

**76 AINSLIE STREET
BROOKLYN, NEW YORK**

Remedial Action Work Plan

NYC VCP Project Number 17CVCP018K

OER Project Number 16EHAZ222K

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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 and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
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
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
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
SRI	Supplemental Remedial Investigation
SSDS	Sub-Slab Depressurization System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

CERTIFICATION

I, James P. Cinelli, P.E., BCEE, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for designing the remedial program for the 76 Ainslie Street (74-78 Ainslie Street, Brooklyn, New York) site, site number 17CVCP018K. I certify to the following:

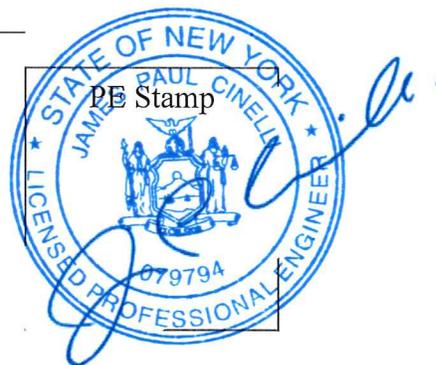
- I have reviewed this document and the Stipulation List, to which my signature and seal are affixed.
- Engineering Controls developed for this remedial action were designed by me or a person under my direct supervision and designed to achieve the goals established in this Remedial Action Work Plan for this site.
- The Engineering Controls to be constructed during this remedial action are accurately reflected in the text and drawings of the Remedial Action Work Plan and are of sufficient detail to enable proper construction.
- 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.

James P. Cinelli, P.E., BCEE
Name

079797-1
PE License Number


Signature

9/23/2016
Date



I, Andrew R. Fetterman, am a qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the 76 Ainslie Street (74-78 Ainslie Street, Brooklyn, New York) site, site number 17CVCP018K. I certify to the following:

- 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.

Andrew R. Fetterman
QEP Name


QEP Signature

9/23/2016
Date

EXECUTIVE SUMMARY

Horrigan Development LLC is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program to investigate and remediate a 5,000-square foot site located at 76 Ainslie Street in Brooklyn, 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 future intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Background

The Site is located at 76 Ainslie Street in the Williamsburg section of Brooklyn, New York and is identified as Block 2375 and Lot 10 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 5,000 square feet and is bounded by Ainslie Street to the north, Lot 3 to the south, Lot 12 to the east, and Lot 5 to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for warehousing and contains a single, high-ceiling former industrial building with a steel frame and masonry walls that covers the entire area of the Site.

Summary of Redevelopment Plan

The proposed redevelopment plan of the Site will consist of conversion of the existing building into a bar/restaurant. The existing raised floor slab will be removed and replaced approximately 32 inches below the current height to meet the sidewalk grade. The estimated excavation depth for the slab-on grade portion is 3 feet bgs. The volume of material estimated to be excavated for lowering the floor slab is 492 cubic yards (739 tons), and is entirely fill material. The Site will be excavated further to install a partial basement anticipated to be 10 feet deep, 100 long by 41 feet wide, on the western portion of the Site. The proposed cellar will be used for: storage and commercial space. The depth of the proposed partial basement is anticipated to be approximately

13 feet below ground surface (bgs), with foundation footings at a maximum proposed depth of 15 feet bgs. The volume of material estimated to be excavated for the installation of the partial basement is 1,520 cubic yards (2,280 tons), which is a mixture of fill material and native soils. It is not anticipated that excavation will extend into the groundwater table. The proposed site development plans are presented in Appendix 1. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

Summary of Surrounding Property

The surrounding neighborhood consists of similarly zoned property including special mixed use residential and light industrial districts, as well as medium-density residential districts. The adjacent property to the north across Ainslie Street, 65 Ainslie Street (Block 2372, Lot 21) contains a five-story residential building. The adjoining property to the west, 66 Ainslie Street (Block 2375, Lot 5), is currently under construction for a seven-story mixed-use residential building. The adjoining property to the east, 80 Ainslie Street (Block 2375, Lot 12), contains a two-story building and is classified as an industrial factory. The adjoining property to the south, 432 Keap Street (Block 2375, Lot 3), contains a two-story building classified as a warehouse. According to the OER *SPEED* application, there are no schools or hospitals identified within a 500-foot radius of the Site. A daycare facility is located at 418 Keap Street, approximately 300 feet to the southwest of the Site, identified as Two By Two Childcare and Consulting, LLC.

Summary of Past Site Uses and Areas of Concern

According to a review of NYC DOB building records for the Site, an alteration of a certificate of occupancy from 1902 was recorded on February 11, 1974 for an altered use of the slab-on grade single-story 18-foot tall building to be used for manufacturing plastic products. NYC DOB records indicate a number of alterations to the property between 1906 and 1989, record of a demolition from 1910, and a building notice on October 21, 1983. According to the current deed, the 76 Ainslie Street property is owned by PHD Ainslie LLC, which acquired the property from Lost City Real Estate LLC on June 9, 2014. Historical fire insurance maps from 1868 and 1904 indicate that the Site was formerly occupied by two adjoining buildings, each 25 feet wide and 100 feet deep, depicted as tenant lofts indicating various manufacturing

occupancies. According to a previous limited investigation report from 2013, at that time the site was being used as a decorative ceramics workshop.

Summary of Work Performed under the Remedial Investigation

Horrigan Development performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed 4 soil borings across the entire project Site, and collected 8 soil samples for chemical analysis from the soil borings to evaluate soil quality for investigation. Fifteen (15) soil samples were collected and analyzed for waste classification purposes; and
3. Installed 3 soil vapor probes and 1 sub-slab vapor sampling point on the Site and collected 4 samples for chemical analysis.

The supplemental remedial investigation included the following scope of work:

1. Conducted a site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed three soil borings through the concrete floor which were converted into three temporary groundwater monitoring wells, one in each soil boring.
3. Three (3) groundwater samples were collected for chemical analysis, one from each of the groundwater monitoring wells, to evaluate the groundwater quality for investigation.
4. Temporary groundwater monitoring wells were surveyed, and a synoptic groundwater elevation measurement was collected to determine groundwater elevation and gradient.

Summary of Findings of Remedial Investigation

1. Elevation of the building floor slab is approximately 19.6 feet above mean sea level.

2. Groundwater elevation at the site ranged between 4.83 and 4.91 amsl (approximately 14.5 feet below the building floor slab).
3. Groundwater gradient is 0.002 feet/feet east. Based on review of topography and surface water draining, groundwater flow is expected to be north-northwest.
4. Depth to bedrock is unknown at the Site.
5. The stratigraphy of the site, from the surface down, consists of approximately 6 to 9 feet of historical fill material underlain by sandy clay loam with pebble clasts. The Site is underlain by the Raritan Formation from the Upper Cretaceous series, described as primarily clay with silty clay, sand and gravel as part of coastal plain sediments to an unknown depth.
6. Soil/fill samples collected during the 2013 Phase II Report and 2016 RI were compared to New York State Department of Environmental Conservation 6NYCRR Part 375-6.8 Unrestricted Use Soil Cleanup Objectives (SCOs) and Restricted Commercial Soil Cleanup Objectives (RCSCOs). No VOCs or pesticides were detected. One PCB was detected below its respective SCO. Several SVOCs consisting of Polycyclic Aromatic Hydrocarbons (PAHs) were detected with benz(a)anthracene (max. of 4.23 mg/kg), benzo(a)pyrene (max. of 3.37 mg/kg), benzo(b)fluoranthene (max. of 2.56 mg/kg), benzo(k)fluoranthene (max. of 3.01 mg/kg), chrysene (max. of 3.94 mg/kg), dibenzo(a,h)anthracene (max of 1.16 mg/kg) and indeno(1,2,3-cd)pyrene (max. of 1.98 mg/kg), exceeding Unrestricted Use SCOs within shallow soil samples. Of those, benzo(a)pyrene and dibenzo(a,h)anthracene also exceeded Restricted Commercial SCOs in shallow soil samples and waste characterization samples. Several metals including arsenic (max. of 29.1 mg/kg), barium (max. of 2,100 mg/kg), chromium (max. of 41.4 mg/kg), copper (max. of 83.8 mg/kg), lead (max. of 2,200 mg/kg), mercury (max of 3.93 mg/kg), and zinc (max. of 2,100 mg/kg) exceeded Unrestricted Use SCOs in soil samples. Of those, arsenic, barium, lead, and mercury also exceeded Restricted Commercial SCOs in soil samples and waste characterization samples. None of the soil samples collected from the 13 to 15-foot interval (in native soil) exceeded RCSCOs.

7. Groundwater sample results from the 2013 Phase II Report were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). Three VOCs, chloroform, trichloroethylene, and tetrachloroethylene was detected at trace concentrations in three groundwater samples below their respective GQS. SVOCs, PCBs, pesticides, and total and dissolved metals were not tested.
8. Groundwater sample results from the Supplemental Remedial Investigation were compared to Class GA GQS. Eleven (11) VOCs were detected in groundwater samples; however, none exceeded the GQS. Detected VOCs include TCA (max. 0.75 micrograms per liter ($\mu\text{g/l}$)), 1,1-dichloroethylene (max. 0.26 $\mu\text{g/l}$), 1,2,4-trimethylbenzene (max. 0.35 $\mu\text{g/l}$), acetone (max. 3.3 $\mu\text{g/l}$), bromodichloromethane (max. 0.63 $\mu\text{g/l}$), bromoform (max. 0.64 $\mu\text{g/l}$), chloroform (max. 5.1 $\mu\text{g/l}$), dibromochloromethane (max. 0.66 $\mu\text{g/l}$), dichlorodifluoromethane (max. 4.5 $\mu\text{g/l}$), PCE (max. 0.58 $\mu\text{g/l}$), and TCE (max. 0.24 $\mu\text{g/l}$). Two (2) SVOC including naphthalene (max. 0.24 $\mu\text{g/l}$), and phenanthrene (max. 0.11 $\mu\text{g/l}$) exceeded the GQS. One (1) pesticide (dieldrin 0.0056 $\mu\text{g/l}$), was detected in groundwater samples above the GQS of 0.004 $\mu\text{g/l}$ in GP-10. No PCBs were detected in the groundwater samples collected as part of this investigation. Ten (10) metals were detected in groundwater samples. The detected metals include barium (max. 44 $\mu\text{g/l}$), calcium (max. 92,700 $\mu\text{g/l}$), copper (max. 7 $\mu\text{g/l}$), iron (max. 163 $\mu\text{g/l}$), lead (max. 4 $\mu\text{g/l}$), magnesium (max. 33,200 $\mu\text{g/l}$), manganese (max. 522 $\mu\text{g/l}$), potassium (max. 12,300 $\mu\text{g/l}$), sodium (max. 109,00 $\mu\text{g/l}$), and zinc (max. 15 $\mu\text{g/l}$). The concentrations of metals which exceed the GQS are manganese in GP-8 (388 $\mu\text{g/l}$), and GP-9 (522 $\mu\text{g/l}$), which has a limit of 300 $\mu\text{g/l}$, and sodium in GP-8 (50,800 $\mu\text{g/l}$), GP-9 (59,000 $\mu\text{g/l}$), and GP-10 (109,000 $\mu\text{g/l}$), which has a limit of 20,000 $\mu\text{g/l}$.
9. Soil vapor samples collected during the RI were compared to the New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006 and subsequent updates). Soil vapor samples collected during the RI indicate that petroleum-related VOCs were present at low concentrations. The maximum total concentration of petroleum-related VOCs (BTEX) was 44.7 $\mu\text{g/m}^3$. Exceedances of NYSDOH guidance values include PCE detected in sub-slab vapor in GP-7 at a concentration of 37 $\mu\text{g/m}^3$, and 1,1,1-TCA detected in soil vapor in GP-4 at a

concentration of 690 $\mu\text{g}/\text{m}^3$. Carbon tetrachloride and trichloroethylene (TCE) were not detected in any of the three samples. Concentrations of 1,1,1-trichloroethane (TCA) were above the mitigation level ranges established within the NYSDOH soil vapor guidance matrix.

