoignition temperature: 435C (815F)

Flammable limits in air % by volume:

lcl: 1.6; ucl: 8.4

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.

Explosion:

Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), A3 - Confirmed animal carcinogen with unknown relevance to humans

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are

required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Characteristic ethereal odor.

Solubility:

4.8 g/100g of water.

Specific Gravity:

0.74

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

55C (131F)

Melting Point:

-110C (-166F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

245 @ 25C (77F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Unstable in acid solutions.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Oxidizers, acids.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Methyl tert butyl ether: Oral rat LD50: 4 gm/kg; inhalation rat LC50: 23576 ppm/4H.

-----\Cancer Lists\-----			
Ingredient	---NTP Known	Carcinogen--- Anticipated	IARC Category
Methyl tert-butyl Ether (1634-04-4)	No	No	3

12. Ecological Information

Environmental Fate:

When released into the soil, this material is not expected to biodegrade. When released into the air, this material is expected to adversely affect the ozone layer. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is not expected to be degraded by photolysis. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHYL TERT-BUTYL ETHER

Hazard Class: 3

UN/NA: UN2398

Packing Group: II

Information reported for product/size: 215L

International (Water, I.M.O.)

Proper Shipping Name: METHYL BUTYL ETHER

Hazard Class: 3

UN/NA: UN2398

Packing Group: II

Information reported for product/size: 215L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Methyl tert-butyl Ether (1634-04-4)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	Canada DSL	NDSL	Phil.
Methyl tert-butyl Ether (1634-04-4)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302- RQ	TPQ	List	-SARA 313- Chemical Catg.
Methyl tert-butyl Ether (1634-04-4)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methyl tert-butyl Ether (1634-04-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
 Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]E

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0

Label Hazard Warning:

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY AFFECT CENTRAL NERVOUS SYSTEM, BLOOD, AND KIDNEYS. A CENTRAL NERVOUS SYSTEM DEPRESSANT. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Label Precautions:

Keep away from heat, sparks and flame.
 Avoid contact with eyes, skin and clothing.
 Avoid breathing vapor.
 Keep container closed.
 Use only with adequate ventilation.
 Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

Product Use:

Laboratory Reagent.

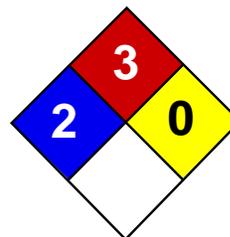
Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	2
Fire	3
Reactivity	0
Personal Protection	J

Material Safety Data Sheet m-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: m-Xylene

Catalog Codes: SLX1066

CAS#: 108-38-3

RTECS: ZE2275000

TSCA: TSCA 8(b) inventory: m-Xylene

CI#: Not applicable.

Synonym: m-Methyltoluene

Chemical Name: 1,3-Dimethylbenzene

Chemical Formula: C₆H₄(CH₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{m-}Xylene	108-38-3	100

Toxicological Data on Ingredients: m-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit.].

Section 3: Hazards Identification

Potential Acute Health Effects:

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

Potential Chronic Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, the nervous system, liver. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

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

Serious Skin Contact:

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

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

Serious Inhalation: Not available.

Ingestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

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

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

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. 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:

Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection: Splash goggles. Lab coat. Gloves.

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:

TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) TWA: 434 STEL: 651 (mg/m³) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

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

Boiling Point: 139.3°C (282.7°F)

Melting Point: -47.87°C (-54.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 6 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

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

Solubility:

Easily soluble in methanol, diethyl ether. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:

Acute oral toxicity (LD50): 5000 mg/kg [Rat.]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit.].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier. 0900 Detected in maternal milk in human. Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: m-Xylene Massachusetts RTK: m-Xylene TSCA 8(b) inventory: m-Xylene SARA 313 toxic chemical notification and release reporting: m-Xylene CERCLA: Hazardous substances.: m-Xylene

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

R10- Flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:

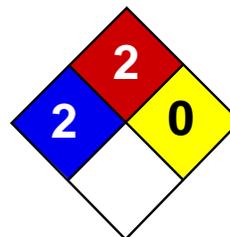
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité internationale. 1986.

Other Special Considerations: Not available.

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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) STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m³) from ACGIH [1995]
Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

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

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:

Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:

Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

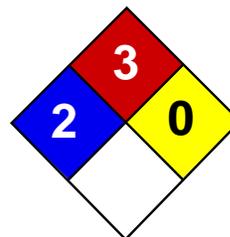
References: Not available.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet o-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: o-Xylene

Catalog Codes: SLX1012

CAS#: 95-47-6

RTECS: ZE2450000

TSCA: TSCA 8(b) inventory: o-Xylene

CI#: Not applicable.

Synonym: 1,2-Dimethylbenzene

Chemical Name: o-Xylene

Chemical Formula: C₆H₄(CH₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{o-}Xylene	95-47-6	100

Toxicological Data on Ingredients: o-Xylene LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Not available. **TERATOGENIC EFFECTS:** Classified POSSIBLE for human. **DEVELOPMENTAL**

TOXICITY: Classified Reproductive system/toxin/male [POSSIBLE]. The substance may be toxic to kidneys, liver, upper respiratory tract, skin, eyes, 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. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention.

Skin Contact:

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

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 463°C (865.4°F)

Flash Points: CLOSED CUP: 17°C (62.6°F).

Flammable Limits: LOWER: 0.9% UPPER: 6.7%

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

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

Explosion Hazards in Presence of Various Substances:

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

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards:

Vapors are heavier than air and may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards:

Explosive in the form of vapor when exposed to heat or flame. Vapors may form explosive mixtures with air. Containers may explode when heated. Runoff to sewer may create fire or explosion hazard

Section 6: Accidental Release Measures

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

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

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

Storage:

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 434 STEL: 651 (mg/m³) from ACGIH (TLV) [United States] TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] STEL: 150 (ppm) from NIOSH STEL: 655 (mg/m³) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Mobile, nonpolar liquid.)

Odor: Aromatic. Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

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

Boiling Point: 144.4°C (291.9°F)

Melting Point: -25°C (-13°F)

Critical Temperature: 359°C (678.2°F)

Specific Gravity: 0.88 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.05 ppm

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

Ionicity (in Water): Not available.

Dispersion Properties:

Dispersed in diethyl ether. Is not dispersed in cold water, hot water. See solubility in diethyl ether, acetone.

Solubility:

Soluble in diethyl ether, acetone. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, flames, incompatible materials.

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Photochemically reactive. Incompatible with strong oxidizers(e.g. chlorine, bromine, fluorine), and strong acids (e.g. nitric acid, acetic acid).

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:

Lowest Published Lethal Dose - Inhalation (LCL): 6125 ppm 12 hours [Rat]; 6125 ppm 12 hours [Human] Lowest Published Lethal Dose - Oral: 5000 mg/kg [Rat]

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/male [POSSIBLE]. May cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (male) and birth defects based on animal data. 0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier. 0900 Detected in maternal milk in human. Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects Skin: May cause skin irritation. May be absorbed through skin in harmful amounts. Eyes: Causes severe eye irritation. Inhalation: Causes respiratory tract and mucous membranes irritation. May affect sense organs, behavior (Central Nervous system) which may result in dizziness, general weakness, central nervous system depression, confusion, ataxia, disorientation, lethargy, drowsiness, headaches. May also affect respiration, cardiovascular system, liver, blood, and digestive system (nausea, vomiting) Ingestion: Harmful if swallowed. Causes digestive tract irritation with nausea, vomiting

and diarrhea. May also affect metabolism, liver, and urinary system, and central nervous system (excitement followed by headache, dizziness, drowsiness and nausea). Chronic Potential Health Effects: Skin: Prolonged or repeated contact may cause defatting of skin and dermatitis. Eyes: Prolonged or repeated exposure may cause conjunctivitis or permanent eye damage. Inhalation: Chronic inhalation may cause effects similar to those of acute inhalation.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Xylene UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: o-Xylene Illinois chemical safety act: o-Xylene New York release reporting list: o-Xylene Pennsylvania RTK: o-Xylene Florida: o-Xylene Massachusetts RTK: o-Xylene Massachusetts spill list: o-Xylene New Jersey: o-Xylene New Jersey spill list: o-Xylene Louisiana spill reporting: o-Xylene California Director's List of Hazardous Substances: o-Xylene TSCA 8(b) inventory: o-Xylene TSCA 8(d) H and S data reporting: o-Xylene: Effective: 10/4/82; Sunset: 10/4/92 SARA 313 toxic chemical notification and release reporting: o-Xylene CERCLA: Hazardous substances.: o-Xylene: 1000 lbs. (453.6 kg)

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la Sant  et de la S curit  du Travail du Qu bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du r glement sur le transport des marchandises dangereuses au canada. Centre de conformit  international Lt e. 1986.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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APG**Analytical Products Group, Inc.**2730 Washington Blvd., Belpre, OH 45714
740-423-4200 800-272-4442 Fax 740-423-5588**Material Safety Data Sheet**

Date prepared on: 9/15/95

Last revised on: 1/20/08

Page 1

Section I: Product Identification

CATALOG NUMBER: 4460,4462,4470,4472,4480,9690,9190	PRODUCT NAME: Pesticides
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Section II - Hazardous Ingredients/Identity Information

Chemical Name	CAS Reg. No.	OSHA PEL (TWA)	% Composition*
Acetone	67-64-1	750ppm	>99%
A table of the compounds possible in this pesticide standard is attached. Data included in the table are CAS numbers, oral LD50 values for rats and PEL/TWA values if available. Total concentration of all pesticides in the standard is less than .1%.			

Section III - Physical/Chemical Characteristics of Hazardous Ingredients**Acetone**

BOILING POINT: 56 C (132 F) @ 760 mm Hg	SPECIFIC GRAVITY: 0.79 (water=1)	
VAPOR PRESSURE: 181 (20 C)	SOLUBILITY IN WATER: Complete	APPEARANCE/ODOR: Clear, colorless liquid, sweet odor (acetone).

Section IV - Fire and Explosion Hazard Data

FLASH POINT (Method used): -18 C (-2 F) Closed Cup	AUTO IGNITION TEMPERATURE: 464 C (869 F)	FLAMMABLE LIMITS	LEL 2.5%	UEL 13%
EXTINGUISHING MEDIA: Use alcohol foam, dry chemical or carbon dioxide (water may be ineffective). Use extinguisher media appropriate for surrounding fire.				
SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire exposed containers cool.				
UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause a fire.				

Section V - Reactivity Data

STABILITY:	Unstable <input type="checkbox"/>	Stable <input checked="" type="checkbox"/>	Conditions to Avoid: Heat, flame, other sources of ignition.
INCOMPATIBILITY (Materials to avoid): Strong oxidizing agents, strong bases, halogen acids and halogen compounds, caustics, amines and ammonia, chlorine and chlorine compounds, strong acids, esp. sulfuric, and nitric.			
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, toxic fumes of chlorine.			
HAZARDOUS POLYMERIZATION:	May Occur <input type="checkbox"/>	Will Not Occur <input checked="" type="checkbox"/>	Conditions to Avoid: None Known.

Section VI - Health Hazard Data

ROUTES OF ENTRY	Inhalation? YES	Skin? YES	Ingestion? YES
HEALTH HAZARDS (Acute and Chronic): ACUTE: Irritation of the nose and throat. CHRONIC: Kidney and liver damage.			
COMPONENTS LISTED AS CARCINOGENS OR POTENTIAL CARCINOGENS: Total of pesticides is less than 1%. Some are on the IARC list.			
SIGNS AND SYMPTOMS OF EXPOSURE: Irritation of skin, eyes, nose and throat. Headache, dizziness, vomiting, nausea, central nervous system depression, low blood pressure and respiratory failure. Prolonged contact may cause dermatitis.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Skin disorders, eye disorders, and chronic respiratory disease.			
EMERGENCY AND FIRST AID PROCEDURES: Seek medical assistance for treatment, observation and support if necessary. EYE CONTACT: Flush with water, seek medical attention. SKIN CONTACT: Wash with soap and water, use protective creams. INHALATION: Remove to fresh air. If not breathing, give artificial			

respiration. If breathing is difficult, give oxygen and obtain medical assistance. INGESTION: Obtain medical assistance if swallowed. If conscious, give large amounts of water and induce vomiting.

Section VII - Precautions for Safe Handling and Use

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Diluted standard can be absorbed with sand or other non-combustible absorbent material and placed into a container for later disposal. Sample solutions should be absorbed with charcoal or other organic absorbent and incinerated. Flush area with water.

WASTE DISPOSAL METHOD: Dispose in accordance with all applicable federal, state, and local regulations.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep container tightly closed. Store in a cool, dry, well ventilated, flammable liquid storage area. Isolate from incompatible materials.

OTHER PRECAUTIONS* Do not heat or evaporate analytical standards to dryness.

Section VIII - Control Measures

RESPIRATORY PROTECTION (Please specify): Respiratory protection required if airborne concentration exceeds PEL 750 ppm. At concentrations up to 5000 ppm a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended. (20,000 ppm is immediately dangerous to life or health).

VENTILATION: Local exhaust

PROTECTIVE GLOVES: Butyl, neoprene, or latex rubber gloves.

EYE PROTECTION: Safety glasses, or goggles.

OTHER PROTECTIVE EQUIPMENT: Impervious Clothing.

EMERGENCY WASH FACILITIES: Maintain eye wash and quick drench showers in work area.

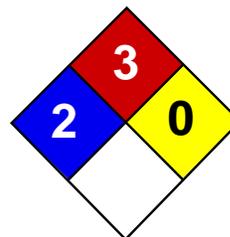
The information stated in this Material Safety Data Sheet (MSDS) is believed to be correct on the date of publication and must not be considered all conclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. Persons not specifically and properly trained should not handle this chemical or its container. This MSDS is provided without any warranty expressed or implied, including merchantability or fitness for any particular purpose.

This product is furnished for laboratory use ONLY! Our standards may not be used as drugs, cosmetics, agricultural or pesticidal products, food additives or as house hold chemicals.

* Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Environmental Protection Agency, and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

Hazardous components of the Pesticide Standard

CHEMICAL	CAS#	% by WEIGHT	LD50
Alachlor	15972-60-8	<0.1%	Not Available
Atrazine	1912-24-9	<0.1%	Not Available
DDE	72-55-9	<0.1%	Not Available
DDD	72-54-8	<0.1%	Not Available
DDT	50-29-3	<0.1%	87 mg/kg
Dieldrin	60-57-1	<0.1%	38 mg/kg
Endrin	72-20-8	<0.1%	3 mg/kg
Heptachlor	76-44-8	<0.1%	Not Available
Heptachlor Epoxide	1024-57-3	<0.1%	40 mg/kg
Lindane	58-89-9	<0.1%	76 mg/kg
Aldrin	309-00-2	<0.1%	39 mg/kg
Endosulfan (a)	959-98-9	<0.1%	Not Available
Endosulfan (b)	33213-65-9	<0.1%	Not Available
Endosulfan Sulfate	1031-07-8	<0.1%	Not Available
Endrin Aldehyde	7421-93-4	<0.1%	Not Available
Benzene Hexachloride alpha	319-84-6	<0.1%	Not Available
Benzene Hexachloride beta	319-85-7	<0.1%	Not Available
Benzene Hexachloride delta	319-86-8	<0.1%	Not Available
Methoxychlor	72-43-5	<0.1%	6430 mg/kg
Alpha-chlordane	5103-71-9	<0.1%	500 mg/kg
Gamma-chlordane	5566-34-7	<0.1%	500 mg/kg



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet p-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: p-Xylene

Catalog Codes: SLX1120

CAS#: 106-42-3

RTECS: ZE2625000

TSCA: TSCA 8(b) inventory: p-Xylene

CI#: Not applicable.

Synonym: p-Methyltoluene

Chemical Name: 1,4-Dimethylbenzene

Chemical Formula: C₆H₄(CH₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{p-}Xylene	106-42-3	100

Toxicological Data on Ingredients: p-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 12400 mg/kg [Rabbit.]. VAPOR (LC50): Acute: 4550 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

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

Potential Chronic Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, the nervous system, liver. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

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

Serious Skin Contact:

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

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

Serious Inhalation: Not available.

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: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

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

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

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. 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:

Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) TWA: 434 STEL: 651 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

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

Boiling Point: 138°C (280.4°F)

Melting Point: 12°C (53.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 9 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

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

Solubility:

Easily soluble in methanol, diethyl ether. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 5000 mg/kg [Rat.]. Acute dermal toxicity (LD50): 12400 mg/kg [Rabbit.]. Acute toxicity of the vapor (LC50): 4550 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier. 0900 Detected in maternal milk in human. Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: p-Xylene Florida: p-Xylene Massachusetts RTK: p-Xylene New Jersey: p-Xylene TSCA 8(b) inventory: p-Xylene SARA 313 toxic chemical notification and release reporting: p-Xylene CERCLA: Hazardous substances.: p-Xylene

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

R10- Flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes. R48/20- Harmful: danger of serious damage to health by prolonged exposure through inhalation.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References:

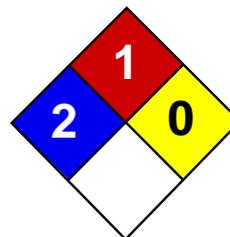
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la Sant   et de la S  curit   du Travail du Qu  bec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du r  glement sur le transport des marchandises dangereuses au Canada. Centre de conformit   international Lt  e. 1986.