Summary of the Remedial Action

Since an active SSDS is required to mitigate soil vapor issues, the preferred remedy for the site is Alternative 2- Site Specific Use (Track 4). The Alternative 2 remedy will remove all soil/fill exceeding Track 4 Site Specific Use SCOs throughout the Site, which will be confirmed with post-excavation sampling. Engineering Controls including a cover and vapor barrier are required for a Track 4 cleanup. The property would continue to be encumbered with an E-designation for hazardous material.

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. Establishment of Track 4 Site-Specific 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(s).
6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. The slab on grade portion of the Site will be excavated to a depth of approximately 3 feet below grade for development purposes, and the western two-thirds of the Site will be

- excavated to a depth of approximately 13 feet below grade to install a partial basement. The foundation footings will be excavated to an approximate depth of 15 feet below grade. Approximately 2,280 tons of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.
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 all USTs that are encountered during soil/fill removal actions.
 10. Registration of tanks and reporting of any petroleum spills associated with USTs and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.
 11. Transportation and off-Site disposal of all soil/fill material at licensed or 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. Appropriate segregation of excavated media on-Site.
 12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
 13. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
 14. Construction of an engineered composite cover consisting of a 9-inch thick concrete building slab with an 8-inch clean granular sub-base beneath all building areas, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas.
 15. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a Yellow Guard 20-mil vapor barrier (or similar) below the slab throughout the full building area and a Yellow Guard 20-mil vapor barrier affixed to the inside of all sub-grade foundation sidewalls. All welds, seams and penetrations will be properly sealed to prevent

- preferential pathways for vapor migration. The vapor barrier system is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier system was designed and properly installed to mitigate soil vapor migration into the building.
16. Installation of an of an active sub-slab depressurization system (SSDS) consisting of a network of sub-slab horizontal pipe set in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. The horizontal piping will consist of fabric wrapped, perforated schedule 40 4-inch PVC pipe connected to a 6-inch steel riser pipe that penetrates the slab and travels through the building to the roof. The gas permeable layer will consist of a 6-inch thick layer of 2-inch trap rock stone. The pipe will be finished at the roof line with a 6-inch rain cap to prevent rain infiltration. The active SSDS is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the active SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.
 17. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.
 18. Implementation of storm-water pollution prevention measures 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 at 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 NYC Office of Environmental Remediation (OER) provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies, shows the location of identified 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.

Project Information:

- Site Name: 76 Ainslie Street
- Site Address: 76 Ainslie Street, Brooklyn, New York, 11211
- NYC Voluntary Cleanup Program Project Number: 17CVCP018K

Project Contacts:

- OER Project Manager: Alysha Alfieri, 212-676-0459
- Site Project Manager: Andrew Fetterman, 610-463-3328
- Site Safety Officer: Andrew Fetterman, 610-463-3328
- Online Document Repository:
<http://www.nyc.gov/html/oer/html/repository/RBrooklyn.shtml>

Remedial Investigation and Cleanup Plan: Under the oversight of the NYC OER, a thorough 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 to 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 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 RAWP are in compliance with applicable safety requirements of the United States Occupational Safety and Health Administration (OSHA). This RAWP includes many protective elements including those discussed below.

Site Safety Coordinator: This project has a designated Site safety coordinator to implement the CHASP. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is identified at the beginning of this Community Protection Statement.

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 to workers performing specific tasks including removing contaminated 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 or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. 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 includes 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 applicable NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document.

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.

Stormwater Management: To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater 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 will conform to requirements of the NYC Department of Buildings.

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 and provides project contact names and numbers, and a link to the document repository where 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 or the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, 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, odor 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 applicable 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 the 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 the Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document

Long-Term Site Management: If long-term protection is needed after the cleanup is complete, 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 Office of Environmental Remediation. Requirements that the property owner must comply with are defined either in the property's deed or established through a city environmental designation registered with the Department of Buildings. 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 Project Background

Horrigan Development is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program and/or in the “E” Designation Program to investigate and remediate a property located at 76 Ainslie Street Site in the Williamsburg section of Brooklyn, 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 alternatives 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, and complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 Site Location and Background

The Site is located at 76 Ainslie Street in the Williamsburg section of Brooklyn, New York and is identified as Block 2375 and Lot 10 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 5,000 square feet and is bounded by Ainslie Street to the north, Lot 3 to the south, Lot 12 to the east, and Lot 5 to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for warehousing and contains a single, high-ceiling former industrial building with a steel frame and masonry walls that covers the entire area of the Site.

1.2 Redevelopment Plan

The proposed redevelopment plan of the Site will consist of conversion of the existing building into a bar/restaurant. The existing raised floor slab will be removed and replaced approximately 32 inches below the current height to meet the sidewalk grade. The volume of material estimated to be excavated for lowering the floor slab is 492 cubic yards (739 tons), and is entirely fill material. The Site will be excavated further to install a partial basement anticipated to be 10 feet deep, 100 feet long by 41 feet wide, on the western portion of the Site. The depth of the proposed partial basement is anticipated to be approximately 13 feet below ground surface (bgs), with

foundation footings at a maximum proposed depth of 15 feet bgs. The volume of material estimated to be excavated for the installation of the partial basement is 1,520 cubic yards (2,280 tons), which is a mixture of fill material and native soils. It is not anticipated that excavation will extend into the groundwater table. The proposed site development plans are presented in Appendix 1. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 Description of Surrounding Property

The surrounding neighborhood consists of similarly zoned property including special mixed use residential and light industrial districts, as well as medium-density residential districts. The adjacent property to the north across Ainslie Street, 65 Ainslie Street (Block 2372, Lot 21), contains a five-story residential building. The adjoining property to the west, 66 Ainslie Street (Block 2375, Lot 5), is currently under construction for a seven-story mixed-use residential building. The adjoining property to the east, 80 Ainslie Street (Block 2375, Lot 12), contains a two-story building and is classified as industrial. The adjoining property to the south, 432 Keap Street (Block 2375, Lot 3), contains a two-story building classified as a warehouse. According to the OER SPEED application, there are no schools or hospitals identified within a 500-foot radius of the Site. A daycare facility is located at 418 Keap Street, approximately 300 feet to the southwest of the Site, identified as Two By Two Childcare and Consulting, LLC. Figure 3 shows the surrounding land usage.

1.4 Summary of Past Site Uses and Areas of Concern

According to a review of historical Sanborn Fire Insurance maps, the first structures depicted on property in 1887 are a number of small dwellings. In 1905 the western portion of the property is depicted as a barrel yard. By 1942 the current structure is depicted as being used for weaving and may have been incorporated into the Wm. Cabbie Excelsior Wire Manufacturing Co. By 1978 the Site is no longer depicted as a manufacturing property. A review of New York City Department of Buildings (NYC DOB) records for the Site, an alteration of a certificate of occupancy from 1902 was recorded on February 11, 1974 for an altered use of the slab-on grade single-story 18-foot tall building to be used for manufacturing plastic products. NYC DOB

records indicate a number of alterations to the property between 1906 and 1989, record of a demolition from 1910, and a building notice on October 21, 1983. According to the current deed, the 76 Ainslie Street property is owned by PHD Ainslie LLC, which acquired the property from Lost City Real Estate LLC on June 9, 2014. The AOCs identified for this Site include:

1. Exceedances of RCSCOs in B1 (5'-7') for lead and mercury;
2. Exceedances of RCSCOs in B3 (3'-5') for arsenic, barium, and lead;
3. Exceedances of RCSCOs in GP-4(0-3) for benzo(a)pyrene;
4. Exceedances of RCSCOs in GP-6(0-3) for mercury;
5. Exceedances of RCSCOs in GP-6WC for benzo(a)pyrene and mercury; and,
6. Exceedances of RCSCOs in GP-7(4-6) for barium.

1.5 Summary of Work Performed under the Remedial Investigations

Horrigan Development performed the following scope of work:

1. Conducted Site inspections to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed 10 soil borings across the entire project Site, and collected 11 soil samples for chemical analysis from the soil borings to evaluate soil quality for investigation. Fifteen (15) soil samples were collected and analyzed for waste classification purposes; and
3. Installed 6 groundwater monitoring wells across the entire project Site, and collected 6 groundwater samples for chemical analysis from the groundwater monitoring wells to evaluate groundwater quality for investigation.
4. Installed 3 soil vapor probes and 1 sub-slab vapor sampling point on the Site and collected 4 soil vapor samples for chemical analysis.

1.6 Summary of Findings of Remedial Investigation

A remedial investigation was performed and the results are documented in a companion document called “Remedial Investigation Report, 76 Ainslie Street”, dated March 2016 (RIR). Additionally, a supplemental remedial investigation was performed and the results are documented in a companion document called “Supplemental Remedial Investigation Report, 76 Ainslie Street” dated May, 2016 (SRIR). The findings of the investigations are as follows:

1. Elevation of the building floor slab is approximately 19.6 feet above mean sea level (amsl).
2. Based on groundwater elevation measurements, groundwater elevation is between approximately 4.83 and 4.91 feet amsl at the site.
3. Groundwater gradient is 0.002 ft/ft east. Based on a review of topography and surface water drainage, groundwater is expected to flow generally to the north-northwest.
4. Depth to bedrock is unknown at the Site.
5. The stratigraphy of the Site consists of approximately 6 to 9 feet of historical fill material underlain by sandy clay loam with pebble clasts. The Site is underlain by the Raritan Formation from the Upper Cretaceous series, described as primarily clay with silty clay, sand and gravel as part of coastal plain sediments to an unknown depth.
6. Soil/fill samples collected during the 2013 Phase II Report and 2016 RI were compared to New York State Department of Environmental Conservation 6NYCRR Part 375-6.8 Unrestricted Use Soil Cleanup Objectives (SCOs) and Restricted Commercial Soil Cleanup Objectives (RCSCOs). No VOCs or pesticides were detected. One PCB was detected below its respective SCO. Several SVOCs consisting of Polycyclic Aromatic Hydrocarbons (PAHs) were detected with benzo(a)anthracene (max. of 4.23 mg/kg), benzo(a)pyrene (max. of 3.37 mg/kg), benzo(b)fluoranthene (max. of 2.56 mg/kg), benzo(k)fluoranthene (max. of 3.01 mg/kg), chrysene (max. of 3.94 mg/kg), dibenzo(a,h)anthracene (max of 1.16 mg/kg) and indeno(1,2,3-cd)pyrene (max. of 1.98 mg/kg), exceeding Unrestricted Use SCOs within shallow soil samples. Of those, benzo(a)pyrene and dibenzo(a,h)anthracene also exceeded Restricted Commercial SCOs in shallow soil samples and waste

characterization samples. Several metals including arsenic (max. of 29.1 mg/kg), barium (max. of 2,100 mg/kg), chromium (max. of 41.4 mg/kg), copper (max. of 83.8 mg/kg), lead (max. of 2,200 mg/kg), mercury (max. of 3.93 mg/kg), and zinc (max. of 2,100 mg/kg) exceeded Unrestricted Use SCOs in soil samples. Of those, arsenic, barium, lead, and mercury also exceeded Restricted Commercial SCOs in soil samples and waste characterization samples. None of the soil samples collected from the 13 to 15-foot interval (in native soil) exceeded the Restricted Commercial Use SCOs.