Other Special Considerations: Not available.

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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: C16-H10

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pyrene	129-00-00	100

Toxicological Data on Ingredients: Pyrene: ORAL (LD50): Acute: 2700 mg/kg [Rat]. 800 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact: Not available.

Inhalation:

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

Serious Inhalation: Not available.

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

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

Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of heat, of combustible materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested,

seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F). Preferably refrigerate.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid. Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 202.26 g/mole

Color: Yellow.

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

Boiling Point: 404°C (759.2°F)

Melting Point: 151.2°C (304.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.271 @ 23 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 4.9$

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 muscle spasticity), 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.

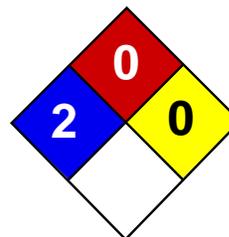
Other Special Considerations: Not available.

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Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolve; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C₂-Cl₄

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
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, 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:

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

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:

Absorb with an inert material and put the spilled material in an appropriate waste 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:

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. 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, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

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

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium, barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. 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): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symptoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorientation, seizures, emotional instability, stupor, coma). It may cause pulmonary edema. Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver (hepatitis, fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremities, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fathead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

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: Tetrachloroethylene 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: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 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 D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

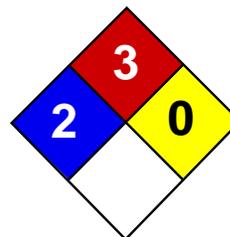
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):**Health Hazard:** 2**Fire Hazard:** 0**Reactivity:** 0**Personal Protection:** g**National Fire Protection Association (U.S.A.):****Health:** 2**Flammability:** 0**Reactivity:** 0**Specific hazard:****Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information**References:** Not available.**Other Special Considerations:** Not available.**Created:** 10/10/2005 08:29 PM**Last Updated:** 11/06/2008 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Xylenes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Xylenes

Catalog Codes: SLX1075, SLX1129, SLX1042, SLX1096

CAS#: 1330-20-7

RTECS: ZE2100000

TSCA: TSCA 8(b) inventory: Xylenes

CI#: Not available.

Synonym: Xylenes; Dimethylbenzene; xylol; methyltoluene

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

Chemical Formula: C₆H₄(CH₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

Potential Chronic Health Effects:

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

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

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

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

Flammable Limits: LOWER: 1% UPPER: 7%

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

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

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

Fire Fighting Media and Instructions:

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

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

Special Remarks on Explosion Hazards:

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

Section 6: Accidental Release Measures

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

Large Spill:

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

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

Section 7: Handling and Storage

Precautions:

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

Storage:

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

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

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless. Clear

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

Boiling Point: 138.5°C (281.3°F)

Melting Point: -47.4°C (-53.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.864 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 1 ppm

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

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:

Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

Special Remarks on Chronic Effects on Humans:

Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and female fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may also cause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification : Xylenes UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Safety data for aroclor 1254



[Glossary](#) of terms on this data sheet.

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

General

Synonyms: arochlor 1254, PCB-1254, polychlorinated biphenyl 1254, chlorodiphenol (54% Cl)

Use: previously widely used as a dielectric fluid; now less widely used

Molecular formula: $C_{12}H_5Cl_5$ (approximate)

CAS No: 11097-69-1

EINECS No:

Physical data

Appearance: light yellow viscous liquid

Melting point: 10 C

Boiling point: ca. 370 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$): 1.51

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: negligible

Stability

Stable. Highly flammable. Incompatible with strong oxidizing agents. Attacks some forms

of plastics and rubber.

Toxicology

Harmful if swallowed. Possible carcinogen. May be a reproductive hazard. Harmful if inhaled or absorbed through the skin. Irritant.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here.](#))

ORL-RAT LD50 1010 mg kg⁻¹

IVN-RAT LD50 358 mg kg⁻¹

IPR-MUS LD50 880 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here.](#))

R11 R20 R21 R22 R36 R37 R38.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here.](#))

UN No. 2315. Packing group II. Hazard class 9.

Personal protection

Safety glasses, gloves, good ventilation. Handle as a possible carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here.](#))

S9 S16 S23 S26.

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

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Safety data for DDT



[Glossary](#) of terms on this data sheet.

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General

Synonyms: 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane, alpha,alpha-bis(p-chlorophenyl)-beta,beta,beta-trichloroethane, dichlorodiphenyltrichloroethane, chlorophenothane, p,p'-dichlorodiphenyltrichloroethane, 4,4'-DDT, 4,4'-dichlorodiphenyltrichloroethane, 1,1-bis(p-chlorophenyl)-2,2,2-trichloroethane, 1,1-bis(4-chlorophenyl)-2,2,2-trichloroethane, diphenyltrichloroethane, 1,1,1-trichloro-2,2-di(4-chlorophenyl)ethane, numerous trade and other non-systematic names, including those given below. (Note: The use of DDT has been largely discontinued, so most - perhaps all - of these trade names are no longer used.) anofex, p,p'-DDT, dicophane, didigam, didimac, ENT 1,506, estonate, genitox, gesafid, gesarol, gyron, ixodex, NCI-C00464, neocid, pentachlorin, santobane, trichlorobis(4-chlorophenyl)ethane, 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane, zeidane, zerdane, agritan, arkotine, azotox, 1,1'-(2,2,2-trichloroethylidene)bis(4-chlorobenzene), bosan, supra, boviderm, chlorphenothan, chlorphenotoxum, citox, clofenotane, dedlo, deoval, detox, detoxan, dibovan, dodat, dykol, gesafid, gesapon, gesarex, guesapon, havero-extra, hildit, ivoran, kopsol, micro, DDT 75, mutoxin, NA 2761, OMS 16, parachlorocium, peb1, pentech, ppzeidan

Use: insecticide, formerly one of the most widely used insecticides in the world; now used in only limited areas because of environmental concerns

Molecular formula: $C_{14}H_9Cl_5$

CAS No: 50-29-3

EINECS No:

Physical data

Appearance: colourless to white crystalline powder

Melting point: 108 - 109 C

Boiling point: 260 C

Vapour density:

Vapour pressure:

Density (g cm⁻³): 1.56

Flash point: 165 C

Explosion limits:

Autoignition temperature:

Water solubility: very slight

Stability

Stable. Combustible. Incompatible with strong oxidizing agents, iron and aluminium and their salts, alkalies.

Toxicology

Poison if swallowed. May be harmful if inhaled or absorbed through the skin. Absorption is considerably enhanced by the presence of oils. Possible human carcinogen. Human mutagenic effects. May cause reproductive damage. May act as a systemic poison. Unlikely to be fatal on its own, but the toxic effects of this chemical appear to be enhanced when exposure simultaneously includes other chemicals.

DDT and its degradation products, particularly DDE, are stored in fat in the body, and this can lead to a total body load of chemical which is potentially much greater than the fatal dose. This stored material is removed only gradually from the body.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here.](#))

ORL-RAT LD50 87 mg kg⁻¹

SKN-RAT LD50 1931 mg kg⁻¹

ORL-HMN LDLO 500 mg kg⁻¹ (though far lower figures are also quoted)

SCU-RAT LD50 1500 mg kg⁻¹

ORL-MUS LD50 135 mg kg⁻¹

ORL-RBT LD50 250 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here.](#))

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here.](#))
UN No 2761. Hazard class 6.1. Packing group III.

Environmental information

A serious environmental hazard due to bioaccumulation and transport up the food chain. Concentrations in animals near the top of the food chain (such as predatory birds) may become high enough in areas in which DDT has been heavily used, to have devastating effects upon reproductive ability. Degrades extremely slowly in the environment and is removed very slowly from animal tissue.

Personal protection

Safety glasses, gloves, good ventilation. Treat as a possible carcinogen. Note that use of DDT as an insecticide is banned in most countries.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here.](#))

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Safety data for dieldrin



[Glossary](#) of terms on this data sheet.

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General

Synonyms: 4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-Dimethanonaphth[2,3-b]oxirene; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-exo-1,4-endo-5,8-dimethanonaphthalene; 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimethanonaphth(2,3-b)oxirene, alvit, compound 497, dieldrix, diledrite, HEOD, illoxol, quintox, octalox, numerous further trade names, especially for mixtures containing dieldrin.

Molecular formula: $C_{12}H_8Cl_6O$

CAS No: 60-57-1

EC No:

Physical data

Appearance: white or light brown powder or crystals

Melting point: 176 C

Boiling point: 385 C

Vapour density:

Vapour pressure:

Specific gravity: 1.75

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: slight

Stability

Stable. Breakdown product of aldrin in the environment. Incompatible with acids, active metals and strong oxidizing agents.

Toxicology

Toxic. May act as a mutagen. Harmful by ingestion or inhalation. Ingestion of large quantities may be fatal. May accumulate in the body. Toxic if absorbed through the skin. Possible risk of irreversible effects. Typical TWA 0.25 mg/m³.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here.](#))

ORL-MAN LDLO 65 mg kg⁻¹

ORL-RAT LD50 38 mg kg⁻¹

IHL-RAT LC50 13 mg/m³/4h

SKN-RAT LD50 56 mg kg⁻¹

SCU-RAT LD50 49 mg kg⁻¹

IVN-RAT LD50 9 mg kg⁻¹

ORL-MKY LD50 3 mg kg⁻¹

ORL-BWD LD50 13 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here.](#))

R25 R27 R40 R48.

Transport information

Environmental information

Harmful to wildlife. Removed only slowly from the environment by natural processes.

Personal protection

Safety glasses, gloves, good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here.](#))

S22 S36 S37 S45.

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Safety data for indeno[1,2,3-cd]pyrene

[Glossary](#) of terms on this data sheet.

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General

Synonyms: 1,10-(1,2-phenylene)pyrene, 1,10-(o-phenylene)pyrene, o-phenylenepyrene, 2,3-phenylenepyrene, 2,3,o-phenylenepyrene, IP

Use:

Molecular formula: $C_{22}H_{12}$

CAS No: 193-39-5

EINECS No: 205-893-2

Physical data

Appearance: solid

Melting point: 161 - 163 C

Boiling point: 536 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility:

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Limited evidence that this material may be carcinogenic.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here.](#))

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here.](#))
R40.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here.](#))
Non-hazardous for air, sea and road freight.

Personal protection

Treat as potentially hazardous - many multi-ring aromatic compounds are suspected carcinogens.

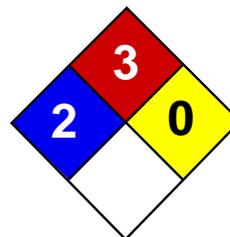
Safety phrases

(The meaning of any safety phrases which appear in this section is given [here.](#))
S36 S37 S45.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

Potential Acute Health Effects:

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

Potential Chronic Health Effects:

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

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

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

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

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

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

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

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

Fire Fighting Media and Instructions:

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

Special Remarks on Fire Hazards:

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

Special Remarks on Explosion Hazards:

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

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

Section 6: Accidental Release Measures

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

Large Spill:

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

Section 7: Handling and Storage

Precautions:

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

Storage:

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

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

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:

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

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

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

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

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

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

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

Ionicity (in Water): Not available.

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

Solubility:

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

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

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

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:

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

Chronic Effects on Humans:

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

Other Toxic Effects on Humans:

Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

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

Special Remarks on other Toxic Effects on Humans:

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

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

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

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

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

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

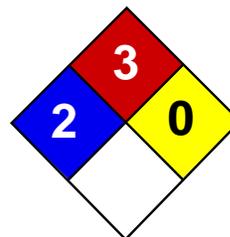
References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C₆H₅-CH₃ or C₇H₈

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
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

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

Serious Skin Contact:

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

Inhalation:

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

Serious Inhalation:

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

Ingestion:

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

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

Fire Hazards in Presence of Various Substances:

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N₂O₄; AgClO₄; BrF₃; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

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

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

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

Storage:

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

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m³) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

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

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

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

Solubility:

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

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

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 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: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

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

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Community Air Monitoring Plan (CAMP)

APPENDIX B

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing

monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring

particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

Job Safety Analyses (JSAs)

JOB SAFETY ANALYSIS Ctrl. No. GEN-001		DATE: 11/4/13	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY Generic	WORK TYPE Construction - Excavation	WORK ACTIVITY (Description) Excavation / Trenching		
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Ian Holst	Staff Engineer	Maria Drakos	Project Manager	
Thalassa Sodre	Staff Assistant Engineer			
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input checked="" type="checkbox"/> LONG SLEEVED SHIRT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel-toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility long sleeved clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather or cut resistant</u> <input type="checkbox"/> OTHER	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
Jackhammer, Excavator, Hand Tools, Photoionization Detector, barrels, cones, caution tape, ladders, shovels, digging bars , power tools (cut off saw)				
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.				
EXCLUSION ZONE: Maintain 10' or greater exclusion zone around excavator while it is in motion.				

Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
1. Pre-Clearance Protocol.	1a. CONTACT: Damage to underground utility. 1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains. Pressurized gas mains. Sewer lines. Underground electric. 1c. FALL: Slip ,Trip or Fall.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. Must have a case # before digging. 1b. Pre-clearing of the trenching location must be conducted to a minimum of 4 vertical feet below the ground surface (8 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar) prior to trenching. Supervisor should be contacted to discuss appropriate pre-clearing depth. Complete subsurface clearance checklist. 1c. Be aware of the conditions when walking, or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Set up work zone.	2a. CONTACT/CAUGHT: Injury from equipment. 2b. FALL: Slip ,Trip or Fall.	2a. Isolate work area from hazards with cones, barricades, and caution tape. Utilize a flag person when necessary (i.e., third party traffic in area). Install traffic signs in roadways and for detours. Spotters will maintain and enforce exclusion zone. 2b. See 1c.
3. Trenching Activity.	3a. CONTACT: Injury due to contact with machine. 3b. FALL: Slip ,Trip or Fall. 3c. EXPOSURE: Noise, Dust, Concrete- Asphalt, petroleum hydrocarbon vapors.	3a. Spotter(s) required for all heavy equipment operation. No worker shall be allowed inside the exclusion zone or along the trench/excavation area while any equipment is digging. A minimum exclusion zone greater than the length of the equipment boom must be established. Workers only allowed in exclusion zone if the operator is in "Hands Off "mode. Operator will not operate equipment until worker is out of exclusion zone. 3b. Any trench/excavation deeper than 4' must have a ladder within 25' of any worker in the excavation. At least 3' (rungs) shall be above the top of the excavation. All spoil piles shall be maintained 2' minimum from edge of excavation. 3c. Air monitoring using a calibrated photoionization detector (PID) will be used to monitor the breathing zone of the work area. If a reading of >5ppm is recorded, the oversight personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings.

¹ Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

² A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.

³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
4. Setting Trench protections if necessary.	<p>4a. CAUGHT: Injury due to contact with failed trench.</p> <p>4b. CONTACT/CAUGHT: Injury due rigging activities and entering exclusion zone during lifting and/or transport of shoring box/material.</p> <p>4c. FALL: Possible injury due to fall into excavation.</p>	<p>4a. To prevent cave-ins and avoid caught by/between, excavations over 5' in depth shall have engineer approved shoring, sheeting or digging box. Top of protection shall be at least 2' above top of excavation.</p> <p>4b. Use only inspected rigging with 2, 3 or 4 lift points; wear cut-resistant gloves. Rigging to be hooked up to factory installed hook up points on equipment. Control load with non-conductive tag lines with workers out of exclusion zone. Don't stand underneath suspended load; wear steel toed boots and hard hat.</p> <p>4c. Shoring to be set and sides will be backfilled to avoid fall hazards before workers allowed to enter area. Operator will be in "HANDS OFF" mode before workers enter work area to unhook rigging. An inspected ladder set 3' above top of shoring will be used to enter and exit shoring. Workers will use three points of contact when using ladder.</p>
5. Secure/Leave Site. If backfilling, see excavation backfilling and compaction JSA for potential hazards and critical actions.	5a. FALL: Potential Slip ,Trip or Fall hazards.	5a. See 1c. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS		Ctrl. No. GEN-002	DATE 3/3/2014	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE Construction - Excavation	WORK ACTIVITY (Description) Backfilling Excavation & Compaction		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
David Kaiser		Project Engineer	Curtis Taylor	Health and Safety Officer - Roux	
			Michael Ritorto	Project Hydrogeologist - Roux	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST	<input type="checkbox"/> GOGGLES	<input checked="" type="checkbox"/> AIR PURIFYING RESPIRATOR	<input checked="" type="checkbox"/> GLOVES: <u>Leather/ cut-resistant</u>		
<input checked="" type="checkbox"/> HARD HAT	<input type="checkbox"/> FACE SHIELD	<input type="checkbox"/> SUPPLIED RESPIRATOR	<input type="checkbox"/> OTHER _____		
<input type="checkbox"/> LIFELINE / BODY HARNESS	<input checked="" type="checkbox"/> HEARING PROTECTION	<input checked="" type="checkbox"/> PPE CLOTHING: <u>Long Sleeved shirt</u>			
<input checked="" type="checkbox"/> SAFETY GLASSES	<input checked="" type="checkbox"/> SAFETY SHOES <u>Steel-toe boots</u>	<input type="checkbox"/> and reflective safety			
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Payloader, Backhoe, Dump Trucks, Mechanical gas powered tampers, Excavator with hydraulic tamper. APR when tamping if dust present.					
EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around excavator, backhoe, tampers, and dump trucks.					
Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS			
1. Secure work area.	<p>1a. CONTACT: Potential for personnel to enter the work area.</p> <p>Potential for equipment to contact personnel.</p> <p>1b. EXERTION: Potential for muscle strain while installing traffic cones and barrels</p>	<p>1a. Ensure work area is secure and inform others of work activity. Establish a work zone using 42" traffic cones, barrels & caution tape. Use of flag persons to minimize motorist confusion during set-up of new traffic pattern.</p> <p>1a. Dump Truck/Excavator/Payloader/Backhoe equipment to be set-up by personnel who are familiar with machinery. Spotters shall be in place for all equipment. Truck wheels are chocked when driver is not in truck and engine shut off. Personnel shall stay out of the exclusion zone (10' minimum or greater than the equipment boom) while equipment is maneuvering.</p> <p>1b. Keep back straight, keep load close to the body and bend knees while lifting and working. If over 50 lbs., use 2 or more laborers for lifting or use of equipment.</p>			
2. Backfilling excavation, and & compaction	<p>2a. CONTACT: Traffic and live equipment.</p> <p>2b. EXPOSURE: Fumes from gas powered tamper.</p> <p>2c. FALL: Slips, trips, fall hazards.</p>	<p>2a. Equipment and trucks shall be isolated from other workers, subcontractors and third party traffic with cones, barricades, caution tape, and/or Jersey barriers. Spotters shall direct dump truck for placement of fill near excavation. Payloader, as directed by spotter, shall move fill into trench where it shall be placed in layers and compacted by mechanical means.</p> <p>2a. Spotters will wear florescent vests at all times.</p> <p>2a. Spotters will remain out of the line of fire from equipment and third party vehicles.</p> <p>2b. Fueling will be done outside of work area in a well vented area. Refueling will be done only after a 2 minute cool down.</p> <p>2c. Work area will be clean and free of any debris to remove slip, trip and fall hazards. All tools will be kept in designated areas. Insure work area is well illuminated.</p> <p>2c. Workers should only be working in areas that have been leveled with a machine.</p>			

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
2. Backfilling, excavation, and compaction (Continued).	2d. OVEREXERTION: Muscle strain. 2e. EXPOSURE: Noise from tamper.	2d. Keep knees bent and back straight while maneuvering tamper. Utilize a co-worker to avoid straining muscles. 2e. Workers will wear hearing protection during compaction tamper activities.
3. Secure/leave site.	3a. FALL: Slip, trip, fall	3a. Clear work area of all debris and store all equipment in designated areas/containers before opening up to traffic.