7. Groundwater sample results from the 2013 Phase II Report were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). Three VOCs, chloroform, trichloroethylene, and tetrachloroethylene was detected at trace concentrations in three groundwater samples below their respective GQS. SVOCs, PCBs, pesticides, and total and dissolved metals were not tested. Groundwater sample results during the 2016 SRI were compared to Class GA GQS. Eleven VOCs were detected in groundwater samples, however none exceeded the GQS. Detected VOCs include TCA (max. 0.75 micrograms per liter ($\mu\text{g/l}$)), 1,1-dichloroethylene (max. 0.26 $\mu\text{g/l}$), 1,2,4-trimethylbenzene (max. 0.35 $\mu\text{g/l}$), acetone (max. 3.3 $\mu\text{g/l}$), bromodichloromethane (max. 0.63 $\mu\text{g/l}$), bromoform (max. 0.64 $\mu\text{g/l}$), chloroform (max. 5.1 $\mu\text{g/l}$), dibromochloromethane (max. 0.66 $\mu\text{g/l}$), dichlorodifluoromethane (max. 4.5 $\mu\text{g/l}$), PCE (max. 0.58 $\mu\text{g/l}$), and TCE (max. 0.24 $\mu\text{g/l}$). Two SVOC were detected in groundwater samples, however exceeded the GQS. Detected SVOCs include naphthalene (max. 0.24 $\mu\text{g/l}$), and phenanthrene (max. 0.11 $\mu\text{g/l}$). One (1) pesticide, was detected in groundwater samples above the GQS. Dieldrin has a standard of 0.004 $\mu\text{g/l}$, and was detected in GP-10 at a concentration of 0.0056 $\mu\text{g/l}$. No PCBs were detected in the groundwater samples collected as part of this investigation. Ten metals were detected in groundwater samples. The detected metals include barium (max. 44 $\mu\text{g/l}$), calcium (max. 92,700 $\mu\text{g/l}$), copper (max. 7 $\mu\text{g/l}$), iron (max. 163 $\mu\text{g/l}$), lead (max. 4 $\mu\text{g/l}$), magnesium (max. 33,200 $\mu\text{g/l}$), manganese (max. 522 $\mu\text{g/l}$), potassium (max. 12,300 $\mu\text{g/l}$), sodium (max. 109,00 $\mu\text{g/l}$), and zinc (max. 15 $\mu\text{g/l}$). The concentrations of metals which exceed the GQS are manganese in GP-8 (388 $\mu\text{g/l}$), and GP-9 (522 $\mu\text{g/l}$),

which has a limit of 300 µg/l, and sodium in GP-8 (50,800 µg/l), GP-9 (59,000 µg/l), and GP-10 (109,000 µg/l), which has a limit of 20,000 µg/l.

8. Soil vapor samples collected during the RI were compared to the New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006 and subsequent updates). Soil vapor samples collected during the RI indicate that petroleum-related VOCs were present at low concentrations. The maximum total concentration of petroleum-related VOCs (BTEX) was 44.7 µg/m³. Exceedances of NYSDOH guidance values include tetrachloroethene (PCE) detected in sub-slab vapor in GP-7 at a concentration of 37 µg/m³, and 1,1,1-trichloroethane (TCA) detected in soil vapor in GP-4 at a concentration of 690 µg/m³. Carbon tetrachloride and trichloroethylene (TCE) were not detected in any of the three samples. Concentrations of TCA were above the mitigation level ranges established within the NYSDOH soil vapor guidance matrix.

For more detailed results, consult the RIR and SRIR. Based on an evaluation of the data and information from the RIR, SRIR 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 and SRI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Soil

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

Groundwater

- Remove contaminant sources causing impact to groundwater.
- Prevent direct exposure to contaminated groundwater.

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). Remedial alternatives are then developed and evaluated 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.

As required, a Track 1 Unrestricted Use scenario is evaluated for the remedial action. The following is a detailed description of the alternatives analyzed to address impacted media at the Site:

Alternative 1:

- 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 have been achieved with post-excavation endpoint sampling. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete, additional

excavation would be performed to ensure complete removal of soil/ fill that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup. However, as part of development, a vapor barrier, and a composite cover would be installed. Additionally, an active sub slab depressurization system is required to manage exposures from soil vapor.

Alternative 2:

- Establishment of NYSDEC 6NYCRR Part 375 Site-Specific (Track 4) SCOs.
- Removal of all soil/fill exceeding Track 4 Site-Specific Use SCOs and confirmation that Track 4 Site-Specific SCOs have been achieved with post-excavation end point sampling. Based on the results of the Remedial Investigation, it is expected that Site-Specific SCOs would be achieved by excavating the interior footprint of the Site building to a depth of approximately 3 feet below the existing floor grade to install a new floor slab, and by excavating for construction of the building's new cellar level to a depth of approximately 13 feet below the existing floor grade across the western two-thirds of the Site. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation, additional excavation would be performed to meet Track 4 Site-Specific SCOs.
- Placement of a composite cover system over the entire Site to prevent exposure to remaining soil/fill;
- Installation of a vapor barrier beneath the building slab and along the foundation side walls to prevent potential exposures from soil vapor;
- Installation of an active sub slab depressurization system;
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of restricted 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 (SMP) 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. The SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and

- The property will continue to be registered with an E-Designation at the NYC Buildings Department.

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 or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing all soil/fill exceeding Track 1 Unrestricted Use SCO's and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater. As part of development, a vapor barrier, and a composite cover system would be installed. An active SSDS is required to prevent potential exposures from soil vapor in the future. System would be run for five years to evaluate if soil vapors concentrations are reduced to switch system to passive and achieve Track 1.

Alternative 2 would achieve comparable protections of human health and the environment by excavation and removal of most of the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCO's, as well as by the placement of Institutional and Engineering Controls, including a composite cover system and an active SSDS. The composite cover system would prevent direct contact with any remaining on-Site soil/fill, and the SSDS will ensure the mitigation of vapor intrusion risks. Implementing Institutional Controls including a Site Management Plan and continuing the E-designation on the property would ensure that the composite cover system remains intact, and that the SSDS remains in operation, and therefore protective of public health. Establishment of Track 4 Site-Specific SCO's would minimize the risk of contamination leaching into 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 as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing a vapor barrier below the building slab and affixing a vapor barrier to the inside of foundation walls below grade, as well as through the operation of a SSDS to prevent potential exposures from soil vapor in the future.

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, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCO's and Protection of Groundwater SCO's. Compliance with SCGs for soil vapor would also be achieved by installing a waterproofing/vapor barrier system and a SSDS below the new building's basement slab and affixing the vapor barrier to the inside of subgrade foundation walls, as part of development.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCO's. Compliance with SCG's for soil vapor would also be achieved by installing a composite cover system with a vapor barrier below the building's new basement slab and slab on-grade and continuing the vapor barrier on the inside of subgrade foundation walls, in addition to installing an active SSDS. A Site Management Plan would ensure that these controls remained protective for the long term. Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) will be implemented during Site redevelopment under this RAWP. For both Alternatives, 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 short term effects during the remedial action on public health and the environment during implementation of the remedial action, including protection of the community, protection of onsite workers and environmental impacts.

Both alternatives would result in potential, short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts would be significantly higher for Alternative 1 since excavation of greater amounts of historical fill material would take place. However, focused attention to means and methods during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An 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 flag persons will be used to protect pedestrians at Site entrances and exits.

The potential adverse impact to the community, workers and the environment for both alternatives would be minimized through implementation of control plans 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. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Construction Health and Safety Plan (CHASP) would provide protection from on-Site contaminants by using personal protective equipment which 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 Engineering Controls/Institutional Controls (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.

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCO's. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; installing a composite cover system, installing and operating a SSDS across the Site; maintaining use restrictions; establishing an SMP to ensure long-term management of ICs and ECs; and maintaining registration as an E-designated property to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

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.

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Track 1 Unrestricted Use SCO's.

Alternative 2 would remove most of the historic fill at the Site, and all remaining on-Site soil/fill beneath the new building will meet Track 4 Site-Specific SCO's.

Alternative 1 would remove a greater total mass of contaminants from the Site. The removal of soil to 13 feet below the current concrete slab elevation across approximately two-thirds of the Site, and removal of soil to 3 feet below the current concrete slab elevation across the remaining area of the site for the planned building renovations in both scenarios would lessen the difference in contaminant mass removal between these two alternatives.

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 techniques, materials and equipment to implement both Alternatives 1 and 2 are readily available and have been proven to be effective in remediating the contaminants present on the Site. They use standard equipment and technologies that are well established in the industry. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

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.

Since historic fill at the Site was found to extend generally to a depth of between 6 to 9 feet below grade during the RI, and the planned building renovations require excavation of the entire Site to a depth of approximately 3 feet across the Site and to a depth of 13 feet for the partial

basement, the costs associated with both Alternative 1 and Alternative 2 will likely not be comparable. Alternative 1 requires additional excavation in order to remove all soil which does not meet Track 1 Unrestricted Residential Use SCOs. Costs associated with Alternative 1 would be significantly higher than Alternative 2 since additional excavations would be required below the excavation depth required for development. Additional costs would include installation of additional shoring/underpinning, disposal of additional soil, and import of clean soil for backfill. However, long-term costs for Alternative 2 are likely higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan would couple the remedial action with the redevelopment of the Site, lowering total costs. The remedial plan will also consider the selection of the most appropriate disposal facilities to reduce transportation and disposal costs during cleanup and 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.

This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix 2. Observations here will be supplemented by public comment received on the RAWP. Under both alternatives, the overall goals of the remedial program, to protect public health and the environment and eliminate potential contaminant exposures, have been broadly supported by citizens in NYC communities.

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.

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes conversion of the existing building into a bar/restaurant with a partial basement.

Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are protective of public health and the environment for its planned commercial use. The proposed use is compliant with the property's zoning and is consistent with recent development patterns. The areas surrounding the site is urban and consists of predominantly mixed residential, commercial, industrial, and manufacturing buildings in zoning districts designated for residential, commercial, industrial, and manufacturing uses. The development would remediate a contaminated industrial lot and provide a modern commercial building. The proposed development would clean up the property and make it safer, create new employment opportunities, and associated societal benefits to the community, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs, both of which are protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. Both alternatives are equally protective of natural resources and cultural resources. Improvements in the current

environmental condition of the property achieved by both alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

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.

While Alternative 1 would potentially result in lower energy usage based on operation of a passive SSDS, Alternative 2 would potentially result in lower energy usage based on reducing the volume of material transported off-Site. Both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan for either alternative would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program is available for reuse of any clean native soils under either alternative. A complete list of green remedial activities considered as part of the NYC VCP is included in a Sustainability Statement.

SELECTION OF THE PREFERRED REMEDY

Since an active SSDS is required to mitigate soil vapor issues, Track 1 Unrestricted Use remedy is not allowed. Additionally, soils above Unrestricted Use SCOs would remain in place below excavation depths. Therefore, preferred remedy for the site is Alternative 2- Site Specific Use (Track 4). The Alternative 2 remedy will remove all soil/fill exceeding Track 4 Site Specific Use SCOs throughout the Site, which will be confirmed with post-excavation sampling. Engineering Controls including a cover and vapor barrier are required for a Track 4 cleanup. The property would continue to be encumbered with an E-designation for hazardous material.

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.

4.0 Remedial Action

4.1 Summary of Preferred Remedial Action

The preferred remedial action alternative is Alternative 2, the Track 4 remedial action. The preferred remedial action achieves protection of public health and the environment for the intended use of the property. The preferred remedial action will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action 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. Establishment of Track 4 Site-Specific 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(s).
6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. The slab on grade portion of the Site will be excavated to a depth of approximately 3 feet below grade for development purposes, and the western two-thirds of the Site will be excavated to a depth of approximately 13 feet below grade to install a partial basement. The foundation footings will be excavated to an approximate depth of 15 feet below grade. Approximately 2,280 tons of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.

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 all UST's that are encountered during soil/fill removal actions.
10. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.
11. Transportation and off-Site disposal of all soil/fill material at licensed or 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. Appropriate segregation of excavated media on-Site.
12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
13. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
14. Construction of an engineered composite cover consisting of a nine-inch thick concrete building slab with an 12-inch clean granular sub-base beneath all building areas, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas.
15. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab and affixed to the inside surface of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a Yellow Guard 20-mil vapor barrier (or similar) below the slab throughout the full building area and a Yellow Guard 20-mil vapor barrier (or similar) affixed to the inside walls of all sub-grade foundations . All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration. The vapor barrier system is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier system was designed and properly installed to mitigate soil vapor migration into the building.

16. Installation of an of an active SSDS consisting of a network of sub-slab horizontal pipes connected to two depressurization pits constructed in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. The horizontal piping will consist of solid schedule 40, 6-inch PVC pipe connected to a 6-inch steel riser pipe that penetrates the slab and travels through the building to the roof. The gas permeable layer will consist of a 12-inch thick layer of 2-inch trap rock stone. The pipe will be finished at the roof line with a 6-inch rain cap to prevent rain infiltration. The active SSDS is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the active SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building. The design specifications for the SSDS are provided on Figure 7a through Figure 7g.
17. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.
18. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
19. Submission of a 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 Remedial Action Plan (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 at 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

The following Track 4 Site-Specific SCO's will be utilized for this project:

<u>Contaminant</u>	<u>Site-Specific SCO's</u>
Total SVOCs	250 ppm
Arsenic	23 ppm
Barium	750 ppm
Lead	1,000 ppm
Mercury	2.5 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 4. 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. Table 1 presents the Track 4 Site-Specific SCOs.

Soil/Fill Excavation and Removal

The planned development will require excavation of the interior footprint of the Site building to a depth of 3 feet below the existing concrete floor to install a new floor slab at sidewalk grade, and excavation for construction of a new cellar to a depth of approximately 13 feet across the western two-thirds of the Site. The location of the planned excavations is shown in Figure 5. The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 2,280 tons. For each disposal facility to be used in the remedial action, a letter from the developer/QEP to the receiving facility requesting approval for disposal and a letter back to the developer/QEP providing approval for disposal will be submitted to OER prior to any transport and disposal of soil at a facility.

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

End-point Sampling

End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

- Semi-volatile organic compounds by EPA Method 8270; and
- Target Analyte List metals

New York State ELAP certified labs will be used for all end-point sample analyses. Labs performing end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values.

Confirmation End-point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation end-point soil sampling. Based on samples collected as part of the remedial investigation, delineation of clean end-points has been achieved at 13 feet below grade in the western portion of the Site which will be excavated for the partial basement. Three (3) additional confirmation end-point samples will be collected from the base of the excavation in the eastern portion of the Site, which will be excavated 3 feet below grade for the new floor slab. To evaluate attainment of Track 4 Site-specific SCOs, analytes will include those for which SCOs have been developed, including SVOCs, arsenic, barium, lead, and mercury according to analytical methods described above. Proposed end-point sample locations are provided in Figure 4.

Hotspot End-point Sampling

For any hotspots identified during this remedial program, including any hotspots identified during the remedial action, hotspot removal actions will be performed to ensure that hotspots are fully removed and end-point samples will be collected at the following frequency:

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.

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 object of QA/QC procedures is to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis and to achieve acceptance of the analytical protocol. Field

QA/QC procedures will be used to document that samples are representative of actual conditions at the Site and identify possible cross-contamination from field activities or sample transit.

Field QA/QC will include the following procedures:

- Calibration of field equipment;
- Use of dedicated and/or disposal field sampling materials;
- Proper sample handling and preservation and,
- Completion of report logs.

Collected samples will be placed into laboratory-supplied bottleware, preserved as necessary according to analytical methods and submitted under chain-of-custody documentation to the analytical laboratory. Samples will be placed in coolers with ice to maintain a temperature of 4° C and shipped overnight or delivered directly to the analytical laboratory by courier service.

Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples (field and trip blanks, duplicates, etc.) will be collected and analyzed at an ELAP-certified laboratory. QA/QC procedures completed for this investigation and will be documented in a final report for the property.

Import of Soils

Import of soils onto the property will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. Imported soil will meet the lower of:

- Track 2 Restricted Commercial Use SCO's, and
- Groundwater Protection Standards in Part 375-6.8.

The estimated quantity of soil to be imported into the Site for backfill and cover soil is to be determined.

Reuse of Onsite Soils

Reuse of onsite soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. The estimated quantity of soil to be reused on this project is to

be determined. Reuse soils will meet the SCO's established for this project. The estimated quantity of soil to be reused on the Site for backfill and cover soil is to be determined.

4.3 Engineering Controls

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the site. The Site has three primary Engineering Control Systems. These are:

- (1) Composite Cover System
- (2) Soil Vapor Barrier System
- (3) Active 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 will be comprised of 9 inches of reinforced concrete slab underlain by 12 inches of clean sub-base material in the basement and beneath all building areas.

- 9-inch reinforced concrete building slab in the basement;
- 9-inch reinforced concrete building slab at grade;
- 8-inch clean granular sub-base beneath all building areas.

The composite cover system will be a permanent engineering control. The system will be inspected and its performance certified at specified intervals as required by this RAWP and the Site Management Plan. A Soil and Materials 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 Remedial Action Report. Location of cover types are included in the engineering diagrams in Appendix 1.

Vapor Barrier System

Migration of soil vapor from onsite or offsite sources into the building will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will consist of a Yellow Guard 20-mil vapor barrier, or equivalent. The vapor barrier will be installed prior to pouring the

building's concrete slab. The vapor barrier will extend below the slab throughout the area occupied by the footprint of the new building (both below the cellar slab and the at-grade slab) and affixed to the interior foundation sidewalls below grade in accordance with manufacturer specifications. All vapor barrier seams, penetrations, and repairs will be sealed either by the tape method or weld method, according to the manufacturer's recommendations and instructions. The project's Professional Engineer will have primary direct responsibility for overseeing the implementation of the vapor barrier.

The Vapor Barrier System is a permanent engineering control and will be inspected and its performance certified at specified intervals as required by this RAWP and the Site Management Plan. A Soil and Materials 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 vapor barrier system is disturbed after the remedial action is complete. Maintenance of these systems will be described in the Site Management Plan in the Remedial Action Report. The vapor barrier will extend throughout the area occupied by the footprint of the new building and will be affixed to the interior foundation sidewalls and will be installed in accordance with manufacturer specifications.

Plans showing the location of the proposed vapor barrier system including typical design sections for the vapor barrier beneath slab and on foundation sidewalls are provided in Figure 6a through Figure 6c. A product specification sheet for Yellow Guard is provided in Appendix 6. The Remedial Action Report will include as-built drawings and diagrams; manufacturer documentation; and photographs.

Sub-Slab Depressurization System

Migration of soil vapor into the building will be mitigated with the construction of an active SSDS. Installation of the active SSDS consists of a network of sub-slab horizontal pipes connected to two depressurization pits constructed in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. The horizontal piping will consist of solid schedule 40, 6-inch PVC pipe connected to a 6-inch steel riser pipe that penetrates the slab and travels through the building to the roof. The gas permeable layer will consist of a 12-inch thick layer of 2-inch trap rock stone. The pipe will be finished at the roof line with a 6-inch rain cap to prevent rain infiltration. The active SSDS will be hardwired and

will include a Fantech model HP220blower installed on the roof line. A suction indicator will be mounted on the riser pipe and located in an accessible area in the basement.

The SSDS is a permanent engineering control. The system will be inspected and its performance certified at specified intervals as required by this RAWP and the Site Management Plan.

Maintenance of this SSDS will be described in the Site Management Plan in the Remedial Action Report. The location and layout of the SSDS is shown in Figure 7a through Figure 7g. Specification sheets for the vacuum blower and manometer are provided in Appendix 7.

4.4 Institutional Controls

A series of Institutional Controls (IC's) are required under this Remedial Action to assure permanent protection of public health by elimination of exposure to residual materials. These IC's define the program to operate, maintain, inspect and certify the performance of Engineering Controls and Institutional Controls on this property. Institutional Controls would be implemented in accordance with a Site Management Plan included in the final Remedial Action Report (RAR). Institutional Controls would be:

- Continued registration of the E-Designation for the property. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the SMP which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. 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 commercial purposes 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 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) operation and maintenance of EC's; (3) inspection and certification of IC's and EC's.

Site management activities and EC/IC certification will be scheduled by OER on a periodic basis to be established in the RAR and 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 July 30 of the year following the reporting period.

4.6 Qualitative Human Health Exposure Assessment

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.

Data and information reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA) for this project. 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 under current and future conditions 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 Contaminant Sources

Elevated concentrations of SVOCs and metals are believed to be related to the presence of historical fill material below the building. Based on observations from the soil investigation, historical fill material is located from the surface to depths of 6 to 9 feet bgs. It is difficult to determine the exact depth of the historical fill-native soil interface due to partial collapse of the walls of the soil boring during the course of probing activities. Generally, sandy clay loam with pebble clasts was observed beneath the historical fill material.

A summary of soil analytical data is provided in Table 2, a summary of soil vapor analytical data is provided in Table 3, and a summary of groundwater analytical data is provided in Table 4.

AOC 1

Exceedances of Restricted Commercial Use SCOs for metals in B1(5-7) during the 2013 limited investigation and metals and SVOCs in GP-6 during this RI, adjacent in location, warrant identification of the B1 and GP-6 boring locations as an area of concern (AOC) to be referred to as AOC-1. Concentrations of lead (1,600 mg/kg) and mercury (3.93 mg/kg) in B1(5-7), mercury (2.95 mg/kg) in GP-6(0-3), as well as benzo(a)pyrene (1.08 mg/kg) and mercury (6.7 mg/kg) in the GP-6WC composite sample were found to exceed Restricted Commercial Use SCOs. The

vertical extent of AOC-1 is limited to soils above 13' bgs; GP-6(13-15) did not exceed Restricted Commercial Use SCOs. The horizontal extent of AOC-1 shall be described as an area of 25 square feet centered upon the B1 and GP-6 boring locations, unless endpoint sampling indicates the presence of concentrations of contaminants of concern exceeding Track 4 Site-Specific SCOs in a wider area.

AOC 2

Exceedances of Restricted Commercial Use SCOs for metals in B3(3-5) during the 2013 limited investigation, warrant identification of the B3 boring location as an AOC to be referred to as AOC-2. Concentrations of arsenic (29.1 mg/kg), barium (2,100 mg/kg), and lead (2,200 mg/kg) in B3(3-5) were found to exceed Restricted Commercial Use SCOs. The vertical extent of AOC-2 is limited to soils between 3 to 5 feet bgs; GP-4(0-3) and the composite sample GP-4WC did not exceed Restricted Commercial Use SCOs. The horizontal extent of AOC-2 shall be described as an area of 25 square feet centered upon the GP-4 boring location, unless endpoint sampling indicates the presence of concentrations of contaminants of concern exceeding Track 4 Site-Specific SCOs in a wider area.

AOC 3

The exceedances of Restricted Commercial Use SCOs for SVOCs in shallow soil samples GP-4(0-3) and GP-5(0-3) during this RI warrant identification of the shallow area of historical fill material encompassing GP-4(0-3) and GP-5(0-3) boring locations as an area of concern (AOC) to be referred to as AOC-3. Concentrations of benzo(a)pyrene (1.69 mg/kg) in GP-4(0-3), and benzo(a)pyrene (3.37 mg/kg) and dibenzo(a,h)anthracene (1.16 mg/kg) in GP-5(0-3) were found to exceed Restricted Commercial Use SCOs. The vertical extent of AOC-3 is limited to soils between 0 to 3 feet bgs. The horizontal extent of AOC-1 shall be described as an area of 50 square feet encompassing the GP-4 and GP-5 boring locations, unless endpoint sampling indicates the presence of concentrations of contaminants of concern exceeding Track 4 Site-Specific SCOs in a wider area. None of the other samples collected during this RI exceed Restricted Commercial Use SCOs for SVOCs aside from GP-6WC, which is described in AOC-1. SVOCs were not analyzed as part of the 2013 limited investigation.