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS		Ctrl. No. GEN-003	DATE: 11/4/2013	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE Construction – Concrete and Asphalt	WORK ACTIVITY (Description) Concrete Form Assembly and Concrete Pouring		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Jimmy Kuruvilla		Project Construction Manager	Maria Drakos	Project Manager	
Thalassa Sodre		Staff Assistant Engineer			
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input type="checkbox"/> PERSONAL FALL ARREST SYSTEM <input checked="" type="checkbox"/> SAFETY GLASSES		<input type="checkbox"/> GOGGLES <input checked="" type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel /composite toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest, long sleeve shirt</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather and Nitrile/Latex</u> <input checked="" type="checkbox"/> OTHER: Chaps	
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE (EZ): Maintain a minimum 10' exclusion zone around equipment and loads while it is in motion.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Set-up work zone.	1a. CONTACT: Moving equipment, third party traffic.	1a. Secure work area using barricades and caution tape. Use flagmen to control third party traffic. Maintain minimum exclusion zone (EZ) of 10' around equipment and live loads. 1a. When machines are operating, all workers will remain outside of EZ unless operator is in "HANDS OFF" mode.			
2. Assembly of concrete form (i.e., plywood, lumber, rebar, etc.).	2a. CONTACT: Contacting materials being lowered into work area. Potential for cuts and abrasions and to be contacted by nails while assembling. 2b. EXERTION: Muscle strain. 2c. EXPOSURE: Noise, dust, fumes. 2d. CAUGHT: Pinch points, Caught between, Crushed	2a. Workers will keep fingers and limbs out of the line of fire of tools, equipment and live loads. Workers will use inspected rigging and only attach rigging to manufacturer installed lifting points. Loads will be controlled with non-conductive tag lines from outside the EZ. Wear hard hat. See JSA for applicable cutting tool. 2b. When transporting and working with forms, workers will keep backs straight, knees bent, and keep loads close to their body. Any load more than 50 lbs., will be lifted by two or more workers or a mechanical lifting device. 2c. Workers will wear hearing protection, face shields and chaps when using all power tools. Fuel powered tools will be fueled away from the work zone in a well-ventilated area. Refueling will be done after a minimum cool down period of 2 minutesSee JSA for applicable cutting tool. 2d. Keep hands away from rigging while hooking/unhooking materials; wear leather gloves.			
3. Set up concrete trucks and chute.	3a. CONTACT/CAUGHT: Potential for truck to contact personnel, fingers to be pinched while setting up hoses. 3b. OVEREXERTION: Strain, pulled muscles.	3a. Spotters will guide concrete trucks into position; wheel chocks will be set before work begins when trucks are parked. Workers will stay out of exclusion zone until truck is parked and secured. 3b. All workers will keep back straight and bend their knees when lifting. Two workers will be used when load exceeds 50 lbs.			
4. Pour concrete into forms.	4b. CONTACT: Wet concrete.	4b. Possible splashing from concrete, portable eye wash stations shall be set up in close proximity for easy access; wear safety glasses. Nitrile or latex gloves shall be worn to eliminate skin contact with concrete.			
5. Vibrate to settle and remove air from poured cement.	5a. ENERGY SOURCE: Potential for personnel to be exposed to live electricity. 5b. OVEREXERTION: Potential muscle strain while vibrating cement, stepping over forms/rebar reinforcements.	5a. Electrical tools shall be inspected for defects prior to being used. Any extension cords shall be heavy duty rated and be free from defects (no exposed wires). All electrical connections shall be connected to GFCI outlets. 5b. Constantly check/observe where you are walking; wear steel toed boots. Keep back straight and knees bent while settling concrete with vibrator.			

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess ¹JOB STEPS	Analyze ²POTENTIAL HAZARDS	Act ³CRITICAL ACTIONS
6. Cleanup of work area and tools.	6a. CONTACT/FALL: Potential slip, trip, and fall on materials and tools left in the work area.	6a. Place additional materials and tools in designated storage areas. Remove any garbage from the work area.

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JOB SAFETY ANALYSIS		Ctrl. No. GEN-006	DATE 9/9/2014	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY Generic		WORK TYPE Surveying	WORK ACTIVITY (Description) Elevation Surveying		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Bjorn Wespestad		Project Engineer	Maria Drakos	Project Manager	
Thalassa Sodre		Staff Assistant Engineer			
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel-toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Cut-resistant or leather</u> <input type="checkbox"/> OTHER		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Surveying equipment (i.e., leveling rod/measuring ruler, tripod and scope).					
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Locate surveying position for instrument and rod and set-up work area	1a. FALL: Slip/trip hazards. 1b. CONTACT: Traffic (surveying locations could potentially be located in parking areas and sidewalks). 1c. OVEREXERTION: Hazard due to carrying, lifting, and bending while transporting equipment. 1d. CAUGHT/CONTACT: Pinch Points / sharp edges associated with setting up the tripod.	1a. Inspect area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to setting up at the survey location. 1b. Be aware of oncoming traffic. Utilize a flagman / spotter for locations in streets or high-traffic areas. 1b. Place 42 inch cones around the work area, and delineate work zone with caution tape, if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective safety vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route. 1c. Use proper body positioning and lifting techniques; keep back straight, lift with legs, keep load close to body, and never reach with a load. 1c. Avoid carrying too much equipment at one time and team-lift equipment that is more than 50lb. 1d. Wear cut resistant gloves when handling the tripod. Don't carry tripod by the pointed ends.			
2. Open / close manhole cover to well that is being surveyed (if necessary).	2a. OVEREXERTION: Muscle strain 2b. CAUGHT: Pinch points associated with removing / replacing manholes and working with hand tools. 2c. EXPOSURE: To potentially hazardous vapors. 2d. CONTACT: With traffic.	2a. See 1c. Bend knees when reaching to open well. Use manhole lifting hook or pry bar to avoid bending. 2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and crowbar or pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover. 2c. No open flames/heat sources. 2c. To minimize exposure to vapors allow well to vent after opening it and before survey activities begin. 2c. Work on the upwind side of well. 2d. See 1b.			

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
3. Perform survey.	3a. FALL: Slip/trip hazards 3b. CONTACT: Traffic (surveying locations could be potentially located in parking areas and sidewalks)	3a. See 1a. 3b. See 1b. 3b. Personnel using the scope will be devoting most of their attention to the surveying activity. Personnel holding the measuring stick should be extra vigilant of survey personnel and communicate any potential hazards to the instrument person via handheld radio or similar means. Ensure reflective safety vest is worn.
4. Break down work area.	4a. CONTACT: Traffic (surveying locations can potentially be located in parking areas and sidewalks). 4b. EXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	4a. See 1b. 4b. See 1c.

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² A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

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JOB SAFETY ANALYSIS		Ctrl. No. GEN-007	DATE: 11/4/2013	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 1
JSA TYPE CATEGORY GENERIC		WORK TYPE	WORK ACTIVITY (Description) Movement of 55-gallon Drums/Drum Handling		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:		POSITION / TITLE
Curtis Taylor		Health and Safety Officer	Maria Drakos		Project Manager
Thalassa Sodre		Staff Assistant Engineer			
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES		<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel toed boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>		<input checked="" type="checkbox"/> GLOVES: <u>Cut-resistant gloves</u> <input type="checkbox"/> OTHER:
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment: Drum Cart and/or forklift, safety cones, and caution tape					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A 10' exclusion zone will be maintained around forklift.					
Assess 1JOB STEPS		Analyze 2POTENTIAL HAZARDS		Act 3CRITICAL ACTIONS	
1. Secure Work Area, Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts. See JSA Forklift for potential hazards and critical actions. Inspect forklift before operating to ensure it is in good condition and functioning correctly.		1a. FALL: Tripping/falling due to uneven surface terrain. 1b. EXPOSURE: Drums could potentially be damaged and contain hazardous material. 1c. OVEREXERTION: Potential muscle strain while loosening or tightening bolts.		1a. Inspect walking path for uneven terrain, weather-related hazards (i.e., tree debris, puddles, etc.), and obstructions prior to accessing work area. 1a. Use established pathways and walk on stable, secure ground. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. 1b. When inspecting drums, don nitrile gloves under cut resistant glove. If drum is not properly labeled, do not open and cease all drum transport related activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed, or in poor condition, place drum in an over-pack drum. 1c. Keep back straight and secure grip on drum ratchet.	
2. When using a forklift, position drum clamp in between drum ribs. When using a drum dolly, secure fastening hook on top of drum.		2a. CAUGHT/CONTACT: Hazards between drum/forklift clamp or dolly fastener/drum. 2b. OVEREXERTION/CONTACT: Hazards associated with balancing drum on drum cart (leaning back and pulling drum with your back).		2a. Position drum clamp between the ribs on the drum to prevent possible slipping. Do not place hands between drum clamp and drum; wear cut resistant gloves. 2b. Do not jerk body. Wear cut-resistant gloves and steel toed boots. 2b. Ensure that drums are not over-filled.	
3. Transport drums to designated location and disengage drum clamp.		3a. EXPOSURE/ CONTACT: Hazards associated with drum transport; skin contact and vapors. 3b. CAUGHT: Pinching hazards associated with maneuvering drums. 3c. FALL: Tripping/ falling due to obstructions and uneven terrain.		3a. Maintain a 10' EZ around forklift. Ensure drum clamp is secure on drum before beginning to move. 3a. Ensure that drum is sealed and lid is tight before beginning to move. 3b. Do not place fingers between drum clamp and drum; wear cut resistant gloves. 3c. See 2b. 3c. If path is too rough for drum cart, utilize forklift. 3c. Utilize a spotter while operating the forklift.	

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JSA TYPE CATEGORY GENERIC		Cntrl. No. GEN-010	DATE: 11/4/2013	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
WORK TYPE Site Recon		WORK ACTIVITY (Description) Mobilization/Demobilization			
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:		POSITION / TITLE	
Jared Lefkowitz	Staff Assistant Scientist	Maria Drakos		Project Manager	
Thalassa Sodre	Staff Assistant Engineer				
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel Toe or composite toe</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest of high-visibility clothing;</u> <u>long sleeve shirt; long pants</u>	<input type="checkbox"/> GLOVES: <u>Leather, nitrile, and cut resistant (as needed)</u> <input type="checkbox"/> OTHER		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment:					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A minimum exclusion zone of 10' will be maintained around moving equipment (if necessary)					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Mobilize/demobilize and establish work area	<p>1a. FALL: Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.</p> <p>1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.</p> <p>1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.</p>	<p>1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle.</p> <p>1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground.</p> <p>1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping.</p> <p>1a. Wear boots with adequate treads.</p> <p>1a. Delineate unsafe areas with 42" cones, caution tape and/or flagging.</p> <p>1b. Observe and maintain the posted speed limits.</p> <p>1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers.</p> <p>1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities.</p> <p>1b. Identify potential traffic sources.</p> <p>1b. Wear PPE including high visibility clothing or reflective vest.</p> <p>1b. Use a spotter while moving work vehicles; plan ahead to avoid backing when unnecessary.</p> <p>1b. Maintain a minimum 10' exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility.</p> <p>1b. Delineate work area with 42" cones, flags, caution tape, and/or other barriers.</p> <p>1b. Position "Work Area" signs at Site entrances, if possible, or at either side of work area.</p> <p>1b. Position largest vehicle to protect against oncoming traffic.</p> <p>1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route.</p> <p>1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient of work area.</p> <p>1c. Wear leather gloves when handling any tools or equipment. Avoid wearing loose clothing. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools.</p> <p>1c. Keep body parts away from line-of-fire of equipment.</p> <p>1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure.</p> <p>1c. Remove any loose jewelry. Ensure loose clothing is secure.</p>			

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Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS
	<p>1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.</p> <p>1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.</p> <p>1f. EXPOSURE: Heat and cold related injuries.</p> <p>1g. EXPOSURE: Personal injury from noise hazards.</p>	<p>1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load.</p> <p>1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either awkward to carry or over 50 lbs.</p> <p>1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.).</p> <p>1e. Wear long sleeved clothes, apply insect repellent containing DEET, and inspect clothes and skin for ticks during and after work.</p> <p>1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.</p> <p>1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed.</p> <p>1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed.</p> <p>1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers).</p> <p>1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.</p> <p>1g. Wear hearing protection if sound levels exceed 85 dBA.</p>

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JOB SAFETY ANALYSIS		Cntrl. No. GEN-012	DATE: 12/31/2012	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: GENERIC		WORK TYPE: Gauging & Sampling	WORK ACTIVITY (Description): Soil Sampling		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Michael Hodess		Staff Environmental Scientist	Curtis Taylor	SHSM	
			Mike Ritorto	Project Hydrogeologist	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES <input checked="" type="checkbox"/> FLAME RESISTANT CLOTHING (as needed)	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD: <input checked="" type="checkbox"/> HEARING PROTECTION: (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: Composite-toe or steel toe boots	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Insect Repellant, sunscreen (as needed)</u>		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Recommended Equipment; 42" traffic cones, caution tape, trowel					
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A minimum 10' exclusion zone will be maintained around moving equipment, if present.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Secure location	<p>1a. CONTACT: Personnel and vehicular traffic may enter the work area.</p> <p>1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.</p> <p>1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke, Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire if occurred. Exposure to explosive vapors due to tank farm operations, Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.</p>	<p>1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity.</p> <p>1a. Wear reflective vest and/or fluorescent clothing.</p> <p>1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic.</p> <p>1a. Communicate work activity with adjacent work areas.</p> <p>1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions.</p> <p>1b. Use established pathways and walk on stable, secure ground.</p> <p>1b. Stage equipment and tools will in a convenient, stable, and orderly manner. Store equipment at lowest potential energy.</p> <p>1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be appropriate (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.</p> <p>1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected.</p> <p>1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are also expected.</p> <p>1c. Be aware of the location of all Site personnel.</p> <p>1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing).</p> <p>1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse).</p> <p>1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or an area with air conditioning (i.e., car, site trailer, etc.). Move to an area that is warm.</p> <p>1c. No open flames/heat sources.</p> <p>1c. Flame resistant clothing must be worn when specified by Site policy.</p> <p>1c. Cell phones should be disabled when specified by Site policy.</p> <p>1c. Pre-treat field clothing with Permethrin prior to site visit to kill/repel ticks and insects.</p> <p>1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin.</p> <p>1c. Spray insect repellent containing DEET on exposed skin when working in overgrown areas of the Site.</p> <p>1c. Inspect area to avoid contact with biological hazards.</p> <p>1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path.</p> <p>1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite.</p> <p>1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water.</p>			

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
2. Collect Soil Sample	<p>2a. CONTACT: Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling.</p> <p>2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.</p>	<p>2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the "show me your hands" policy. 2a. See 1a.</p> <p>2b. Wear chemical-resistant disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.</p>
3. Decontaminate equipment	<p>3a. EXPOSURE/CONTACT: Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil).</p> <p>3b. EXPOSURE: Chemicals in cleaning solution including ammonia.</p>	<p>3a. Wear chemical-resistant disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area.</p> <p>3b. Wear chemical-resistant disposable gloves and safety glasses. 3b. Work on the upwind side of decon area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area.</p>

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JOB SAFETY ANALYSIS		DATE: 3/3/2014	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY Site Specific Site: 239 10th Ave	WORK TYPE Construction - Excavation	WORK ACTIVITY (Description) Excavation /Trenching With Heavy Machinery		
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Jeffrey Wills	Project Hydrogeologist	Ray Fitzpatrick	OHSO	
Thalassa Sodre	Staff Assistant Engineer			
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT WITH LIGHT <input checked="" type="checkbox"/> PPE CLOTHING: <u>fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.</u> <input type="checkbox"/> LIFELINE / BODY HARNESS	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY BOOTS <u>steel or composite toe</u>	<input checked="" type="checkbox"/> AIR PURIFYING RESPIRATOR as needed <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> CLEAR SAFETY GLASSES	<input checked="" type="checkbox"/> GLOVES: Leather or cut resistant <input type="checkbox"/> OTHER	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
Excavator, VAC Truck, Photoionization Detector, ladders, shovels, digging bars, APR if VOC's >5 ppm				
EXCLUSION ZONE: 10' exclusion zone (EZ) around excavator. 4' EZ for the primary machine spotter in order to look out for unmarked utilities.				
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS		
1. Pre-Clearance protocol REFER TO VAC TRUCK JSA AND SUBSURFACE CLEARANCE PROCEDURE CHECKLIST	1a. CONTACT: Property Damage: Underground utilities, pressure water mains, pressure gas mains, sewer lines, underground electric 1b. FALL: Slip ,Trip or Fall	1a. Confirm that "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. All mark-outs shall be re-marked with fresh paint on a daily basis. Prior to initiating any new excavation, the Subsurface Clearance Procedure Checklist will be reviewed by field supervisor and/or foreman. There shall be a pre-excavation meeting of all field personnel involved with any excavation activities to discuss where utilities are located and what precautions shall be taken to identify and protect them. All utilities within excavation area shall be exposed 5' feet in all directions using hand tools (shovel and bar) and/or soft excavation (Vac Truck) prior to excavating with machine. Fiberglass digging bars shall be used when digging within 5' of known electrical lines. 1b. Be aware of the conditions when walking in or around work area. Walk within established pathways and avoid uneven surfaces.		
2. Setup work zone	2a. CONTACT/CAUGHT: Injury from equipment 2b. FALL: Slip ,Trip or Fall 2c. OVEREXERTION: Potential for back and muscle strain while soft digging	2a. Isolate work area from hazards with cones, barrels or barricades and caution tape. A flag person shall be used to control third party vehicular and/or pedestrian traffic. Spotters shall maintain and enforce 10ft exclusion zone (EZ) . 2b. See 1b. 2c. Keep back straight, knees bent, heels flat on ground when lifting. Stay hydrated, take adequate breaks.		
3. Trenching activity	3a. CONTACT: With machine, with falling debris or material Personnel injury to personnel in trench 3b. FALL: Slip ,Trip or Fall	3a. Workers shall enter exclusion zone only when the operator is in "Hands Off "mode. Operator shall not operate equipment until workers are out of the exclusion zone. The EZ is 10 feet for this task (4 ft for the primary spotter). All spoil piles and materials shall be maintained 2' minimum from edge of excavation. Any time there is a worker(s) present in trench there shall be a competent person out of the trench (on top) to watch for hazards. 3b. Any trench/excavation deeper than 4' shall have an inspected ladder within 25' of any worker in the excavation. At least 3' (rungs) shall be above the top of the excavation. Ladders shall be secured and tied off. Workers shall maintain three points of contact on ladder at all times. Tools and equipment shall not be carried while on ladder – use taglines or machines to move tools/equipment/material in and out of the excavation. 3b. Any excavation 6ft or deeper requires a guardrail/fence system – <u>or</u> – anyone within 6ft of an unprotected edge shall don a personal fall arrest system (harness & lanyard anchored to a 5000 pound anchorage point).		

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
	3c. EXPOSURE: To fumes and vapors: toxic, flammable, explosive, corrosive and/or asphyxiating	3c. Air monitor shall be calibrated, bump tested and monitored <u>daily</u> (readings documented at regular intervals) during excavation activities. Excavation shall be evacuated when/if air monitor sounds (VOC's >5 ppm). APR shall be donned before reentering. Inspected 20lb Fire extinguisher shall be at hand. Don't stand downwind of excavation.
4. Shoring Refer to JSA for Wood Sheeting Installation, Steel Trench Box Assembly, or Installation of Steel Z Sheeting	4a. Refer to JSA for Wood Sheeting Installation, Steel Trench Box Assembly, or Installation of Steel Z Sheeting for potential hazards	4a. Refer to JSA for Wood Sheeting Installation, Steel Trench Box Assembly, or Installation of Steel Z Sheeting for critical actions.
5. Secure/Leave Site Refer to Backfilling Excavation JSA if applicable	5a. FALL: Slip ,Trip or Fall	5a. See 1b. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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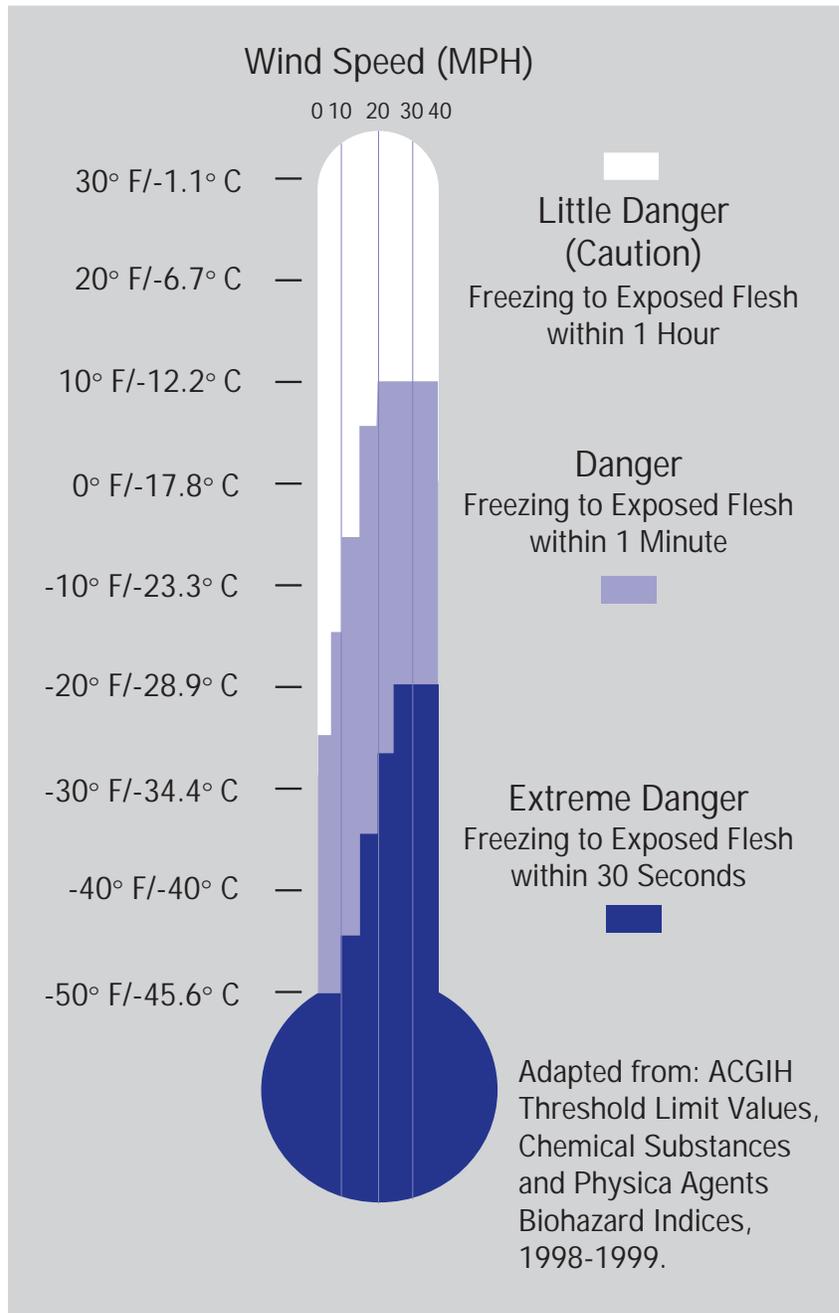
Heat and Cold Stress Guidelines

THE COLD STRESS EQUATION

**LOW TEMPERATURE + WIND SPEED + WETNESS
= INJURIES & ILLNESS**

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

Hypothermia can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6° F/37°C) DROPS TO OR BELOW 95°F (35° C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When...

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

Protecting Workers from Heat Stress

Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake; previous heat illnesses
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

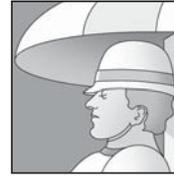
To Prevent Heat Illness, Your Employer Should

- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



For more complete information:

- Schedule frequent rest periods with water breaks in shaded or air-conditioned areas.
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.



How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.
- Be aware that poor physical condition, some health problems (such as high blood pressure or diabetes), pregnancy, colds and flu, and some medications can increase your personal risk. If you are under treatment, ask your healthcare provider.



What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

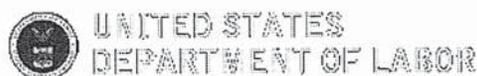
If you have any questions or concerns, call OSHA at 1-800-321-OSHA.

For more complete information:



U.S. Department of Labor

www.osha.gov (800) 321-OSHA



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SECTION III: CHAPTER 4

HEAT STRESS

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For problems with accessibility in using figures and illustrations in this document, please contact the Office of Science and Technology Assessment at (202) 693-2095.

I. INTRODUCTION.

Operations involving high air temperatures, radiant heat sources, high humidity, direct physical contact with hot objects, or strenuous physical activities have a high potential for inducing heat stress in employees engaged in such operations. Such places include: iron and steel foundries, nonferrous foundries, brick-firing and ceramic plants, glass products facilities, rubber products factories, electrical utilities (particularly boiler rooms), bakeries, confectioneries, commercial kitchens, laundries, food canneries, chemical plants, mining sites, smelters, and steam tunnels.

Outdoor operations conducted in hot weather, such as construction, refining, asbestos removal, and hazardous waste site activities, especially those that require workers to wear semipermeable or impermeable protective clothing, are also likely to cause heat stress among exposed workers.

A. CAUSAL FACTORS.

1. Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury.
2. It is difficult to predict just who will be affected and when, because individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

B. DEFINITIONS.

1. The American Conference of Governmental Industrial Hygienists (1992) states that workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).
2. **Heat** is a measure of energy in terms of quantity.

3. A **calorie** is the amount of heat required to raise 1 gram of water 1°C (based on a standard temperature of 16.5 to 17.5°C).
4. **Conduction** is the transfer of heat between materials that contact each other. Heat passes from the warmer material to the cooler material. For example, a worker's skin can transfer heat to a contacting surface if that surface is cooler, and vice versa.
5. **Convection** is the transfer of heat in a moving fluid. Air flowing past the body can cool the body if the air temperature is cool. On the other hand, air that exceeds 35°C (95°F) can increase the heat load on the body.
6. **Evaporative cooling** takes place when sweat evaporates from the skin. High humidity reduces the rate of evaporation and thus reduces the effectiveness of the body's primary cooling mechanism.
7. **Radiation** is the transfer of heat energy through space. A worker whose body temperature is greater than the temperature of the surrounding surfaces radiates heat to these surfaces. Hot surfaces and infrared light sources radiate heat that can increase the body's heat load.
8. **Globe temperature** is the temperature inside a blackened, hollow, thin copper globe.
9. **Metabolic heat** is a by-product of the body's activity.
10. **Natural wet bulb (NWB) temperature** is measured by exposing a wet sensor, such as a wet cotton wick fitted over the bulb of a thermometer, to the effects of evaporation and convection. The term natural refers to the movement of air around the sensor.
11. **Dry bulb (DB) temperature** is measured by a thermal sensor, such as an ordinary mercury-in-glass thermometer, that is shielded from direct radiant energy sources.

II. HEAT DISORDERS AND HEALTH EFFECTS.

- A. **HEAT STROKE** occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protests, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

- B. **HEAT EXHAUSTION.** The signs and symptoms of heat exhaustion are headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment. Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest.

- C. **HEAT CRAMPS** are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused by both too much and too little salt. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution ($\pm 0.3\%$ NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

- D. **HEAT COLLAPSE** ("Fainting"). In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the worker should gradually become acclimatized to the hot environment.

- E. **HEAT RASHES** are the most common problem in hot work environments. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.
- F. **HEAT FATIGUE.** A factor that predisposes an individual to heat fatigue is lack of acclimatization. The use of a program of acclimatization and training for work in hot environments is advisable. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

III. INVESTIGATION GUIDELINES.

These guidelines for evaluating employee heat stress approximate those found in the 1992-1993 ACGIH publication, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

A. EMPLOYER AND EMPLOYEE INTERVIEWS.

- 1. The inspector will review the OSHA 200 Log and, if possible, the OSHA 101 forms for indications of prior heat stress problems.
- 2. Following are some questions for employer interviews: What type of action, if any, has the employer taken to prevent heat stress problems? What are the potential sources of heat? What employee complaints have been made?
- 3. Following are some questions for employee interviews: What heat stress problems have been experienced? What type of action has the employee taken to minimize heat stress? What is the employer's involvement, i.e., does employee training include information on heat stress? (Appendix III:4-1 lists factors to be evaluated when reviewing a heat stress situation, and Appendix III:4-2 contains a follow-up checklist.)

B. WALKAROUND INSPECTION. During the walkaround inspection, the investigator will: determine building and operation characteristics; determine whether engineering controls are functioning properly; verify information obtained from the employer and employee interviews; and perform temperature measurements and make other determinations to identify potential sources of heat stress. Investigators may wish to discuss any operations that have the potential to cause heat stress with engineers and other knowledgeable personnel. The walkaround inspection should cover all affected areas. Heat sources, such as furnaces, ovens, and boilers, and relative heat load per employee should be noted.

C. WORK-LOAD ASSESSMENT.

- 1. Under conditions of high temperature and heavy workload, the CSHO should determine the work-load category of each job (Table III:4-1 and Figure III:4-1). Work-load category is determined by averaging metabolic rates for the tasks and then ranking them:
 - 1. Light work: up to 200 kcal/hour
 - 2. Medium work: 200-350 kcal/hour
 - 3. Heavy work: 350-500 kcal/hour

2. *Cool Rest Area:* Where heat conditions in the rest area are different from those in the work area, the metabolic rate (M) should be calculated using a time-weighted average, as follows:

Equation III: 4-1. Average Metabolic Rate

$$Average_M = \frac{(M_1)(t_1) + (M_2)(t_2) + \dots + (M_n)(t_n)}{(t_1) + (t_2) + \dots + (t_n)}$$

where: M = metabolic rate
 t = time in minutes

In some cases, a videotape is helpful in evaluating work practices and metabolic load.

FIGURE III:4-1. ACTIVITY EXAMPLES

- Light hand work: writing, hand knitting
- Heavy hand work: typewriting
- Heavy work with one arm: hammering in nails (shoemaker, upholsterer)
- Light work with two arms: filing metal, planing wood, raking the garden
- Moderate work with the body: cleaning a floor, beating a carpet
- Heavy work with the body: railroad track laying, digging, barking trees

Sample Calculation: Assembly line work using a heavy hand tool

Walking along	2.0 kcal/min
Intermediate value between heavy work with two arms and light work with the body	3.0 kcal/min
Add for basal metabolism	1.0 kcal/min
Total:	6.0 kcal/min

Source: ACGIH 1992.

TABLE III:4-1. ASSESSMENT OF WORK

<i>Body position and movement</i>		<i>kcal/min*</i>	
Sitting		0.3	
Standing		0.6	
Walking		2.0-3.0	
Walking uphill		add 0.8 for every meter (yard) rise	
Type of work	Average kcal/min	Range kcal/min	
Hand work			
Light	0.4	0.2-1.2	
Heavy	0.9		
Work: One arm			
Light	1.0	0.7-2.5	
Heavy	1.7		
Work: Both arms			
Light	1.5	1.0-3.5	
Heavy	2.5		
Work: Whole body			
Light	3.5	2.5-15.0	
Moderate	5.0		
Heavy	7.0		
Very heavy	9.0		
* For a "standard" worker of 70 kg body weight (154 lbs) and 1.8m ² body surface (19.4 ft ²).			

Source: ACGIH 1992.