AOC 4

The Exceedances of the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (final October 2006 and subsequent updates) for TCA detected in soil vapor in GP-4 at a concentration of 690 $\mu\text{g}/\text{m}^3$ warrant identification of a site-wide AOC to be referred to as AOC-4. TCA was detected in other vapor samples collected during this RI, but these concentrations were below applicable guidance values. PCE and petroleum-related VOCs were also detected in soil vapor below applicable guidance values. No air samples were analyzed as part of the 2013 limited investigation.

Based on the results of the RIR, the contaminants of concern are:

Soil:

- SVOCs including benzo(a)pyrene and dibenzo(a,h)anthracene exceeded Restricted Commercial Use SCOs.
- Metals including arsenic, barium, lead and mercury were detected above Restricted Commercial Use SCOs.

Soil Vapor:

- TCA was detected above the mitigation level range established within the NYSDOH soil vapor guidance matrix. PCE and petroleum-related VOCs were detected in soil vapor below monitoring and mitigation level ranges established within the NYSDOH soil vapor guidance matrix.

Groundwater:

- The pesticide dieldrin was detected above the applicable GQS.
- Metals including manganese and sodium were detected above applicable GQSs.

Nature, Extent, Fate and Transport of Contaminants

SVOCs and metals are present in shallow soils throughout the Site and are attributed to historic fill material beneath the Site. Based upon field observations and laboratory results from soil samples collected during the Remedial Investigation, it appears that contaminants are from

historic fill material. The migration of the contamination to groundwater is not expected, as contaminants found in soil samples were not found to correspond to contaminants found in groundwater samples collected from the Site. However, one pesticide, as well as manganese and sodium were found to exceed applicable GQS in groundwater. One chlorinated VOC was detected in soil vapor above guidance values by the New York State DOH, and was found in sub-slab vapor as well as soil vapor collected from 13-13.5 feet deep. Groundwater is not a media of concern based on depth and analytical results.

Soil: Two SVOCs, specifically PAHs, were detected within shallow soil samples and historic fill material at concentrations exceeding Restricted Commercial Use SCOs. Two metals were detected within shallow soil samples and historic fill material at concentrations exceeding Restricted Commercial Use SCOs. These elevated concentrations are not anticipated to impact groundwater at a depth of approximately 17 feet where native soils were encountered. There elevated concentrations of PAHs in soil are also not anticipated to impact soil vapor, as the contaminants and concentrations found in soil were not found to correspond to the results of groundwater and soil vapor samples collected from the Site.

Groundwater: A single pesticide compound exceeded GQS in one groundwater sample, and manganese exceeded GQS in the remaining two groundwater samples. Sodium exceeded GQS in all three samples collected during the SRI. However, concentrations of contaminants found in groundwater are not correlated with concentrations of contaminants in soil or soil vapor, Groundwater is therefore is not anticipated to impact soil or soil vapor. Groundwater contaminants are believed to be migrating onto the site from offsite.

Soil Vapor: 1,1,1-trichloroethane (TCA) was detected in all three soil vapor samples below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion. TCA was detected in the one sub-slab vapor sample collected and exceeded the mitigation level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion. PCE was detected in two soil vapor samples the one sub-slab vapor sample below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion. Since no VOCs were detected in soil samples collected during this RI, and no exceedances of GQS for VOCs were detected in groundwater samples, the source of VOC concentrations in soil vapor

and sub-slab soil vapor are not believed to originate from the site. While the source of these vapor phase contaminants is unknown, they may be related to the former industrial uses of surrounding properties.

Receptor Populations

On-Site Receptors: The Site is currently used for warehousing and access to the Site is restricted by a single, high-ceiling former industrial building with a steel frame and masonry walls that covers the entire area of the Site. Onsite receptors are limited to trespassers, site representatives and visitors granted access to the property. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult workers, as well as adult and child visitors.

Off-Site Receptors: Potential off-site receptors within a 500 foot radius of the Site include adult and child residents; commercial and construction workers; pedestrians; and trespassers based on the following land uses within 500 feet of the Site:

1. Residential Buildings – existing and future
2. Commercial Businesses – existing and future
3. Industrial Businesses – existing and future
4. Building Construction/ Renovation – existing and future
5. Pedestrians, Trespassers, Cyclists – existing and future
6. Schools – future

Potential Routes of Exposure

Three potential primary routes exist by which chemicals can enter the body: ingestion, inhalation, and dermal absorption. Exposure can occur based on the following potential media:

- Ingestion of groundwater or fill/ soil;
- Inhalation of vapors or particulates; and
- Dermal absorption of groundwater or fill/ soil.

Potential Exposure Points

Current Conditions: The site is currently capped with concrete and there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. Groundwater is

not exposed at the site. The site is served by the public water supply and groundwater is not used at the site for potable supply and there is no potential for exposure. The single, high-ceiling building that occupies the entire footprint of the Site has a floor slab with a number of roof drain collection sumps, and at least one notable crack in the concrete floor slab formed near the base of the western wall in the northwest portion of the Site. The potential for vapor accumulation exists, and the potential for vapor intrusion exists as well.

Construction/ Remediation Conditions: During the remedial action, onsite workers will come into direct contact with surface and subsurface soils as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale or have dermal contact with exposed impacted soil and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. Due to the depth of groundwater, direct contact with groundwater is not expected. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan, dust controls, and through the implementation of the Community Air-Monitoring Program and a Construction Health and Safety Plan.

Proposed Future Conditions: Under future remediated conditions, all soils in excess of Track 4 Site-Specific SCOs will be removed. The site will be fully capped, preventing potential direct exposure to soil and groundwater remaining in place, and engineering controls including a composite cover with a vapor barrier system and a SSDS will prevent any potential exposure due to inhalation by preventing soil vapor intrusion. The site is served by the public water supply, and groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways for the current site condition. There are potential complete exposure pathways that require 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 commercial structure, site-wide surface cover, a subsurface vapor barrier system, and a sub-slab depressurization system. Under current conditions, on-Site exposure pathways exist for those with access to the Site and trespassers. 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. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

5.0 Remedial Action Management

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Site Safety Coordinator, Andrew R. Fetterman. The Professional Engineer (PE) for this project is James P. Cinelli, P.E., BCEE, and the Qualified Environmental Professional (QEP) is Andrew R. Fetterman.

5.2 Site Security

Site access will be controlled by a secured doorway or gated entrance to the building on the Site.

5.3 Work Hours

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. The hours of operation will be conveyed to OER during the pre-construction meeting.

5.4 Construction Health and Safety Plan

The Health and Safety Plan is included in Appendix 5. The Site Safety Coordinator will be Andrew R. Fetterman. 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, such as 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 will comply with all requirements of 29 CFR 1910.120. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed.

Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

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

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 bailing/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/m³) 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 mcg/m³ 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 mcg/m³ 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 mcg/m³ 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 including NYC Building Code to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Mark-Out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this 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

Dewatering is not anticipated during remediation and construction.

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 pads 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 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 clean 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 excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

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. Stormwater 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 within statutory defined timelines. 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 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 shown on Figure 8.

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 business day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of excavation and other remedial 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 results noting all excursions. CAMP data may be reported;
- 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, and approved by, 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 with basis 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;
- Text description with thorough detail of all engineering and institutional controls (if Track 1 remedial action is not achieved)
- As-built drawings for all constructed remedial elements;
- Manifests for all soil or fill disposal;
- Photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 remedial action 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 (including all soil test results from the remedial investigation for soil that will remain on site) and all soil/fill waste characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all soil or fill material removed from the Site including a map showing the location of these excavations and hotspots, tanks or other contaminant source areas;
- Full accounting 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;
- The RAWP, Remedial Investigation Report, and Supplemental Remedial Investigation Report, will be included as appendices to the RAR;
- Reports and supporting material will be submitted in digital form and final PDF's will include bookmarks for each appendix.

Remedial Action Report Certification

I, James P. Cinelli, P.E., BCCE, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for the 76 Ainslie Street (74-78 Ainslie Street, Brooklyn, New York) site, site number [VCP site number]. I certify to the following:

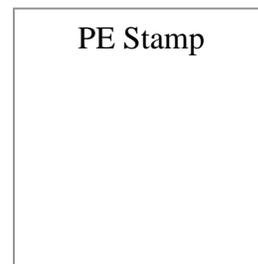
- I have reviewed this document, to which my signature and seal are affixed.
- Engineering Controls implemented during this remedial action were designed by me or a person under my direct supervision and achieve the goals established in the Remedial Action Work Plan for this site.
- The Engineering Controls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

James P. Cinelli, P.E., BCCE
Name

DRAFT
PE License Number

DRAFT
Signature

DRAFT
Date



I, Andrew R. Fetterman, am a Qualified Environmental Professional. I had primary direct responsibility for implementation of the remedial program for the 76 Ainslie Street (74-78 Ainslie Street, Brooklyn, New York) site, site number **VCP site number**. I certify to the following:

- The OER-approved Remedial Action Work Plan dated [redacted] and Stipulations in a letter dated [redacted] were/was 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.

Andrew R. Fetterman
QEP Name

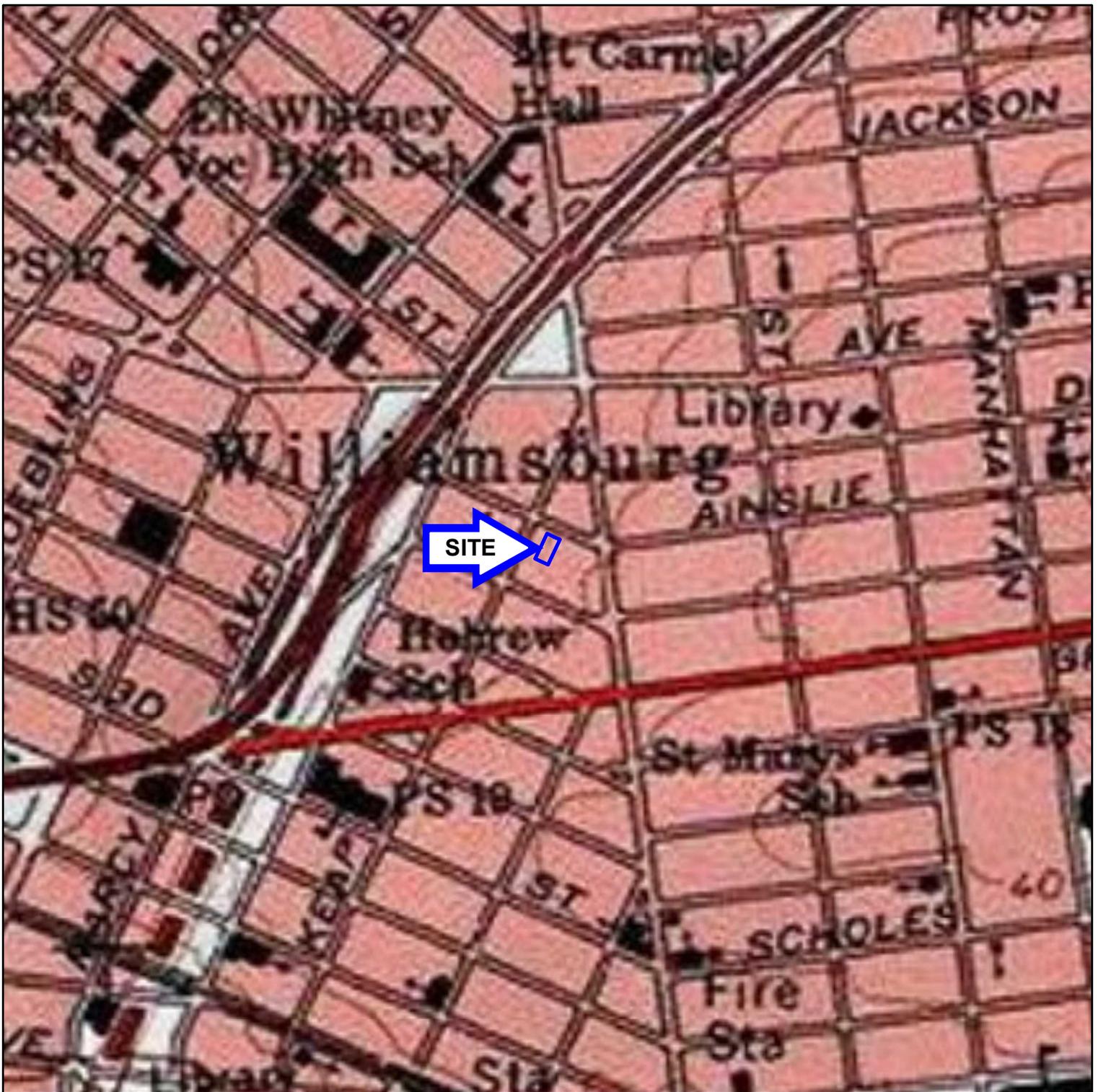
DRAFT
QEP Signature

DRAFT
Date

7.0 Schedule

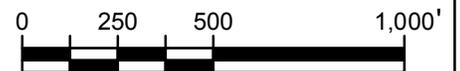
The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a two month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	4	1
Remedial Excavation	5	8
Demobilization	13	2
Submit Remedial Action Report	18	4



SOURCE: USA TOPO MAPS - COPYRIGHT © 2013 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED.
 BROOKLYN (1995), NEW YORK 7.5-MINUTE QUADRANGLE.

SCALE: 1" = 500'



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 New York, NY 10013
 Phone: 800-305-6019
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Figure 1 - Site Location Map

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 123456

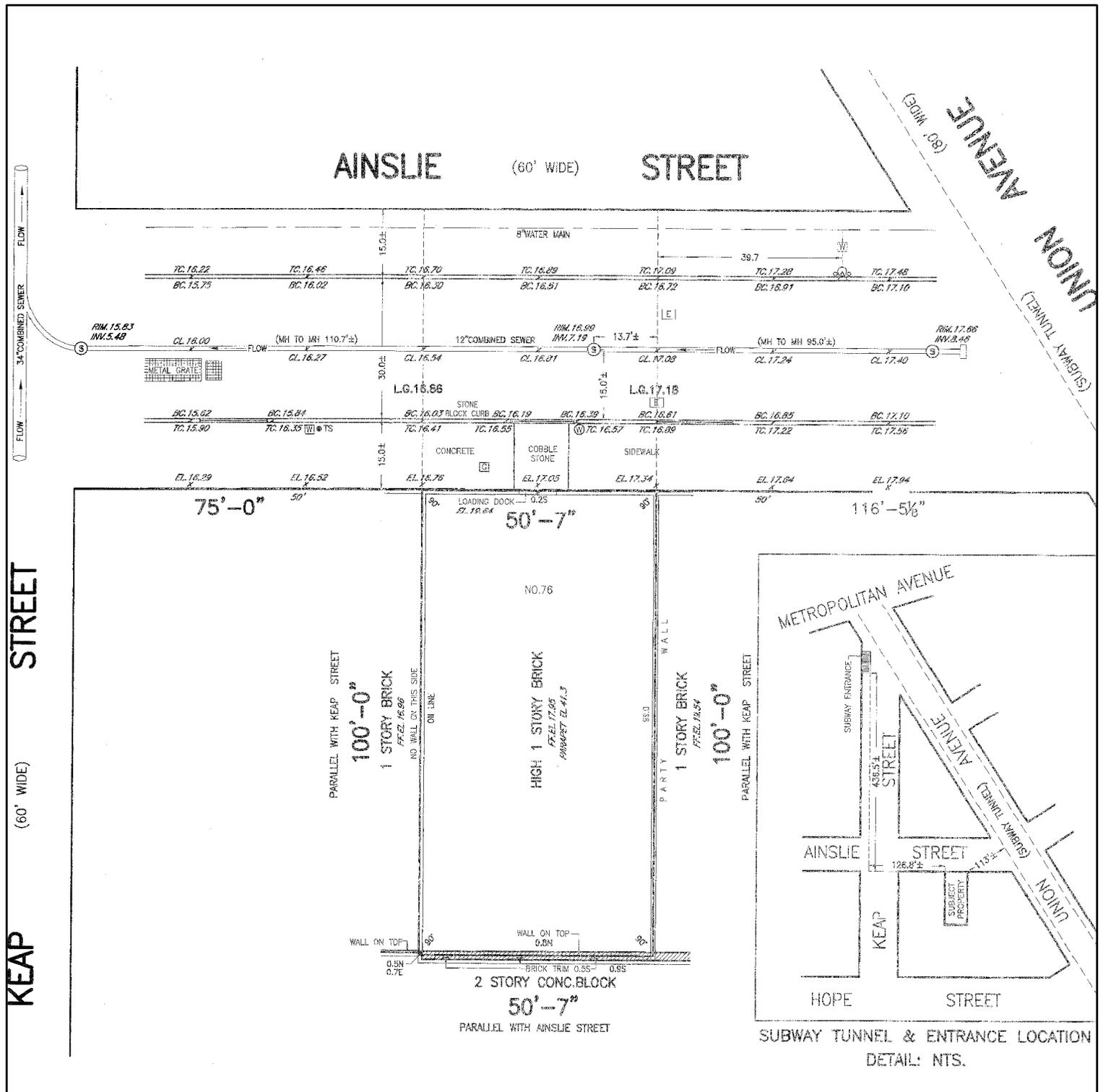
REV: 0

PREPARED BY: EMC

DATE: FEBRUARY 2, 2016

SCALE: 1" = 500'

APPROVED BY: JPC



NOTE: THIS DRAWING INTENDED FOR ILLUSTRATIVE PURPOSES ONLY, AS PART OF A SITE CHARACTERIZATION. NOT TO BE USED AS A BASIS FOR ENGINEERING OR DESIGN.
NOTE: DRAWING AFTER JOSEPH NICOLETTI ASSOCIATES' ARCHITECTURAL SURVEY, DATED JANUARY 9, 2014.

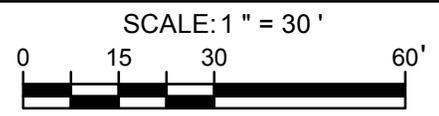


Figure 2 - Site Boundary Map

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

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PROJECT NO.: 160020
 DATE: JANUARY 13, 2016

REV: 0
 SCALE: 1" = 30'

PREPARED BY: EMC
 APPROVED BY: JPC



NOTE: THIS DRAWING INTENDED FOR ILLUSTRATIVE PURPOSES ONLY, AS PART OF A SITE CHARACTERIZATION.
 NOT TO BE USED AS A BASIS FOR ENGINEERING OR DESIGN.
AERIAL IMAGE: ESRI, MICROSOFT. PHOTO DATE: MARCH 19, 2011.
LOT LINES: (SHOWN IN WHITE) NEW YORK CITY DEPT. OF FINANCE DIGITAL TAX MAP DATASET.

SCALE: 1" = 150'



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Figure 3 - Surrounding Land Usage

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020

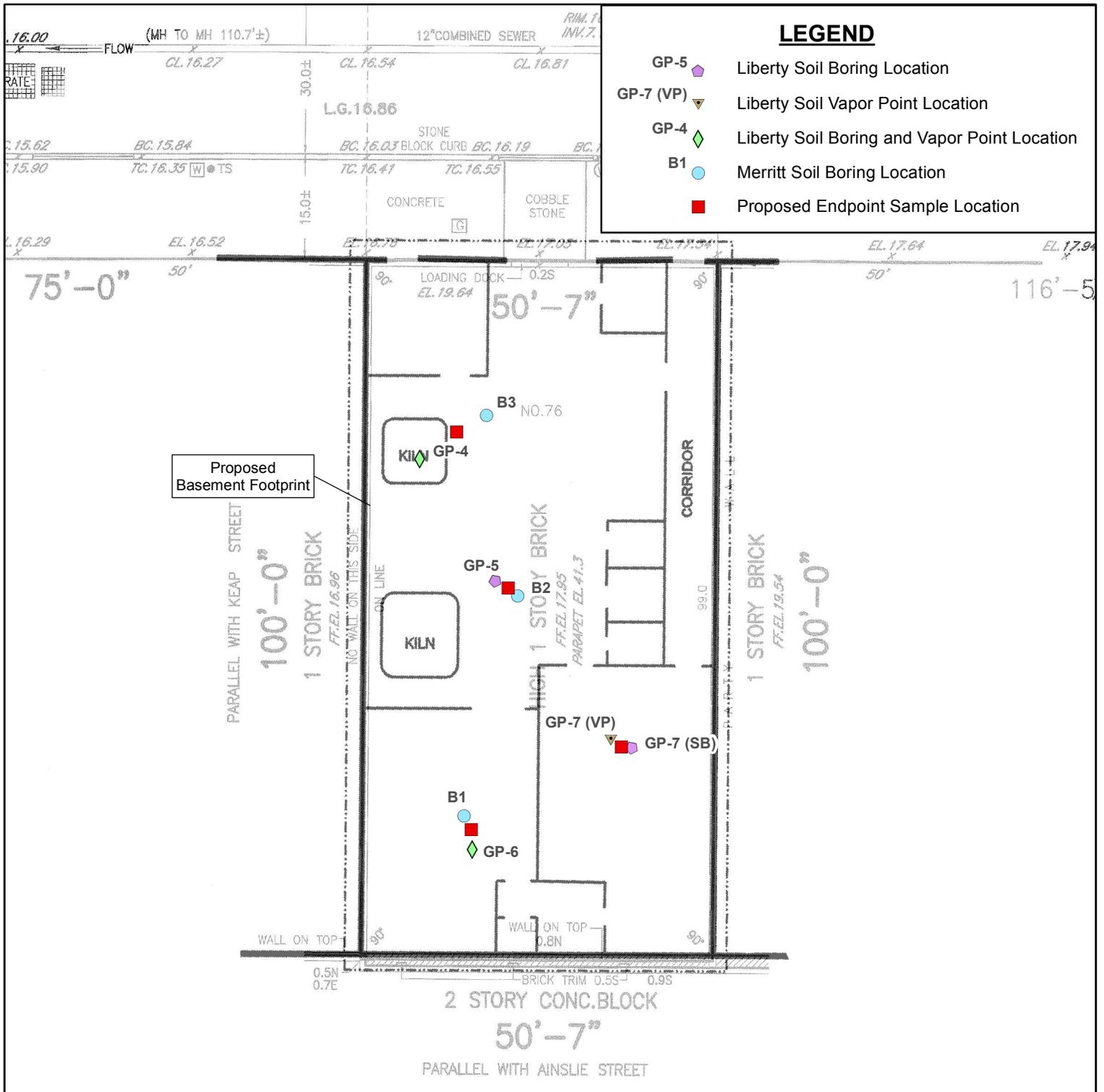
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PREPARED BY: EMC

DATE: FEBRUARY 5, 2016

SCALE: 1" = 150'

APPROVED BY: JPC



NOTE: THIS DRAWING INTENDED FOR ILLUSTRATIVE PURPOSES ONLY, AS PART OF A SITE CHARACTERIZATION. NOT TO BE USED AS A BASIS FOR ENGINEERING OR DESIGN.
NOTE: DRAWING AFTER JOSEPH NICOLETTI ASSOCIATES' ARCHITECTURAL SURVEY, DATED JANUARY 9, 2014 AND MERRITT ENVIRONMENTAL CONSULTING CORP.'S SITE SKETCH.