IV. SAMPLING METHODS.

- A. **BODY TEMPERATURE MEASUREMENTS.** Although instruments are available to estimate deep body temperature by measuring the temperature in the ear canal or on the skin, these instruments are not sufficiently reliable to use in compliance evaluations.
- B. **ENVIRONMENTAL MEASUREMENTS.** Environmental heat measurements should be made at, or as close as possible to, the specific work area where the worker is exposed. When a worker is not continuously exposed in a single hot area but moves between two or more areas having different levels of environmental heat, or when the environmental heat varies substantially at a single hot area, environmental heat exposures should be measured for each area and for each level of environmental heat to which employees are exposed.
- C. **WET BULB GLOBE TEMPERATURE INDEX.**

- 1. Wet Bulb Globe Temperature (WBGT) should be calculated using the appropriate formula in [Appendix III:4-2](#). The

WBGT for continuous all-day or several hour exposures should be averaged over a 60-minute period. Intermittent exposures should be averaged over a 120-minute period. These averages should be calculated using the following formula:

Equation III:4-2. Average Web Bulb Globe Temperature (WBGT)

$$Average_{WBGT} = \frac{(WBGT_1)(t_1) + (WBGT_2)(t_2) + \dots + (WBGT_n)(t_n)}{(t_1) + (t_2) + \dots + (t_n)}$$

For indoor and outdoor conditions with no solar load, WBGT is calculated as:

$$WBGT = 0.7NWB + 0.3GT$$

For outdoors with a solar load, WBGT is calculated as

$$WBGT = 0.7NWB + 0.2GT + 0.1DB$$

- where:
- WBGT = Wet Bulb Globe Temperature Index
 - NWB = Nature Wet-Bulb Temperature
 - DB = Dry-Bulb Temperature
 - GT = Globe Temperature

2. The exposure limits in Table III:4-2 are valid for employees wearing light clothing. They must be adjusted for the insulation from clothing that impedes sweat evaporation and other body cooling mechanisms. Use Table III:4-3 to correct Table III:4-2 for various kinds of clothing.
 3. Use of Table III:4-2 requires knowledge of the WBGT and approximate workload. Workload can be estimated using the data in Table III:4-1, and sample calculations are presented in Figure III:4-1.
- D. **MEASUREMENT.** Portable heat stress meters or monitors are used to measure heat conditions. These instruments can calculate both the indoor and outdoor WBGT index according to established ACGIH Threshold Limit Value equations. With this information and information on the type of work being performed, heat stress meters can determine how long a person can safely work or remain in a particular hot environment. See Appendix III:4-2 for an alternate method of calculation.

TABLE III:4-2. PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUE

Work/rest regimen	----- Work Load* -----		
	Light	Moderate	Heavy
Continuous work	30.0°C (86°F)	26.7°C (80°F)	25.0°C (77°F)
75% Work, 25% rest, each hour	30.6°C (87°F)	28.0°C (82°F)	25.9°C (78°F)
50% Work, 50% rest, each hour	31.4°C (89°F)	29.4°C (85°F)	27.9°C (82°F)
25% Work, 75% rest, each hour	32.2°C (90°F)	31.1°C (88°F)	30.0°C (86°F)

*Values are in °C and °F, WBGT.

These TLV's are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C (100.4° F). They are also based on the assumption that the WBGT of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average should be used (consult the ACGIH 1992-1993 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (1992).

These TLV's apply to physically fit and acclimatized individuals wearing light summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLV's in Table III:4-2 must be reduced by the corrections shown in Table III:4-3.

Source: ACGIH 1992.

E. OTHER THERMAL STRESS INDICES.

1. The Effective Temperature index (ET) combines the temperature, the humidity of the air, and air velocity. This index has been used extensively in the field of comfort ventilation and air-conditioning. ET remains a useful measurement technique in mines and other places where humidity is high and radiant heat is low.
2. The Heat-Stress Index (HSI) was developed by Belding and Hatch in 1965. Although the HSI considers all environmental factors and work rate, it is not completely satisfactory for determining an individual worker's heat stress and is also difficult to use.

TABLE III:4-3. WBGT CORRECTION FACTORS IN °C

Clothing type	Clo* value	WBGT correction
Summer lightweight working clothing	0.6	0
Cotton coveralls	1.0	-2
Winter work clothing	1.4	-4
Water barrier, permeable	1.2	-6

*Clo: Insulation value of clothing. One clo = 5.55 kcal/m²/hr of heat exchange by radiation and convection for each degree °C difference in temperature between the skin and the adjusted dry bulb temperature.

Note: Deleted from the previous version are trade names and "fully encapsulating suit, gloves, boots and hood" including its clo value of 1.2 and WBGT correction of -10.

Source: ACGIH 1992.

V. CONTROL.

Ventilation, air cooling, fans, shielding, and insulation are the five major types of engineering controls used to reduce heat stress in hot work environments. Heat reduction can also be achieved by using power assists and tools that reduce the physical demands placed on a worker.

However, for this approach to be successful, the metabolic effort required for the worker to use or operate these devices must be less than the effort required without them. Another method is to reduce the effort necessary to operate power assists. The worker should be allowed to take frequent rest breaks in a cooler environment.

A. ACCLIMATIZATION.

1. The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimatization. After a period of acclimatization, the same activity will produce fewer cardiovascular demands. The worker will sweat more efficiently (causing better evaporative cooling), and thus will more easily be able to maintain normal body temperatures.
2. A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such a program basically involves exposing employees to work in a hot environment for progressively longer periods. NIOSH (1986) says that, for workers who have had previous experience in jobs where heat levels are high enough to produce heat stress, the regimen should be 50% exposure on day one, 60% on day two, 80% on day three, and 100% on day four. For new workers who will be similarly exposed, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.

B. FLUID REPLACEMENT. Cool (50°-60°F) water or any cool liquid (except alcoholic beverages) should be made available to workers to encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

C. ENGINEERING CONTROLS.

1. **General ventilation** is used to dilute hot air with cooler air (generally cooler air that is brought in from the outside). This technique clearly works better in cooler climates than in hot ones. A permanently installed ventilation system usually handles large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.
2. **Air treatment/air cooling** differs from ventilation because it reduces the temperature of the air by removing heat (and sometimes humidity) from the air.
3. **Air conditioning** is a method of air cooling, but it is expensive to install and operate. An alternative to air conditioning is the use of chillers to circulate cool water through heat exchangers over which air from the ventilation system is then passed; chillers are more efficient in cooler climates or in dry climates where

evaporative cooling can be used.

4. **Local air cooling** can be effective in reducing air temperature in specific areas. Two methods have been used successfully in industrial settings. One type, cool rooms, can be used to enclose a specific workplace or to offer a recovery area near hot jobs. The second type is a portable blower with built-in air chiller. The main advantage of a blower, aside from portability, is minimal set-up time.
5. Another way to reduce heat stress is to increase the air flow or **convection** using fans, etc. in the work area (as long as the air temperature is less than the worker's skin temperature). Changes in air speed can help workers stay cooler by increasing both the convective heat exchange (the exchange between the skin surface and the surrounding air) and the rate of evaporation. Because this method does not actually cool the air, any increases in air speed must impact the worker directly to be effective.

If the dry bulb temperature is higher than 35°C (95°F), the hot air passing over the skin can actually make the worker hotter. When the temperature is more than 35°C and the air is dry, evaporative cooling may be improved by air movement, although this improvement will be offset by the convective heat. When the temperature exceeds 35°C and the relative humidity is 100%, air movement will make the worker hotter. Increases in air speed have no effect on the body temperature of workers wearing vapor-barrier clothing.

6. **Heat conduction** methods include insulating the hot surface that generates the heat and changing the surface itself.
7. Simple engineering controls, such as shields, can be used to reduce radiant **heat**, i.e. heat coming from hot surfaces within the worker's line of sight. Surfaces that exceed 35°C (95°F) are sources of infrared radiation that can add to the worker's heat load. Flat black surfaces absorb heat more than smooth, polished ones. Having cooler surfaces surrounding the worker assists in cooling because the worker's body radiates heat toward them.

With some sources of radiation, such as heating pipes, it is possible to use both insulation and surface modifications to achieve a substantial reduction in radiant heat. Instead of reducing radiation from the source, shielding can be used to interrupt the path between the source and the worker. Polished surfaces make the best barriers, although special glass or metal mesh surfaces can be used if visibility is a problem.

Shields should be located so that they do not interfere with air flow, unless they are also being used to reduce convective heating. The reflective surface of the shield should be kept clean to maintain its effectiveness.

D. ADMINISTRATIVE CONTROLS AND WORK PRACTICES.

1. Training is the key to good work practices. Unless all employees understand the reasons for using new, or changing old, work practices, the chances of such a program succeeding are greatly reduced.
2. NIOSH (1986) states that a good heat stress training program should include at least the following components:
 - Knowledge of the hazards of heat stress;
 - Recognition of predisposing factors, danger signs, and symptoms;
 - Awareness of first-aid procedures for, and the potential health effects of, heat stroke;
 - Employee responsibilities in avoiding heat stress;
 - Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments;
 - Use of protective clothing and equipment; and
 - Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs.
3. Hot jobs should be scheduled for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.

E. WORKER MONITORING PROGRAMS.

1. Every worker who works in extraordinary conditions that increase the risk of heat stress should be personally monitored. These conditions include wearing semipermeable or impermeable clothing when the temperature exceeds 21°C (69.8°F), working at extreme metabolic loads (greater than 500 kcal/hour), etc.
2. Personal monitoring can be done by checking the heart rate, recovery heart rate, oral temperature, or extent of body water loss.
3. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.
4. The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P_1) with the pulse rate taken at 2.5 minutes (P_3) after the rest break starts. The two pulse rates can be interpreted using Table III:4-4.
5. Oral temperature can be checked with a clinical thermometer after work but before the employee drinks water. If the oral temperature taken under the tongue exceeds 37.6°C, shorten the next work cycle by one third.
6. Body water loss can be measured by weighing the worker on a scale at the beginning and end of each work day.

The worker's weight loss should not exceed 1.5% of total body weight in a work day. If a weight loss exceeding this amount is observed, fluid intake should increase.

F. **OTHER ADMINISTRATIVE CONTROLS.** The following administrative controls can be used to reduce heat stress:

- Reduce the physical demands of work, e.g., excessive lifting or digging with heavy objects;
- Provide recovery areas, e.g., air-conditioned enclosures and rooms;
- Use shifts, e.g., early morning, cool part of the day, or night work;
- Use intermittent rest periods with water breaks;
- Use relief workers;
- Use worker pacing; and
- Assign extra workers and limit worker occupancy, or the number of workers present, especially in confined or enclosed spaces.

TABLE III:4-4. HEART RATE RECOVERY CRITERIA

Heart rate recovery pattern	P ₃	Difference between P ₁ and P ₃
Satisfactory recovery	<90	--
High recovery (Conditions may require further study)	90	10
No recovery (May indicate too much stress)	90	<10

VI. PERSONAL PROTECTIVE EQUIPMENT.

A. **REFLECTIVE CLOTHING**, which can vary from aprons and jackets to suits that completely enclose the worker from neck to feet, can stop the skin from absorbing radiant heat. However, since most reflective clothing does not allow air exchange through the garment, the reduction of radiant heat must more than offset the corresponding loss in evaporative cooling. For this reason, reflective clothing should be worn as loosely as possible. In situations where radiant heat is high, auxiliary cooling systems can be used under the reflective clothing.

B. AUXILIARY BODY COOLING.

1. Commercially available **ice vests**, though heavy, may accommodate as many as 72 ice packets, which are usually filled with water. Carbon dioxide (dry ice) can also be used as a coolant. The cooling offered by ice packets lasts only 2 to 4 hours at moderate to heavy heat loads, and frequent replacement is necessary. However, ice vests do not encumber the worker and thus permit maximum mobility. Cooling with ice is also relatively inexpensive.
2. **Wetted clothing** is another simple and inexpensive personal cooling technique. It is effective when reflective or other impermeable protective clothing is worn. The clothing may be wetted terry cloth coveralls or wetted two-piece, whole-body cotton suits. This approach to auxiliary cooling can be quite effective under conditions of high temperature and low humidity, where evaporation from the wetted garment is not restricted.
3. **Water-cooled garments** range from a hood, which cools only the head, to vests and "long johns," which offer partial or complete body cooling. Use of this equipment requires a battery-driven circulating pump, liquid-ice coolant, and a container.

Although this system has the advantage of allowing wearer mobility, the weight of the components limits the amount of ice that can be carried and thus reduces the effective use time. The heat transfer rate in liquid cooling systems may limit their use to low-activity jobs; even in such jobs, their service time is only about 20 minutes per pound of cooling ice. To keep outside heat from melting the ice, an outer insulating jacket should be an integral part of these systems.

4. **Circulating air** is the most highly effective, as well as the most complicated, personal cooling system. By directing compressed air around the body from a supplied air system, both evaporative and convective cooling are improved. The greatest advantage occurs when circulating air is used with impermeable garments or double cotton overalls.

One type, used when respiratory protection is also necessary, forces exhaust air from a supplied-air hood ("bubble hood") around the neck and down inside an impermeable suit. The air then escapes through openings in the suit. Air can also be supplied directly to the suit without using a hood in three ways:

- by a single inlet;
- by a distribution tree; or
- by a perforated vest.

In addition, a vortex tube can be used to reduce the temperature of circulating air. The cooled air from this tube can be introduced either under the clothing or into a bubble hood. The use of a vortex tube separates the air stream into a hot and cold stream; these tubes also can be used to supply heat in cold climates. Circulating air, however, is noisy and requires a constant source of compressed air supplied through an attached air hose.

One problem with this system is the limited mobility of workers whose suits are attached to an air hose. Another is that of getting air to the work area itself. These systems should therefore be used in work areas where workers are not required to move around much or to climb. Another concern with these systems is that they can lead to dehydration. The cool, dry air feels comfortable and the worker may not realize that it is important to drink liquids frequently.

- C. **RESPIRATOR USAGE.** The weight of a self-contained breathing apparatus (SCBA) increases stress on a worker, and this stress contributes to overall heat stress. Chemical protective clothing such as totally encapsulating chemical protection suits will also add to the heat stress problem.

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APPENDIX III:4-1. HEAT STRESS: GENERAL WORKPLACE REVIEW.

NOTE: Listed below are sample questions that the Compliance Officer may wish to consider when investigating heat stress in the workplace.

WORKPLACE DESCRIPTION.

- A. Type of business
- B. Heat-producing equipment or processes used
- C. Previous history (if any) of heat-related problems
- D. At "hot" spots:
 - Is the heat steady or intermittent?
 - Number of employees exposed?
 - For how many hours per day?
 - Is potable water available?
 - Are supervisors trained to detect/evaluate heat stress symptoms?

ARE EXPOSURES TYPICAL FOR A WORKPLACE IN THIS INDUSTRY?

- A. Weather at Time of Review
- B. Temperature
- C. Humidity
- D. Air velocity
- E. Is Day Typical of Recent Weather Conditions?
(Get information from the Weather Bureau)
- F. Heat-Reducing Engineering Controls

- G. Ventilation in place?
- H. Ventilation operating?
- I. Air conditioning in place?
- J. Air conditioning operating?
- K. Fans in place?
- L. Fans operating?
- M. Shields or insulation between sources and employees?
- N. Are reflective faces of shields clean?

WORK PRACTICES TO DETECT, EVALUATE, AND PREVENT OR REDUCE HEAT STRESS.

- A. Training program?
- B. Content?
- C. Where given?
- D. For whom?
- E. Liquid replacement program?
- F. Acclimatization program?
- G. Work/rest schedule?
- H. Scheduling of work (during cooler parts of shift, cleaning and maintenance during shut-downs, etc.)
- I. Cool rest areas (including shelter at outdoor work sites)?
- J. Heat monitoring program?
- K. Personal Protective Equipment
- L. Reflective clothing in use?
- M. Ice and/or water-cooled garments in use?
- N. Wetted undergarments (used with reflective or impermeable clothing) in use?
- O. Circulating air systems in use?
- P. First Aid Program
- Q. Trained personnel?
- R. Provision for rapid cool-down?
- S. Procedures for getting medical attention?
- T. Transportation to medical facilities readily available for heat stroke victims?
- U. Medical Screening and Surveillance Program
- V. Content?
- W. Who manages program?
- X. Additional Comments

(Use additional pages as needed.)

APPENDIX III: 4-2. HEAT STRESS-RELATED ILLNESS OR ACCIDENT FOLLOW-UP.

- A. Describe events leading up to the episode.
- B. Evaluation/comments by other workers at the scene.
- C. Work at time of episode (heavy, medium, light)?
- D. How long was affected employee working at site prior to episode?
- E. Medical history of affected worker, if known.
- F. Appropriate engineering controls in place?
- G. Appropriate engineering controls in operation?
- H. Appropriate work practices used by affected employee(s)?
- I. Appropriate personal protective equipment available?
- J. Appropriate personal protective equipment in use?
- K. Medical screening for heat stress and continued surveillance for signs of heat stress given other employees?
- L. Additional comments regarding specific episode(s): (Use additional pages as needed.)

APPENDIX III: 4-3. MEASUREMENT OF WET BULB GLOBE TEMPERATURE.