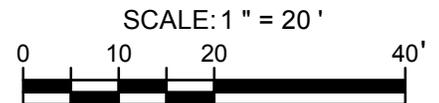


Figure 4 - Map of Proposed Endpoint Sample Locations

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 Borough of Brooklyn, City of New York, New York

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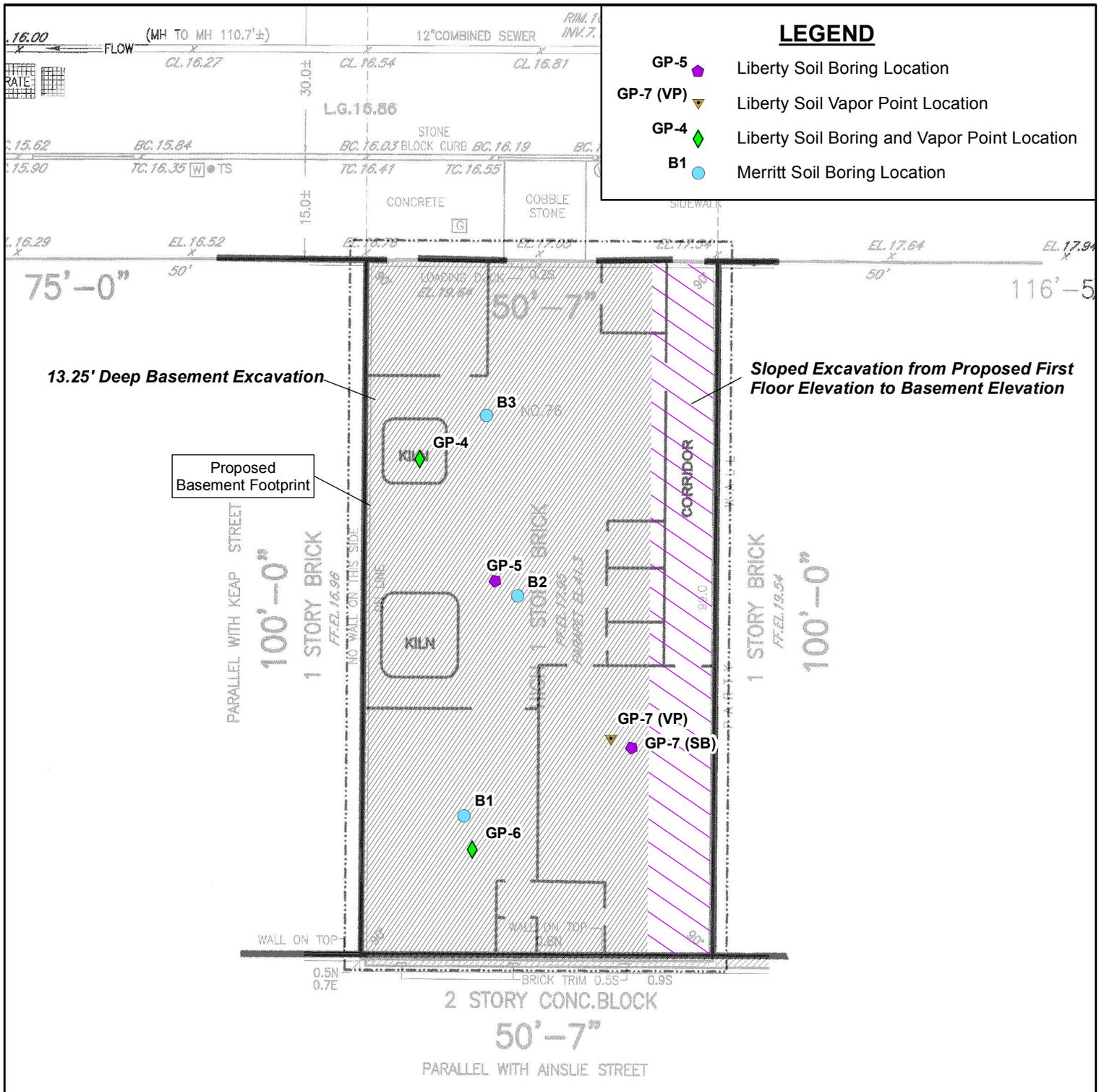
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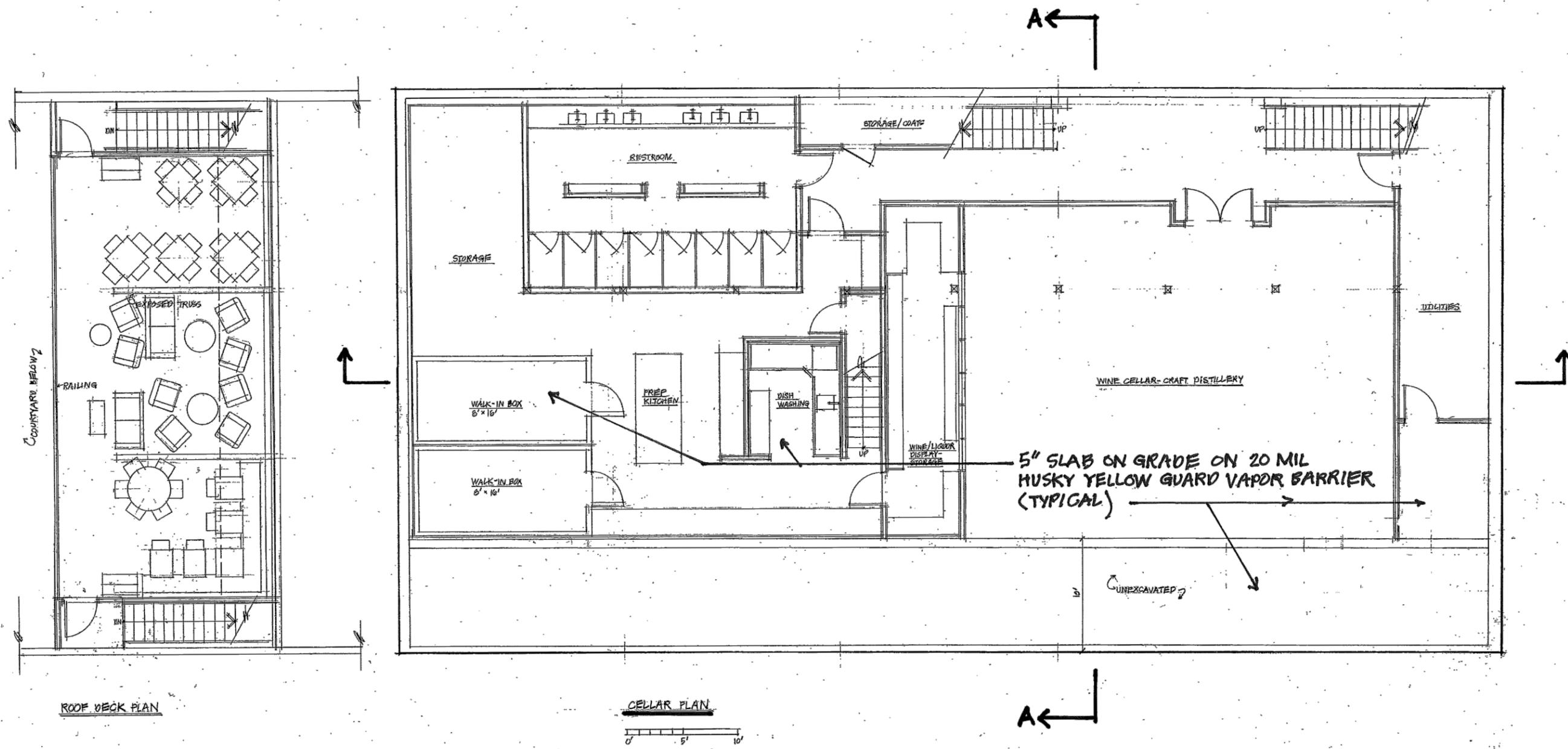
PREPARED BY: EMC

DATE: AUGUST 11, 2016

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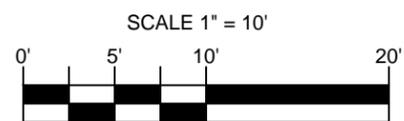
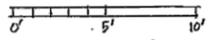
APPROVED BY: JPC





ROOF DECK PLAN

CELLAR PLAN

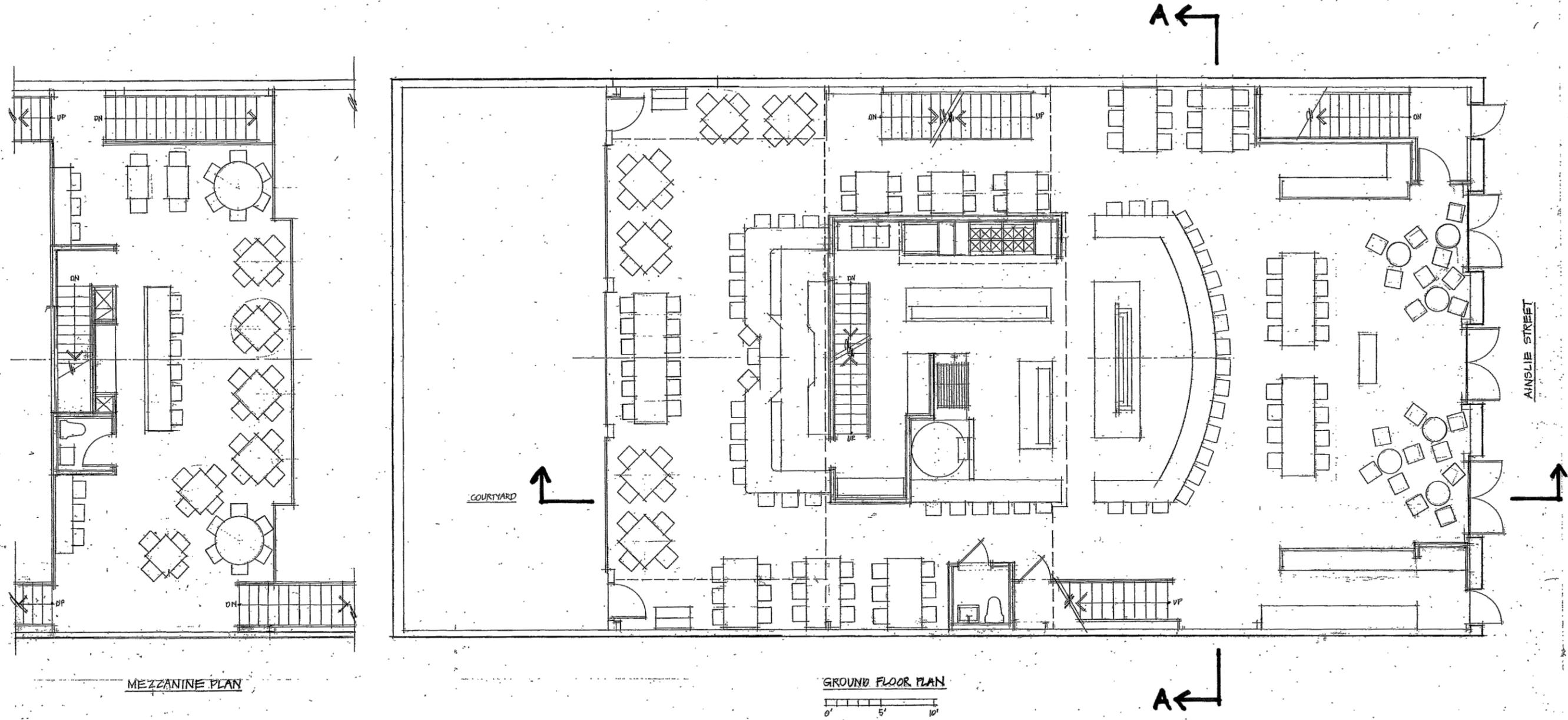


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**Figure 6a - Vapor Barrier System
 Basement Plan**