Measurement is often required of those environmental factors that most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, the Wet Bulb Globe Temperature Index (WBGT) is the most used technique to measure these environmental factors. WBGT values are calculated by the following equations:

Equation III:4-4. Indoor or Outdoor Wet Bulb Globe Temperature Indexes (WBGI) Indoor or outdoors with no solar load

$$WBGT = 0.7NWB + 0.3GT$$

Outdoors with solar load

$$WBGT = 0.7NWB + 0.2GT + 0.1DB$$

where: WBGT = Wet Bulb Globe Temperature Index
 NWB = Natural Wet-Bulb Temperature
 DB = Dry-Bulb (air) Temperature
 GT = Globe Thermometer Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. The measurement of environmental factors shall be performed as follows:

1. The range of the dry and the natural wet-bulb thermometers should be -5°C to $+50^{\circ}\text{C}$, with an accuracy of $\pm 0.5^{\circ}\text{C}$. The dry bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb. The wick of the natural wet bulb thermometer should be kept wet with distilled water for at least one-half hour before the temperature reading is made. It is not enough to immerse the other end of the wick into a reservoir of distilled water and wait until the whole wick becomes wet by capillarity. The wick must be wetted by direct application of water from a syringe one-half hour before each reading. The wick must cover the bulb of the thermometer and an equal length of additional wick must cover the stem above the bulb. The wick should always be clean, and new wicks should be washed before using.
2. A globe thermometer, consisting of a 15 cm (6-inch) in diameter hollow copper sphere painted on the outside with a matte black finish, or equivalent, must be used. The bulb or sensor of a thermometer (range -5°C to $+100^{\circ}\text{C}$ with an accuracy of $\pm 0.5^{\circ}\text{C}$) must be fixed in the center of the sphere. The globe thermometer should be exposed at least 25 minutes before it is read.
3. A stand should be used to suspend the three thermometers so that they do not restrict free air flow around the bulbs and the wet-bulb and globe thermometer are not shaded.
4. It is permissible to use any other type of temperature sensor that gives a reading similar to that of a mercury thermometer under the same conditions.
5. The thermometers must be placed so that the readings are representative of the employee's work or rest areas, as appropriate.

Once the WBGT has been estimated, employers can estimate workers' metabolic heat load (see Tables III:4-1 and III:4-2) and use the ACGIH method to determine the appropriate work/rest regimen, clothing, and equipment to use to control the heat exposures of workers in their facilities.

[Freedom of Information Act](#) | [Privacy & Security Statement](#) | [Disclaimers](#) | [Customer Survey](#) | [Important Web Site Notices](#) | [International](#) | [Contact Us](#)

U.S. Department of Labor | Occupational Safety & Health Administration | 200 Constitution Ave., NW, Washington, DC 20210
Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627

www.OSHA.gov

Health and Safety Briefing Tailgate Form

HEALTH AND SAFETY BRIEFING /
TAILGATE MEETING FORM

Site Name / Location _____

Date: _____ Weather Forecast: _____

Names of Personnel Attending Briefing

_____	_____	_____
_____	_____	_____
_____	_____	_____

Planned Work _____

Items Discussed _____

Work Permit Type and
Applicable Restrictions

Signatures of Attending Personnel

_____	_____	_____
_____	_____	_____
_____	_____	_____

Concentra Medical Data Form



(Patient Must Present Photo ID at Time of Service)

Authorization for Examination or Treatment

Patient Name: _____ Social Security Number: _____

Employer: _____ Date of Birth: _____

Street Address: _____ Location Number: _____

Temporary Staffing Agency: _____

Work Related

Injury Illness

Date of Injury _____

Substance Abuse Testing* (check all that apply)

Regulated drug screen Breath alcohol

Collection only Hair collect

Non-regulated drug screen Rapid drug screen

Other _____

Type of Substance Abuse Testing

Preplacement Reasonable cause

Post-accident Random

Follow-up

Special instructions/comments: _____

Authorized by: _____

Please print

Phone: (_____) _____

Physical Examination

Preplacement Baseline Annual Exit

DOT Physical Examination

Preplacement Recertification

Special Examination

Asbestos Respirator Audiogram

Human Performance Evaluation*

HAZMAT Medical Surveillance

Other _____

Billing (check if applicable)

Employee to pay charges

★ Due to the nature of these specific services, only the patient and staff are allowed in the testing/treatment area. Please alert your employee so that they can make arrangements for children or others that might otherwise be accompanying them to the medical center.

Title: _____

Date

Concentra now offers urgent care services for non-work related illness and injury. We accept many insurance plans.

(Copies of this form are available at www.concentra.com)

Improving America's health, one patient at a time.

The Reason for Today's Visit

- Physical exam Drug Screen Physical and Drug Screen Injury
 DOT (CDL) certification Other: _____

Patient

Last name: _____ First name: _____ M.I.: _____
Social Security #: _____ Date of birth (MM/DD/YYYY): _____
Address: _____ Apt. # _____ City: _____ ST: _____ ZIP: _____
Contact phone (home or cell): _____ Work phone: _____ Female Male
Occupation _____ Single Married

Employer Requesting Services

Employer

Name: _____ Location/store number: _____
Contact name: _____ Contact phone: _____
Address: _____ City: _____ ST: _____ ZIP: _____
Is your employment arranged through a temporary hire agency? Yes No Name of agency: _____ Agency phone: _____

The information provided is correct to the best of my knowledge. I will not hold Concentra, its health providers, or its employees responsible for any errors or omissions that I may have made in completing the information on this form. You may contact my employer to verify the purpose of my visit, if necessary.

 Signature: _____ Date: _____

Notice of Privacy Practices

Your name and signature below indicate that you have received a copy of Concentra's Notice of Privacy Practices on the date and time indicated. If you have any questions regarding the information in Concentra's Notice of Privacy Practices, contact Concentra's Privacy Office at 800-819-5571 or PrivacyOffice@concentra.com.

Name (please print): _____

 Signature: _____

Date and time Notice received: _____

If you are here for an injury, please complete the section below.

Injury date: _____ Injury time: _____

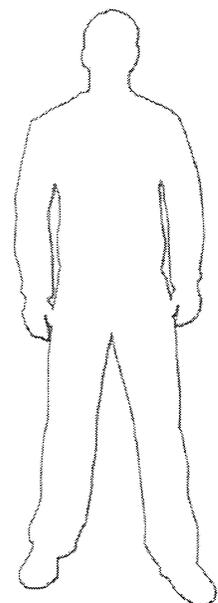
Where were you when the injury occurred?: _____

How did the injury happen? _____

What part of your body is injured? _____

Please check which side of your body is injured. Right Left Both

Using the figure at right, please circle the areas where you are injured. ➔



You may be contacted by Westgate Research, acting on behalf of Concentra, to participate in a satisfaction survey about this visit. We rely on your feedback to help us improve.

Mejorando la salud de los Estados Unidos, un paciente a la vez.

La razón para la consulta de hoy

- Examen físico Chequeo de drogas Examen físico y chequeo de drogas Lesión
 Certificación DOT (CDL) Otro: _____

Paciente
Apellido: _____ Nombre: _____ Inicial Seg. Nombre: _____
Seguro Social: _____ Fecha de Nacimiento (MM/DD/AAAA): _____
Dirección: _____ Apt. # _____ Ciudad: _____ Estado _____ Cód. Postal: _____
Teléfono de contacto (casa o celular): _____ Teléfono trabajo: _____ Mujer Hombre
Ocupación: _____ Soltero(a) Casado(a)

Empleador Solicitando los Servicios

Empleador
Nombre: _____ Ubicación/Tienda Número: _____
Nombre del Contacto: _____ Teléfono del Contacto: _____
Dirección: _____ Apt. # _____ Ciudad: _____ Estado _____ Cód. Postal: _____
¿Su empleo está contratado a través de una agencia de empleos temporales? Sí No
Nombre de la agencia: _____ Teléfono de la agencia: _____

La información provista es correcta hasta donde yo sé. Yo no haré responsable a Concentra, sus proveedores de la salud, o sus empleados por cualquier error u omisión que yo haya hecho al llenar la información en este formulario. Si es necesario, usted puede contactar a mi empleador para verificar el propósito de mi consulta.

 Firma: _____ Fecha: _____

Aviso de las Políticas de Privacidad

Su nombre y firma abajo indican que usted ha recibido una copia de la Notificación de Políticas de Privacidad de Concentra en la fecha y hora indicados. Si usted tiene cualquier pregunta en relación con la Notificación de Prácticas de Privacidad de Concentra, por favor contacte al Oficial de Privacidad y Seguridad de Concentra al 800-819-5571 o PrivacyOffice@concentra.com.

Nombre (letra imprenta por favor) _____

 Firma: _____

Fecha y hora de recibida la notificación: _____

Si usted está aquí por una lesión, por favor llenar la sección de abajo.

Fecha de la lesión: _____ Hora de la lesión: _____

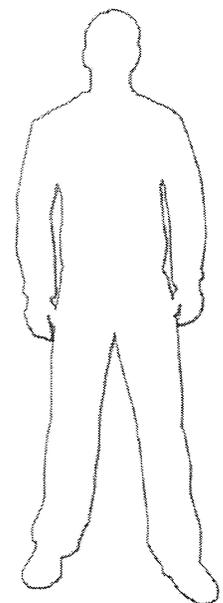
¿Dónde estaba cuando ocurrió la lesión? _____

¿Cómo ocurrió la lesión? _____

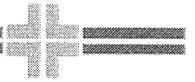
¿Qué parte de su cuerpo está lesionada? _____

Por favor indique cuál lado de su cuerpo está lesionado Derecho Izquierdo Ambos
Utilizando el dibujo a la derecha, por favor marque con un círculo las áreas que están lesionadas ☺

Puede que lo contacte de Westgate Research, en representación de Concentra para que participe en una encuesta de satisfacción acerca de su consulta. Nosotros contamos con esta información, la cual nos ayuda a mejorar.



Patient Information



Thank you for trusting us with your care today.

Last name: _____ First name: _____ M.I.: _____
Patient SS #: _____ Date of Birth (MM/DD/YYYY): _____ Married
Home phone: _____ Cell phone: _____ Single
Reason for visit: _____ Male Female
Patient e-mail address: _____
Address: _____ Apt # _____ City: _____ ST: _____ ZIP: _____
Primary care physician name: _____ Phone: _____
Employer name: _____
Employer address: _____ City: _____ ST: _____ ZIP: _____
Emergency Contact Name: _____ Emergency Contact Phone: _____

How did you learn about Concentra? (Check one, please.)

- Billboard Direct mail Doctor referral Driving by Employer Existing patient Friend/relative
 Insurance company Internet Movie theater Newspaper Phone book Radio Pharmacy
 School Apartment Complex

Today's Payment

How will you be paying for today's bill?

Payment made today will be paid by:

- Patient Pay—I will be paying today using: Cash Check VISA MasterCard Discover Debit card
 My company—I am participating in a program that is company-paid.
 Insurance—I will present my insurance card and an approved form of ID. (Please complete next two sections.)

Insurance Information

If you're using insurance to pay today's bill, please provide this information...

Employer of insured person: _____
Insurance carrier: _____
Member ID: _____ Group #: _____
Claims address: _____ City: _____ ST: _____ ZIP: _____
Do you have insurance with more than one health plan? Yes No
If yes, name of other insurance carrier: _____
➔ (Please present both ID cards at check-in.)

Account Information

If you're using insurance, this is information about the person carrying the insurance...

Last name: _____ First name: _____ M.I.: _____
Account SS #: _____ Date of birth (MM/DD/YYYY): _____
Home phone: _____ Cell phone: _____
Address: _____ City: _____ ST: _____ ZIP: _____
Relationship to patient: (Check one, please.) Self Spouse Parent/Guardian Other: _____

I certify that the information provided is correct to the best of my knowledge. I will not hold Concentra, its health providers, or its employees responsible for any errors or omissions that I may have made in completing the information on this form.

You may be contacted by Westgate Research, acting on behalf of Concentra to participate in a satisfaction survey about this visit. We rely on your feedback to help us improve.

Signature: _____ Date: _____

Información Paciente

Concentra[®]
treated right



Gracias por confiarnos sus cuidados de hoy.

Apellido: _____ Nombre: _____ Inicial Segundo Nombre: _____
#SS del paciente: _____ Fecha de nacimiento (MM/DD/AAAA): _____ Casado(a)
Teléfono en casa: _____ Teléfono celular: _____ Soltero(a)
Motivo de la consulta: _____ Hombre Mujer
Correo electrónico del paciente: _____
Dirección: _____ Apt # _____ Ciudad: _____ Estado: _____ Cód. Postal: _____
Nombre del médico de atención primaria: _____ Teléfono: _____
Nombre del empleador: _____
Dirección del empleador: _____ Ciudad: _____ Estado: _____ Cód. Postal: _____
Contacto de Emergencia: _____ Teléfono de Contacto de Emergencia: _____

Cómo se enteró
de Concentra?
(Por favor marque una)

- Valla Correo Directo Remitido por un doctor Pasábaros por aquí Empleador Paciente existente
 Amigo/pariente Compañía de seguro Internet Teatro de cine Periódico Radio Farmacia Escuela
 Complejo de Apartamentos

Pago de hoy
Cómo va a pagar
la cuenta de hoy?

El pago de hoy lo va a hacer:

- El paciente — Yo pagaré la cuenta total usando: Efectivo Cheque VISA MasterCard Discover Tarjeta Débito
 La Compañía paga - Estoy participando en un programa que es pagado por la Compañía
 El seguro — Yo presentaré mi tarjeta de seguro y una forma de identificación aprobada
(Por favor complete las siguientes dos secciones).

**Información
del seguro**
Si usted está usando
seguro para pagar
la cuenta de hoy,
por favor proveéanos
con la siguiente
información...

Empleador de la persona asegurada: _____
Compañía de seguro: _____
Identificación del Miembro: _____ # de Grupo: _____
Dirección de reclamos: _____ Ciudad: _____ Estado: _____ Cód. Postal: _____
Tiene seguro con más de un plan de salud? Sí No
Sí sí, nombre el otro seguro: _____
➔ (Por favor presente ambas tarjetas de identificación al registrarse)

**Información de
la cuenta**
Si usted está usando
seguro, esta es
información acerca de
la persona que tiene
el seguro...

Apellido: _____ Nombre: _____ Inicial Seg. Nombre: _____
de SS en la Cuenta: _____ Fecha de Nacimiento: (MM/DD/AAAA) _____
Teléfono en casa: _____ Teléfono celular: _____
Dirección: _____ Ciudad: _____ Estado: _____ Cód. Postal: _____
Relación con el paciente: Usted mismo Cónyuge Padre/Guardián Otro: _____
(Por favor marque una)

Yo certifico que la información provista es correcta hasta donde yo sé. Yo no haré responsable a Concentra, sus proveedores de la salud, o sus empleados por cualquier error u omisión que yo haya hecho al llenar la información en este formulario.

Firma: _____ Fecha: _____

Near Loss Reporting Form

NEAR LOSS REPORT FORM

Incident ID: _____

IMPORTANT: Do not include any personal non-work related medical information on this form

PART 1: ADMINISTRATIVE INFORMATION

Project Manager :		
Project Site Name:		
City:	State/Province:	Country:

PART 2: NEAR LOSS DETAILS

Date\Time Occurred (MM/DD/YYYY HH:MM):	Date\Time Submitted to IMPACT (MM/DD/YYYY HH:MM):
NEAR LOSS TYPE - What could have happened? - Select all that apply (1-7)	
1. <input type="checkbox"/> Fire / Explosion	3. <input type="checkbox"/> Security (e.g theft, trespassing, vandalism)
2. <input type="checkbox"/> Injury / Illness	4. <input type="checkbox"/> Environmental (spill, permit exceedance, etc.)
	5. <input type="checkbox"/> Transportation of personnel (vehicle accident)
	6. <input type="checkbox"/> Property/Equipment Damage
	7. <input type="checkbox"/> Business Interruption
Event Leading to Potential Injury/Illness*:	Activity: Remediation
Job Task*:	Phase of Operation : Remediation
Equipment Involved*:	
<p>WHAT HAPPENED? Do not include individuals' or company names. Ensure photos, sketches, etc. are not personally identifiable unless written consent has been obtained. (NOTE: For IMPACT entry, this information must be in English.)</p> <p>Summary (1-2 sentences. Provide brief description of the incident. Provide facts only, no speculation or opinion):</p> <p>Near Loss Details (Brief factual details of what, where, when; include photos, sketches, etc. as attachments):</p> <p>Immediate Corrective Actions Taken:</p>	
NEAR LOSS INVOLVED:	
Was a post-incident alcohol or drug test conducted? <input type="checkbox"/> 1. Yes <input type="checkbox"/> 2. No	
Contractor Company Name:	Subcontractor Company Name:

PART 3: NEAR LOSS INVESTIGATION FINDINGS AND REPORT QUALITY REVIEW

Date Investigation Team Assigned (mm/dd/yyyy):
<p>INVESTIGATION SUMMARY: Determine and list by number what behaviors and/or conditions may have contributed to the Near Loss. Then, use the "5-Why Technique" for each of these behaviors/conditions; provide a narrative for each that explains how the associated root cause(s) was determined. Do not include individuals' or company names. (NOTE: For IMPACT entry, this information must be in English.)</p>

ROOT CAUSE NUMBER(S) AND SOLUTION(S): HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING
Selection of RCs and solutions reflects the analysis of investigation team and is not meant to be a legally binding conclusion as to the RC and/or solution.

Behavior/ Condition #	Root Cause # (1/line)	Solution(s) (must match Root Cause) (For IMPACT entry, solutions must be in English.)	Job Title Responsible for Completion	Completion Target Date	Completion Actual Date

QUALITY REVIEW Were the correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?	
Job Title :	Company :

PART 4: VERIFICATION (Solutions Implemented) & VALIDATION (Solutions Effective)

Date	Solution	Verifier / Validator Job Title	Verifier / Validator Company	Details (of V & V performed)

Incident Report – Page 2

JOB TASK - Select the most appropriate one (primary job associated with incident-related work activity, avoid "Other" if possible)			
<ul style="list-style-type: none"> ◆ 1. Carbon Change ◆ 2. Construction ◆ 3. Demolition ◆ 4. Dewatering ◆ 5. Drilling (includes well) ◆ 6. Excavation / Trenching 	<ul style="list-style-type: none"> ◆ 7. Gauging ◆ 8. Geoprobe / Direct Push ◆ 9. Mobil Remediation (includes vacuum event and chemical injection) ◆ 10. NAPL Recovery ◆ 11. O&M (remediation system) 	<ul style="list-style-type: none"> ◆ 12. Pavement Cutting ◆ 13. Pump Test ◆ 14. Sampling ◆ 15. Site Visit / Survey ◆ 16. Subsurface Clearance ◆ 17. System Install 	<ul style="list-style-type: none"> ◆ 18. System Startup ◆ 19. UST Removal (includes tank exposure and backfill) ◆ 20. Waste Management ◆ 21. Well Plugging/Abandonment ◆ 22. Other: _____
EVENT LEADING TO POTENTIAL INJURY/ILLNESS - Select the most appropriate one			
Body Position/Force: <ul style="list-style-type: none"> ◆ 1. Line of Fire ◆ 2. Overexertion, Strain ◆ 3. Struck Against Object ◆ 4. Struck By Object ◆ 5. Personal Energy ◆ 6. Repetitive Strain Injury (RSI) ◆ 7. Buried ◆ 8. Caught In, Under, Between 	Chemical Exposure: <ul style="list-style-type: none"> ◆ 9. Inhalation ◆ 10. Ingestion ◆ 11. Physical Contact Contact By: <ul style="list-style-type: none"> ◆ 12. Animal, Insect, Plant ◆ 13. Blood / Potentially Infectious Materials ◆ 14. Electricity ◆ 15. Noise ◆ 16. Other Physical Agents ◆ 17. Radiation ◆ 18. Temperature Extremes 	◆ 19. Drowning Falls: <ul style="list-style-type: none"> ◆ 20. Fall, From Elevation ◆ 21. Fall, Same Level ◆ 22. Slip or Trip Without Fall ◆ 23. Food Consumption ◆ 24. Suffocate/Asphyxiate (Lack of Oxygen) ◆ 25. Transportation Incident ◆ 26. Other (describe): _____	
EQUIPMENT INVOLVED THAT CONTRIBUTED TO NEAR LOSS - Select all that apply			
<ul style="list-style-type: none"> ◆ 1. Air Stripper ◆ 2. API Separator ◆ 3. Automobile ◆ 4. Boom Material ◆ 5. Bulldozer ◆ 6. Cable ◆ 7. Carbon Drum / Vessel ◆ 8. Chain Block ◆ 9. Compressor, Air ◆ 10. Control Panel (local) ◆ 11. Crane (mobile) ◆ 12. Drill Rig ◆ 13. Drilling Equipment, Vacuum ◆ 14. Drum, Vertical ◆ 15. Dump Truck ◆ 16. Electric Heater ◆ 17. Electrical Power Supply ◆ 18. Engine, Internal Combustion ◆ 19. Equipment Safety Grounding ◆ 20. Excavator / Power Shovel ◆ 21. Exclusion Zone Equipment ◆ 22 Fan, Centrifugal / Blower ◆ 23 Fencing ◆ 24 Filter 	<ul style="list-style-type: none"> ◆ 25. Fire Extinguisher ◆ 26. Forklift ◆ 27. Front End Loader ◆ 28. Grader ◆ 29. Hand Tool, Hammer ◆ 30. Hand Tool, Knife ◆ 31. Hand Tool, Non-Powered ◆ 32. Hand Tool, Powered ◆ 33. Hand Tool, Powered, Drill ◆ 34. Hand Tool, Powered, Grinder ◆ 35. Hand Tool, Powered, Hydraulic Torque ◆ 36. Hand Tool, Powered, Saw ◆ 37. Hand Tool, Powered, Wrench, Impact ◆ 38. Hand Tool, Saw ◆ 39. Hand Tool, Screwdriver ◆ 40. Hand Tool, Shears ◆ 41. Hand Tool, Shovel ◆ 42. Hand Tool, Snip ◆ 43. Hand Tool, Wrench ◆ 44. Hoist ◆ 45. Hook/Clamp/Buckle, etc. ◆ 46. Jack ◆ 47. Ladder, Extension ◆ 48. Ladder, Platform ◆ 49. Ladder, Step ◆ 50. Lock / Tag 	<ul style="list-style-type: none"> ◆ 51. Maintenance Tool, General ◆ 52. Manifold ◆ 53. Manlift/Basket/Cherry Picker ◆ 54. Motor, Electric ◆ 55. Oxidizer ◆ 56. Pallet ◆ 57. Piping ◆ 58. Piping, Hose ◆ 59. Piping, Injection/Mixing Point ◆ 60. Powered Tools, Hydrojet ◆ 61. Pump, Centrifugal ◆ 62. Pump, Diaphragm ◆ 63. Pump, Reciprocating ◆ 64. Pump, Regenerative ◆ 65. Pump, Rotary ◆ 66. Pumps (transfer, electrical) ◆ 67. Pump, Submerged ◆ 68. PPE, Face Shield ◆ 69. PPE, Fall Protection ◆ 70. PPE, Gloves ◆ 71. PPE, Hard Hat / Helmet ◆ 72. PPE, Hearing Protection ◆ 73. PPE, Respiratory, Chemical ◆ 74. PPE, Respiratory, Particulate ◆ 75. PPE, Safety Glasses ◆ 76. PPE, Safety Goggles 	<ul style="list-style-type: none"> ◆ 77. PPE, Safety Shoes / Boots ◆ 78. PPE, Safety Vest / Clothing ◆ 79. Rope ◆ 80. Sampling Equipment, Bailer ◆ 81. Sampling Equipment, Geoprobe ◆ 82. Sampling Equipment, Hand Auger ◆ 83. Sampling Equipment, PID ◆ 84. Sampling Equipment, Sample Container ◆ 85. Sampling Equipment, Split Spoon Sampler ◆ 86. Sling ◆ 87. Snow Blower ◆ 88. Snow Plow ◆ 89. Space Heater, Electric ◆ 90. System, Air Sparging ◆ 91. System, Carbon Treatment ◆ 92. System, Chemical Oxidation ◆ 93. System, Dual Phase Product Recover ◆ 94. System, Groundwater Pump and Treat ◆ 95. System, POET ◆ 96. System, Shed or Trailer
ROOT CAUSE NUMBER(S)			
PERSONAL FACTORS: <ul style="list-style-type: none"> (1) LACK OF SKILL OR KNOWLEDGE (2) DOING THE JOB ACCORDING TO PROCEDURES OR ACCEPTABLE PRACTICES TAKES MORE TIME OR EFFORT (3) SHORT-CUTTING PROCEDURES OR ACCEPTABLE PRACTICES IS POSITIVELY REINFORCED OR TOLERATED (4) IN PAST, DID NOT FOLLOW PROCEDURES OR ACCEPTABLE PRACTICES AND NO INCIDENT OCCURRED 	JOB FACTORS: <ul style="list-style-type: none"> (5) LACK OF OR INADEQUATE PROCEDURES (6) INADEQUATE COMMUNICATION OF EXPECTATIONS REGARDING PROCEDURES OR ACCEPTABLE STANDARDS (7) INADEQUATE TOOLS OR EQUIPMENT (available, maintained, etc.) 		

Proposed Development Plans
(See Figures 3, 7)

Sample Hazardous or
Non-Hazardous Soil Disposal Manifest

NON-HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Doc No.	2. Page 1 of 1			
3. Generator's Name and Mailing Address							
4. Generator's Phone (including area code)							
5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone					
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone					
9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone					
11. Waste Shipping Name and Description		12. Containers		13. Total Quantity	14. Unit Wt/Vol		
		No.	Type				
G E N E R A T O R	a.						
	b.						
	c.						
	d.						
D. Additional Descriptions for Materials Listed Above		E. Handling Codes for Wastes Listed Above					
15. Special Handling Instructions and Additional Information							
16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.							
Printed/Typed Name		Signature			Month	Day	Year
T R A N S P O R T E R	17. Transporter 1 Acknowledgement of Receipt of Materials						
	Printed/Typed Name	Signature	Month	Day	Year		
F A C I L I T Y	18. Transporter 2 Acknowledgement of Receipt of Materials						
	Printed/Typed Name	Signature	Month	Day	Year		
19. Discrepancy Indication Space							
20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.							
Printed/Typed Name		Signature			Month	Day	Year

ORIGINAL - RETURN TO GENERATOR

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of	Information in the shaded areas is not required by Federal law.
3. Generator's Name and Mailing Address				A. State Manifest Document Number	
4. Generator's Phone ()				B. State Generator's ID	
5. Transporter 1 Company Name		6. US EPA ID Number		C. State Transporter's ID	
7. Transporter 2 Company Name		8. US EPA ID Number		D. Transporter's Phone	
9. Designated Facility Name and Site Address		10. US EPA ID Number		E. State Transporter's ID	
				F. Transporter's Phone	
				G. State Facility's ID	
				H. Facility's Phone	
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)				12. Containers	13. Total
				No.	Quantity
				Type	Unit
				Wt/Vol	Waste No.
a.					
b.					
c.					
d.					
J. Additional Descriptions for Materials Listed Above				K. Handling Codes for Wastes Listed Above	
15. Special Handling Instructions and Additional Information					
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.					
Printed/Typed Name				Signature	
				Month Day Year	
17. Transporter 1 Acknowledgement of Receipt of Materials					
Printed/Typed Name				Signature	
				Month Day Year	
18. Transporter 2 Acknowledgement of Receipt of Materials					
Printed/Typed Name				Signature	
				Month Day Year	
19. Discrepancy Indication Space					
20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.					
Printed/Typed Name				Signature	
				Month Day Year	

Specifications for
Vapor Barrier/Waterproofing Membrane



MiraPLY™ -H

Self-Adhering, Blindsided Waterproofing Membrane Horizontal Grade

DESCRIPTION

MiraPLY-H is a horizontal grade, self-adhering, blindsided waterproofing membrane that is a fully adhered composite comprised of a tough, durable and flexible TPO backing with a butyl alloy adhesive.

TYPICAL USES

MiraPLY-H self-adhering blindsided waterproofing membrane is designed for waterproofing below-grade structural slabs. MiraPLY-H is also very effective in rehab waterproofing and zero clearance property line construction.

ADVANTAGES

- Tremendous impermeability and excellent resistance to chemicals (i.e., acids and bases)
- Effective Radon Barrier
- Seals cracks in concrete

CAUTION / LIMITATIONS

- Protect membrane from torch welding or cutting slag
- Do not use in conjunction with spiked rebar chairs
- Do not leave exposed for more than 60 days (30 with release liner, another 30 days without the release liner)
- Installation below 25°F require special tools and techniques. Consult Technical Services for details.

PACKAGING

4' x 50' (1.22 m x 15.24 m) rolls. Weight: 85 lbs (38.6 kg)

STORAGE

Store in the original packaging until use. Protect from UV exposure and weather below 40°F or above 100°F.

LIMITED WARRANTY

Carlisle Coatings & Waterproofing Incorporated (Carlisle) warrants this product to be free of defects in workmanship and materials only at the time of shipment from our factory. If any Carlisle materials prove to contain manufacturing defects that substantially affect their performance, Carlisle will, at its option, replace the materials or refund its purchase price.

This limited warranty is the only warranty extended by Carlisle with respect to its materials. There are no other warranties, including the implied warranties of merchantability and fitness for a particular purpose. Carlisle specifically disclaims liability for any incidental, consequential, or other damages, including but not limited to, loss of profits or damages to a structure or its contents, arising under any theory of law whatsoever.

The dollar value of Carlisle's liability and buyer's remedy under this limited warranty shall not exceed the purchase price of the Carlisle material in question.

TECHNICAL DATA

PROPERTY	METHOD	UNIT	TYPICAL VALUE
TPO	—	mils (mm)	30 (.76)
Butyl Alloy	—	mils (mm)	25 (.64)
Tensile Strength*	ASTM D882	psi	1,696
Puncture Strength - Failure Load	ASTM E154	lbf	139
Puncture Strength - Elongation at Failure	ASTM E154	%	301
300% Modulus*	ASTM D412	psi	893
Ultimate Elongation*	ASTM D412	%	534
Tear Strength*	ASTM D624 Die C	psi	291
Lap Seam Peel Strength - Test @ 75°	ASTM D903	pli	5.9
Lap Seam Peel Strength - Sep. Type	ASTM D903	pli	Cohesive
Water Vapor Permeance	ASTM E96, Method B	Perms	0.08
Low Temperature Flexibility	ASTM D1970	°F	< -10°
Lap Peel Adhesion	ASTM D1876, Modified	lbs/in	> 5.0
Peel Adhesion to Concrete	ASTM D903, Modified	lbs/in	> 5.0

*Data listed according to "Machine Direction" criteria, where applicable





MiraPLY™-V

Self-Adhering, Blindsided Waterproofing Membrane Vertical Grade

DESCRIPTION

MiraPLY-V is a vertical grade, self-adhering, blindsided waterproofing membrane. This membrane is a fully adhered composite comprised of a tough, durable and flexible TPO backing with a butyl alloy adhesive.

TYPICAL USES

MiraPLY-V self-adhering blindsided waterproofing membrane is designed for waterproofing zero property line applications against soil retention systems. MiraPLY-V is also very effective in rehab waterproofing and ideal for critical positive side waterproofing applications.

ADVANTAGES

- Seals around fasteners
- Tremendous impermeability and excellent resistance to chemicals (i.e., acids and bases)
- Effective Radon Barrier
- Seals cracks in concrete

CAUTION / LIMITATIONS

- Protect membrane from torch welding or cutting slag
- Do not use in conjunction with spiked rebar chairs
- Do not leave exposed for more than 60 days (30 with release liner and an additional 30 days without liner)
- Installation below 25°F require special tools and techniques. Consult Technical Services for details.

PACKAGING

4' x 50' (1.22 m x 15.24 m) rolls. Weight: 65 lbs (29.5 kg)

STORAGE

Store in the original packaging until use. Protect from UV exposure and weather below 40°F or above 100°F.

LIMITED WARRANTY

Carlisle Coatings & Waterproofing Incorporated (Carlisle) warrants this product to be free of defects in workmanship and materials only at the time of shipment from our factory. If any Carlisle materials prove to contain manufacturing defects that substantially affect their performance, Carlisle will, at its option, replace the materials or refund its purchase price.

This limited warranty is the only warranty extended by Carlisle with respect to its materials. There are no other warranties, including the implied warranties of merchantability and fitness for a particular purpose. Carlisle specifically disclaims liability for any incidental, consequential, or other damages, including but not limited to, loss of profits or damages to a structure or its contents, arising under any theory of law whatsoever.

The dollar value of Carlisle's liability and buyer's remedy under this limited warranty shall not exceed the purchase price of the Carlisle material in question.

TECHNICAL DATA

PROPERTY	METHOD	UNIT	TYPICAL VALUE
TPO	—	mils (mm)	22 (.56)
Butyl Alloy	—	mils (mm)	25 (.64)
Water Vapor Permeance	ASTM E96, Method B	Perms	0.02
Tensile Strength*	ASTM D412	psi	1,999
300% Modulus*	ASTM D412	psi	874
Elongation @ Break*	ASTM D412	%	774
Maximum Tensile Strength*	ASTM D882	psi	1,898
Elongation @ Maximum*	ASTM D882	%	1,138
Tensile Strength @ Break*	ASTM D882	psi	1,598
Elongation @ Break*	ASTM D882	%	1,146
Modulus @ 200% Elongation*	ASTM D882	psi	811
Tear Strength*	ASTM D624 Die C	psi	289
Tear Strength*	ASTM D1004	psi	290
Puncture Strength @ Peak Load	ASTM E154	lbf	108

*Data listed according to "Machine Direction" criteria, where applicable





CCW MiraDRI®

860/861

Self-Adhering Waterproofing Membrane

DESCRIPTION

CCW MiraDRI® 860/861 are self-adhering sheet membranes consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to 4 mils (0.1 mm) of polyethylene to form a minimum 60-mil (1.5 mm) membrane. CCW MiraDRI 860 membrane is a summer-grade material, suitable for installations where the ambient temperature is 40°F (4.4°C) or above. CCW MiraDRI 861 should be used for applications between 25°F (-3.9°C) and 65°F (18°C). The combination of these two excellent waterproofing materials provides a high-performance, extremely durable waterproofing barrier.

TYPICAL USE

CCW MiraDRI 860/861 membranes are used for vertical and horizontal waterproofing on structural foundation walls and decks. Below-grade foundation walls, tunnels, split slabs, plaza decks and parking decks are all areas where CCW MiraDRI 860/861 may be applied. CCW MiraDRI 860/861 also may be used in interior areas such as mechanical rooms, laboratories, kitchens and bathrooms. CCW MiraDRI 860/861 should be covered with either CCW 200V/300HV Protection Course, CCW Protection Board, or CCW MiraDRAIN® drainage composites.

LIMITATIONS

- Do not apply where membrane will be subject to continuous exposure to sunlight.
- The membrane should not be left exposed to direct sunlight for longer than 14 days.
- Do not apply primer or membrane to frozen concrete. Optimum results are obtained when membrane is installed at temperatures above 25°F. Between 25°F and 65°F use the CCW MiraDRI 861 membrane. CCW MiraDRI 860 can be used from 40°F and above.
- Do not apply primer or membrane to a damp, frosty or contaminated surface.
- Not recommended as a pond or tank liner except for between-slab applications.
- Do not apply over sealants containing coal tar or polysulfides. In the event of existing bitumen-modified materials, consult your Carlisle representative.

APPLICABLE STANDARDS

CCW MiraDRI 860/861 meets the applicable requirements of:

- GSA; PBS PCD 07121
- USN; NAVFAC TS-07111
- VA; H-08-1
- Federal Construction Guide Specs; FCGS-07111
- Corps of Engineers; CEGS-07111-3-82
- UL 790, Class A
- LA Research Report Number 25094L

TECHNICAL DATA

PROPERTY	METHOD	RESULTS
Color	—	Dark Gray
Thickness	ASTM D3767	60 mils
Tensile (Membrane)	ASTM D412	325 psi
Tensile (Film)	ASTM D882	5000 psi
Elongation	ASTM D412	350%
Permeance	ASTM E96	0.05 perms
Low Temp. Flexibility	ASTM D1970	Unaffected @ -45°F Crack Cycling*
(100 cycles)	ASTM C836	Unaffected @ -25°F
Peel Strength	ASTM D903	10.0 lb/in
Lap Adhesion	ASTM D1876	19.0 lb/in
Puncture Resistance	ASTM E154	60 lb (min)
Soil Burial	GSA-PBS 07121	16 wks, no effect
H ₂ O Absorption	ASTM D570	0.1% by wt
Hydrostatic Head	ASTM D5385	230 ft
*180° bend over a 1" (25 MM) mandrel at -45°F (-43°C)		

PACKAGING

CCW MiraDRI 860/861-36 = 36" wide x 67' roll (200 ft²) 25 rolls per pallet (5000 ft²) - Weight = 80 lb/roll (approx.)

CCW-702 VOC-Compliant Solvent Base Contact Adhesive:
5-gallon pails (45 pails per pallet)

CCW-702WB Water Base Contact Adhesive:
5-gallon pails (45 pails per pallet)

CCW-AWP Water Base Contact Adhesive:
1-gallon pails (100 pails per pallet)
5-gallon pails (45 pails per pallet)

CCW-702 Solvent Base Contact Adhesive:
5-gallon pails (45 pails per pallet)

CCW-715 Damp Concrete Contact Adhesive:
5 gallon pails (45 pails per pallet)

CCW-704 Mastic and CCW LM-800XL:
30-oz. Qt. Tube (12 tubes per carton)
5-gallon pails (45 pails per pallet)

INSTALLATION

Weather Conditions

CCW MiraDRI 860 is used for applications where the surface temperature is 40°F (4.4°C) and above. CCW MiraDRI 861 is used for applications where the surface temperature is between 25°F (-3.9°C) and 65°F (18°C). Do not apply CCW MiraDRI 860/861 to frozen or wet substrates. The membrane should not be left exposed to direct sunlight for longer than 14 days.

Substrate Preparation: CCW MiraDRI 860/861 can be applied to concrete, metal, wood, insulated wall systems or masonry surfaces. All substrates must be clean, dry and free of surface irregularities.

Concrete Substrates: Structural concrete must be cured a minimum of 7 days and lightweight structural concrete must cure a minimum of 14 days before the application of CCW MiraDRI 860/861. Repair surfaces that are not structurally sound or have voids, protrusions, rough spalled areas, loose aggregate or exposed course aggregate. Void areas should be filled with latex Portland cement, concrete or epoxy concrete and troweled smooth to match the existing surface. Protrusions and other rough areas should be broken off and patched as above. CCW LM-800XL or CCW-201 may be used to fill small voids, honeycombs or bug holes.

Masonry Substrate: Rough masonry may require the surface to be parged with a plaster coat of cementitious material to form a well-adhered, smooth and uniform finish. Allow the parge coat to dry before priming and installing the CCW MiraDRI 860/861 waterproofing membrane.

Chemical Additives: Curing compounds should be clear resin-based materials without waxes, oils or pigments. Form release agents must not transfer to the concrete. Curing compounds or form release agents that adversely affect the adherence of the CCW MiraDRI 860/861 waterproofing membrane must be removed from the substrate prior to application.

Priming & Detailing: All concrete, metal, masonry, wood and sheathing substrates require a contact adhesive. Insulated concrete forms require a water-based contact adhesive. Carlisle Coatings & Waterproofing recommends an adhesion test of the CCW MiraDRI 860/861 on any bare substrate to verify proper adhesion. Apply the appropriate CCW Contact Adhesive at the specified coverage rate. Apply Contact Adhesive with a lambswool roller, brush or spray apparatus. Allow Contact Adhesive to dry for a minimum of 30 minutes. The CCW Contact Adhesive will dry to a tacky finish. Areas applied but not covered with CCW MiraDRI 860/861 within 24 hours should be reapplied. All vertical-to-horizontal transitions must have a 3/4" (18 mm) fillet of CCW LM-800XL or CCW-201 Sealant.

The 3/4" (18 mm) fillet must be allowed to cure before covering with the CCW MiraDRI 860/861 membrane. All inside and outside corners, as well as the vertical-to-horizontal transitions, should be double covered. A CCW MiraDRI 860/861 Membrane Strip should be applied to each surface a minimum of 4.5" (112 mm) before being covered by the field membrane. Refer to the standard detail drawings for specific detail instructions.

VERTICAL INSTALLATION

Start at the low point and work towards the high point. Remove 6-8" (150-200 mm) of the release paper, and then begin applying the membrane. Press and smooth the membrane against the substrate while pulling the release paper free. Install membrane with side laps overlapped a minimum of 2.5" (63 mm) and end laps a minimum of 5" (127 mm). Carlisle Coatings & Waterproofing recommends that the membrane be rolled in place immediately after its placement to ensure full adhesion to the primed substrate. Apply a bead of CCW-704 Mastic OR CCW-703V Liqueal at terminations, cut edges, joints, drains, penetrations and protrusions. For walls over 8' (240 cm), the membrane should be placed in lifts. Protect the CCW MiraDRI

860/861 membrane with the appropriate CCW MiraDRAIN drainage composite, CCW 200V/300HV Protection Course or CCW Protection Board V.

HORIZONTAL INSTALLATION

Start at the low point (establish a starting point with a chalk line if necessary) and work towards the high point in shingle fashion. Remove 2'-3' (60-90 cm) of the release paper and apply the membrane to the substrate. Continue pulling the release paper free while pressing and smoothing the membrane against the substrate. Apply in a straight line avoiding wrinkles and over-correcting. Roll the membrane with a minimum 75-lb. (34 kg) linoleum roller. Install membrane with side laps overlapped a minimum of 2.5" (63 mm) and end laps a minimum of 5" (127 mm). Apply a bead of CCW-704 Mastic at all terminations of the membrane and T-joints. Apply a 3/4" (18 mm) fillet of CCW LM-800XL or CCW-201 in all inside corners of planter boxes, shower stalls and shower pans. Patch inadequately lapped seams and damaged areas with CCW MiraDRI 860/861 membrane covering the damaged area by a minimum of 6" (150 mm). "Fish-mouths" and severe wrinkles should be slit, flaps overlapped and repaired as above. Protect the CCW MiraDRI 860/861 membrane with the appropriate CCW MiraDRAIN drainage composite or CCW 300HV Protection Course.

Detail Requirements: For standard installation details follow the CCW MiraDRI 860/861 details drawings. For non-standard installation instructions contact your local Carlisle Coatings & Waterproofing representative.

WARNINGS AND HAZARDS

CCW-702 and CCW-704 contain flammable and combustible solvents. Avoid exposure to open flame. Avoid breathing vapors. Use only in areas with adequate ventilation. Refer to MSDS for important warnings and product information.

LIMITED WARRANTY

Carlisle Coatings & Waterproofing Incorporated (Carlisle) warrants this product to be free of defects in workmanship and materials only at the time of shipment from our factory. If any Carlisle materials prove to contain manufacturing defects that substantially effect their performance, Carlisle will, at its option, replace the materials or refund its purchase price.

This limited warranty is the only warranty extended by Carlisle with respect to its materials. There are no other warranties, including the implied warranties of merchantability and fitness for a particular purpose. Carlisle specifically disclaims liability for any incidental, consequential or other damages, including, but not limited to, loss of profits or damages to a structure or its contents, arising under any theory of law whatsoever.

The dollar value of Carlisle's liability and buyer's remedy under this limited warranty shall not exceed the purchase price of the Carlisle material in question.

SECTION 07 13 26 – SELF ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. **Composite sheet waterproofing at foundation walls, under slabs, and at elevator pits, sump pits and as indicated.**

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining construction, and other termination conditions.
- C. Samples: 12 by 12 inch square of each type of waterproofing and protection board.
- D. Manufacturer's Certification: Submit written certification signed by manufacturer of each product that materials provided are suitable for long-term use with materials existing at site, including but not limited to soils containing saltwater and dredged hydraulic fills.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to waterproofing manufacturer to install manufacturer's products.
- B. Preinstallation Conference: Conduct conference at Project site. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Store rolls according to manufacturer's written instructions. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.
 - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
 - 2. Warranty Period: Two years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following products for each application:
 - 1. Composite Sheet Waterproofing:
 - a. Carlisle Miraply V for vertical applications
 - b. Carlisle Miraply H for horizontal applications.

2.2 COMPOSITE SHEET WATERPROOFING

- A. **Sheet for Horizontal Applications: Carlisle Miraply H -25 mils butyl alloy membrane laminated to a 30 mil TPO membrane.**
- B. **Sheet for Vertical Applications: Carlisle Miraply V - 25 mils butyl alloy membrane laminated to a 22 mil TPO membrane.**
- C. Physical Properties: As follows, measured per standard test methods referenced:
 - 1. **Tensile Strength, Film: 1200 psi minimum; ASTM D 412.**
 - 2. **Low-Temperature Flexibility: Pass at minus 25 deg F ; ASTM D 1970.**

3. **Peel Adhesion to Concrete: 5 lbf/in.; ASTM D 903, modified.**
4. **Lap Adhesion: 5 lbf/in.; ASTM D 1876, modified.**
5. **Hydrostatic-Head Resistance: 231 feet / 100 psi; ASTM D 5385.**
6. **Vapor Permeance: 0.02 perms; ASTM E 96, Water Method.**

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. **Seam Tape: Shall be SecurTAPE – 6” wide**
- C. **Detailing Tapes: Shall be:**
 1. **CCW-Detail Tape – 2”, 6” wide**
 2. **TPO Cover Strip**
- D. **Primers: Shall be:**
 1. **Low VOC TPO Primer**
 2. **HP-250 Primer**
- E. **Termination Sealant: Shall be Sure-Seal Lap Sealant**
- F. **Detail Sealants: Shall be:**
 1. **Sure-Seal Lap Sealant**
 2. **Universal Single Ply Sealant**
- G. **2-Part Liquid Membrane: Shall be CCW-703V LiquiSeal**
- H. **Reinforcing Fabric: Shall be:**
 1. **CCW-LiquiFiber – 6”, 12” wide**
 2. **CCW-DCH Reinforcing Fabric – 6”, 12” wide**
- I. **Termination Bar: Shall be Sure-Seal Termination Bar**
- J. **Water Stop: Shall be CCW MiraSTOP**
- K. **Backer Rod: Shall be closed-cell polyethylene foam rod.**
- L. **Expansion Joints: Shall be the EJ-500**
- M. **Drain Composite: Shall be CCW MiraDRAIN Drainage Composite.**
- N. **Perimeter Drainage System: Where required, shall be CCW MiraDRAIN HC**
- O. **Cleaner: Shall be Weathered Membrane Cleaner or approved equal.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that compacted subgrade is dry, smooth, and sound; ready to receive HDPE sheet.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and at footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 COMPOSITE SHEET APPLICATION

- A. Install **composite** sheets according to waterproofing manufacturer's written instructions.

- B. Horizontal Applications: Install sheet membrane **with TPO face** against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps with detail tape to ensure watertight installation.
- C. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- D. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- E. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet membrane and firmly secure with detail tape.
- G. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed board insulation from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

Specifications for
Sub-Slab Depressurization System

SUB-SLAB DEPRESSURIZATION SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SCOPE OF WORK

- A. The purpose of this work is to install a sub-slab depressurization system (SSDS). The SSDS has been designed to operate actively. The SSDS consists of ¾-inch gravel with 4-inch diameter perforated soil gas collection pipe. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric will be installed between the venting layer and the concrete slab. All penetrations through the concrete slab will be sealed using a silicone based waterproof sealant or equivalent.
- B. The Contractor shall be responsible for furnishing all labor, services, tools, materials, equipment, and incidentals for proper installation of all material and equipment.
- C. The Contractor shall provide all piping, valves, fittings, sleeves, mechanical seals, pipe hangers and supports, and appurtenances that are required, as shown on the Contract Drawings and specified herein.
- D. The Contractor shall be responsible for all excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone based waterproof sealant or equivalent.
- E. The Contractor shall perform all work in a neat, workmanlike manner.

1.3 RELATED SECTIONS

- A. Excavation and Fill.
- B. Cast-in Place Concrete.

1.4 SUBMITTALS

- A. Submit to the Engineer samples and manufacturer information for nonwoven geotextile filter fabric.
- B. Submit to the Engineer certification from suppliers for each truckload of delivered backfill that the material meets the requirements of Part 2.
- C. Submit to the Engineer manufacturer information for the silicone based waterproof sealant.

- D. Submit to the Engineer shop drawings for piping under this Section. The shop drawings shall include all data and information required for complete piping system.

1.5 QUALITY ASSURANCE

- A. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle in strict compliance with manufacturer's instructions and recommendations.
 - 1. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 WARRANTIES

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the City of New York may have under the Contract Documents.

PART 2 PRODUCTS

2.1 SELECT FILL

- A. The ¾-inch gravel to be placed around the perforated vent piping and under concrete slab as shown on the Construction Drawing. The ¾-inch gravel shall be washed stone (rounded). The gravel shall be a continuous layer, minimum of 12 inches. The gravel shall be hard, angular, non-disintegrating stone with no fines conforming to the following gradation:

<u>U.S. SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1 ½-inch	100
1-inch	95 – 100
¾-inch	20 – 90
# 4	0 – 10

2.2 NONWOVEN GEOTEXTILE FILTER FABRIC

- A. Geotextile shall be nonwoven as approved by the Engineer. The nonwoven geotextile filter fabric shall be placed around the perforated vent piping, as shown on the Construction Drawing, and shall have weight of 10-ounce/square yard.

2.3 SILICONE BASED WATERPROOF SEALANT

- A. The silicone based sealant or approved equal will be used to seal all penetrations through the floor slab.

2.4 PIPING AND FITTINGS

- A. PVC Pipe and Fittings: PVC piping shall be polyvinyl chloride, Type 1, Grade 1. Schedule 40 shall conform to ASTM Specifications D1784.
- B. Pipe shall be of the sizes shown on the Drawings.
- C. Pipe shall bear trademark of the manufacturer.
- D. All fittings for PVC piping shall be of the same schedule approved for use by the pipe manufacturer.
- E. Perforated PVC Pipe: Where perforated pipe is to be installed as shown on the Construction Drawing, the pipe shall have four rows of ½-inch diameter holes, staggered, with 6-inch center-to-center spacing along pipe.
- F. Cast Iron Pipe: The piping above the concrete slab shall be cast iron and installed as shown on the Construction Drawing and conform to AWWA Class 22 pipe.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Place vapor barrier/waterproofing membrane in accordance with manufacturer's installation requirements.
- B. Placement of 10-ounce geotextile, backfill, and piping shall be as shown on the Construction Drawing.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.
- D. Excavate trench for SSDS piping as shown on the Construction Drawing.
- E. The trenching/piping shall be routed, as required, below any point the pipe intersects with utilities.
- F. Place geotextile fabric following the manufacturer's installation requirement in trench. Provide a material overlap of 18 inches.
- G. Place backfill and piping in trench as shown on the Construction Drawing.
- H. The installation of plastic pipe shall be strictly in accordance with the manufacturer's technical data and printed instructions.
- I. All piping shall be cleaned out prior to being put into service.
- J. Where plastic pipe passes through floor sleeves, the space between the pipe and sleeve shall be sealed with a silicone based waterproof sealant.

K. The pipe shall be installed in such a manner that it is not forced out of line by pipe supports, hangers or other supporting members.

L. The pipe shall be sloped away from the floor penetrations.

3.2 BACKFILLING

A. Select fill for placement around the perforated pipe as shown on Construction Drawing shall be ¾-inch gravel. Gravel to be continuous 12-inch layer, minimum.

B. Place and ¾-inch gravel in accordance with Section – Excavation and Backfill.

C. Remove surplus backfill materials from Site.

D. Leave fill material stockpile areas completely free of excess fill materials.

3.3 PROTECTION

A. The Contractor shall seal all penetrations through the floor slab using a silicone based waterproof sealant or equivalent.

B. The Contractor shall maintain all pipe installations in a condition such that they will function continuously and shall be kept clean of silt, debris, and other foreign matter from the pipe.

3.4 FINAL INSPECTION

A. Upon completion of the work and before final inspection by the owner, the SSDS shall be subject to a final inspection in the presence of Owner and/or Engineer.

END OF SECTION