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	SCALE: 1" = 10'	APPROVED BY: JPC

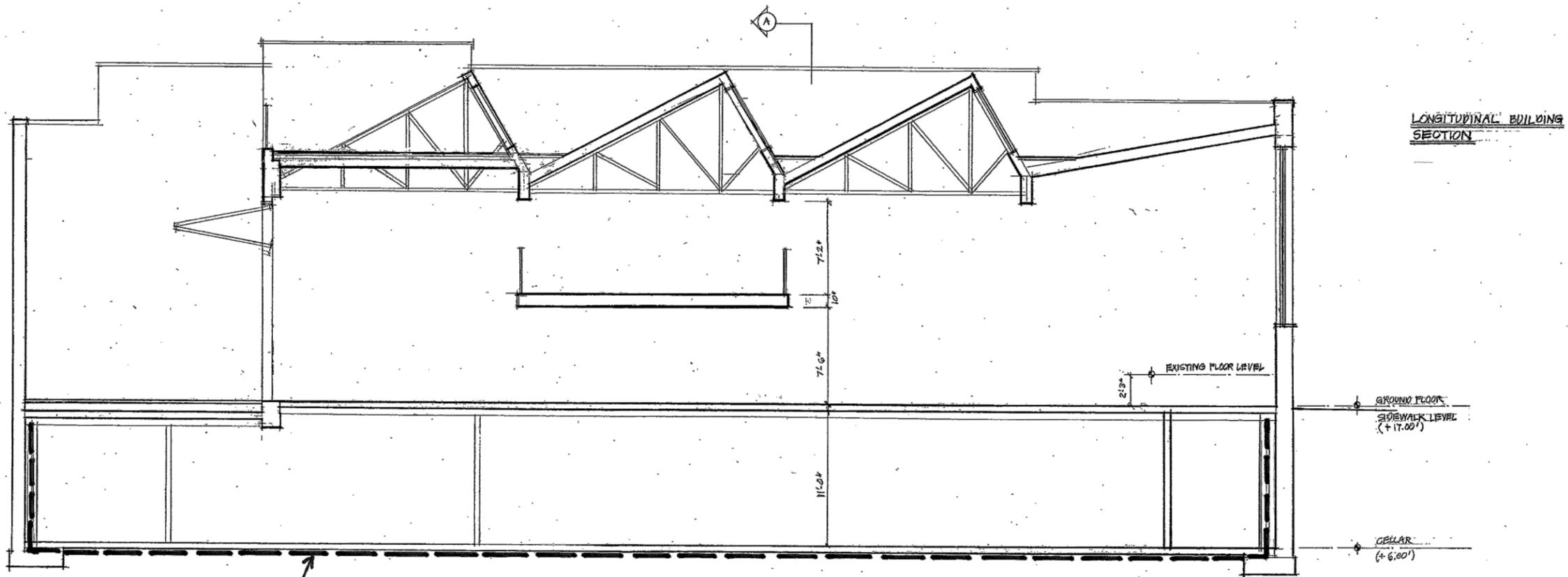


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**Figure 6b - Vapor Barrier System
 Ground Floor Plan**

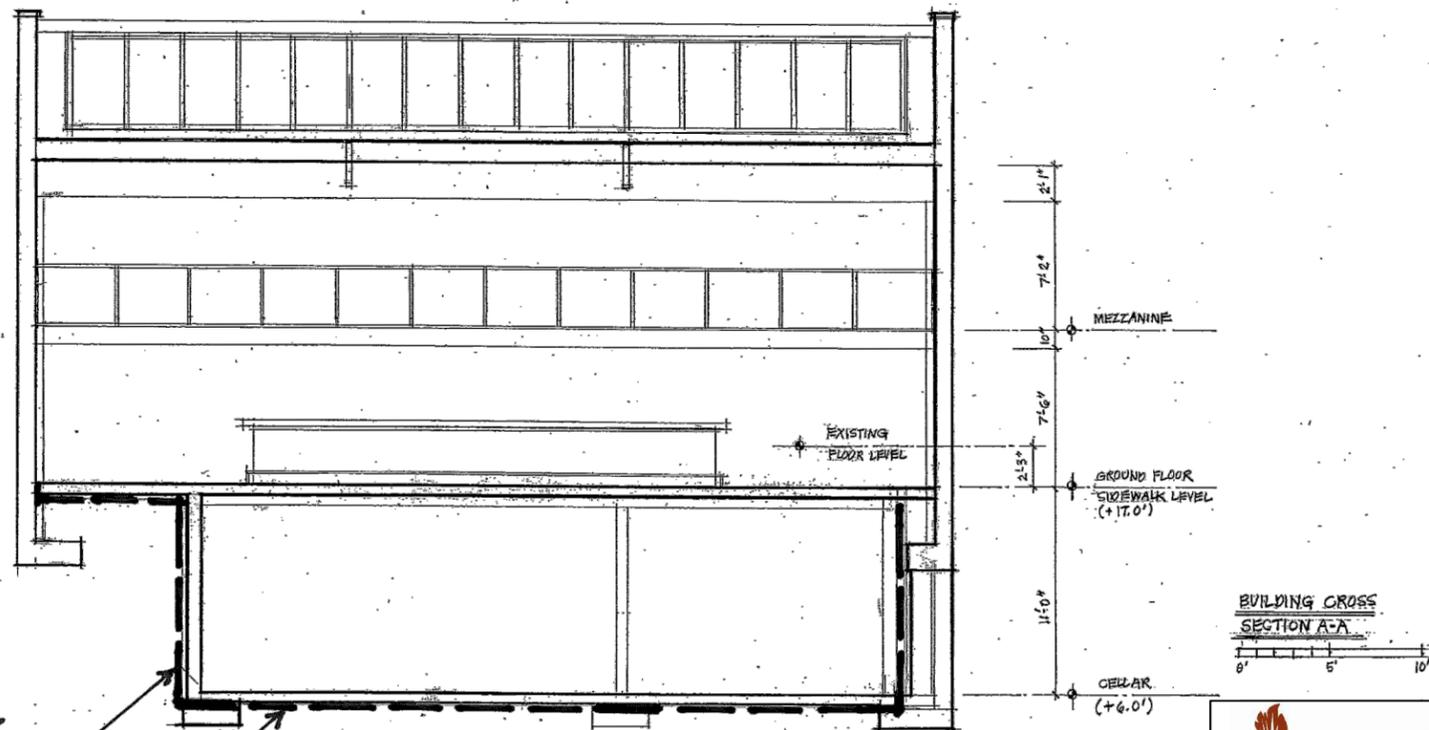
76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	SCALE: 1" = 10'	APPROVED BY: JPC



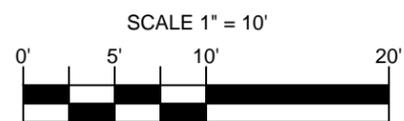
LONGITUDINAL BUILDING SECTION

MINIMUM 20 MIL VAPOR BARRIER



BUILDING CROSS SECTION A-A

MINIMUM 20 MIL VAPOR BARRIER

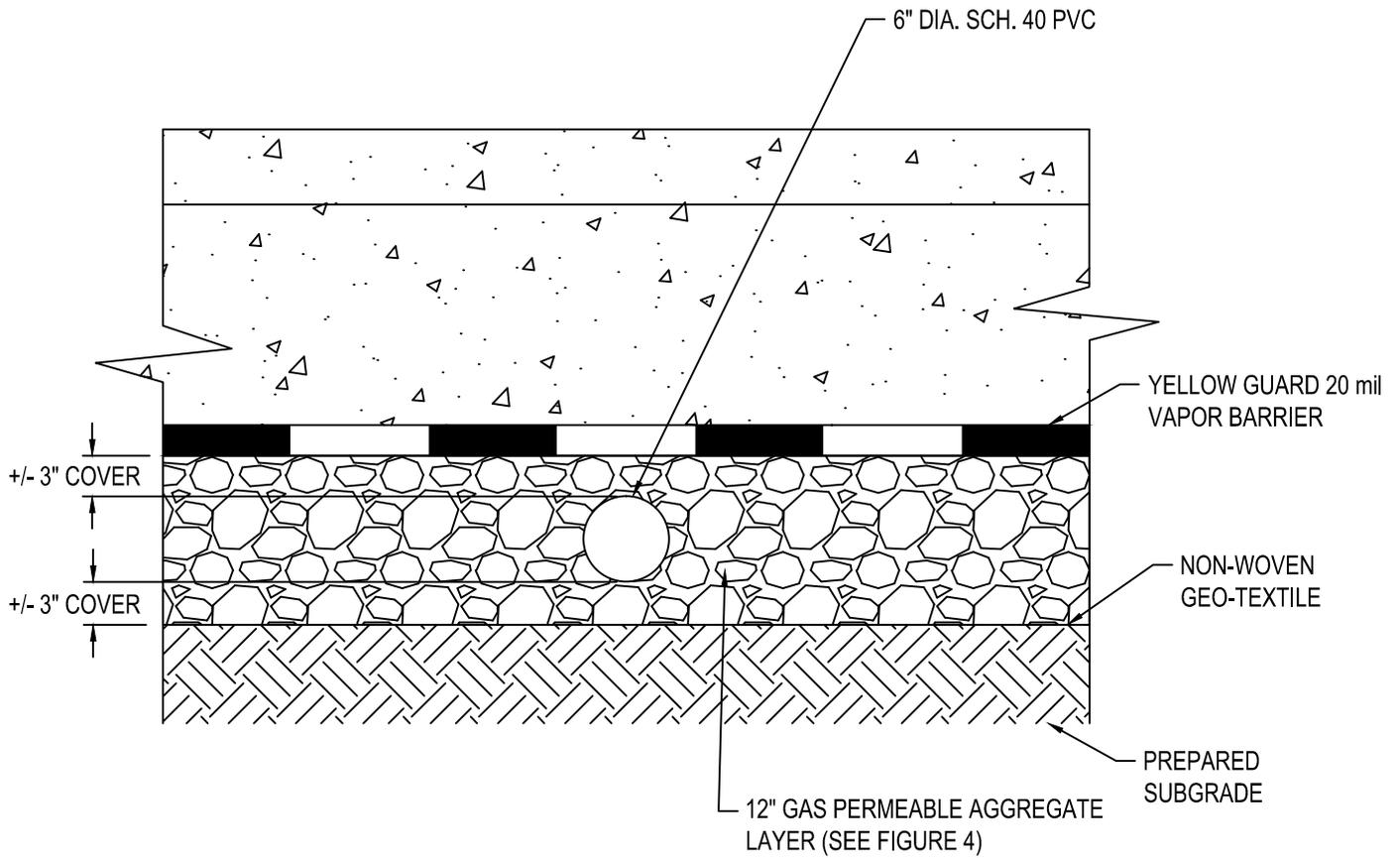


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Figure 6c - Vapor Barrier System Elevation

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	SCALE: 1" = 10'	APPROVED BY: JPC



NOTES:

1. SCHEDULE 40 PVC SHALL BE 6" DIAMETER AS INDICATED ON THE DRAWINGS.
2. IF A CONFLICT ARISES BETWEEN THE SSDS PIPING AND STRUCTURAL, ARCHITECTURAL OR MEP ELEMENTS OF THE BUILDING, THE SSDS PIPING CAN BE REALIGNED (HORIZONTALLY OR VERTICALLY) AS NECESSARY TO AVOID THE CONFLICT. SUBMIT SHOP DRAWINGS PRIOR TO INSTALLATION.

A
C-8.01

TYPICAL SUBGRADE PIPING

NOT TO SCALE

FIGURE 1.dwg



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Figure 7a - Sub-Slab Depressurization Design Diagram: Typical Subgrade Piping

Turkey Hill Minit Markets - Store #159
419 East Drinker Street
Dunmore Borough, Lackawanna County, Pennsylvania

PROJECT NO.: 160020

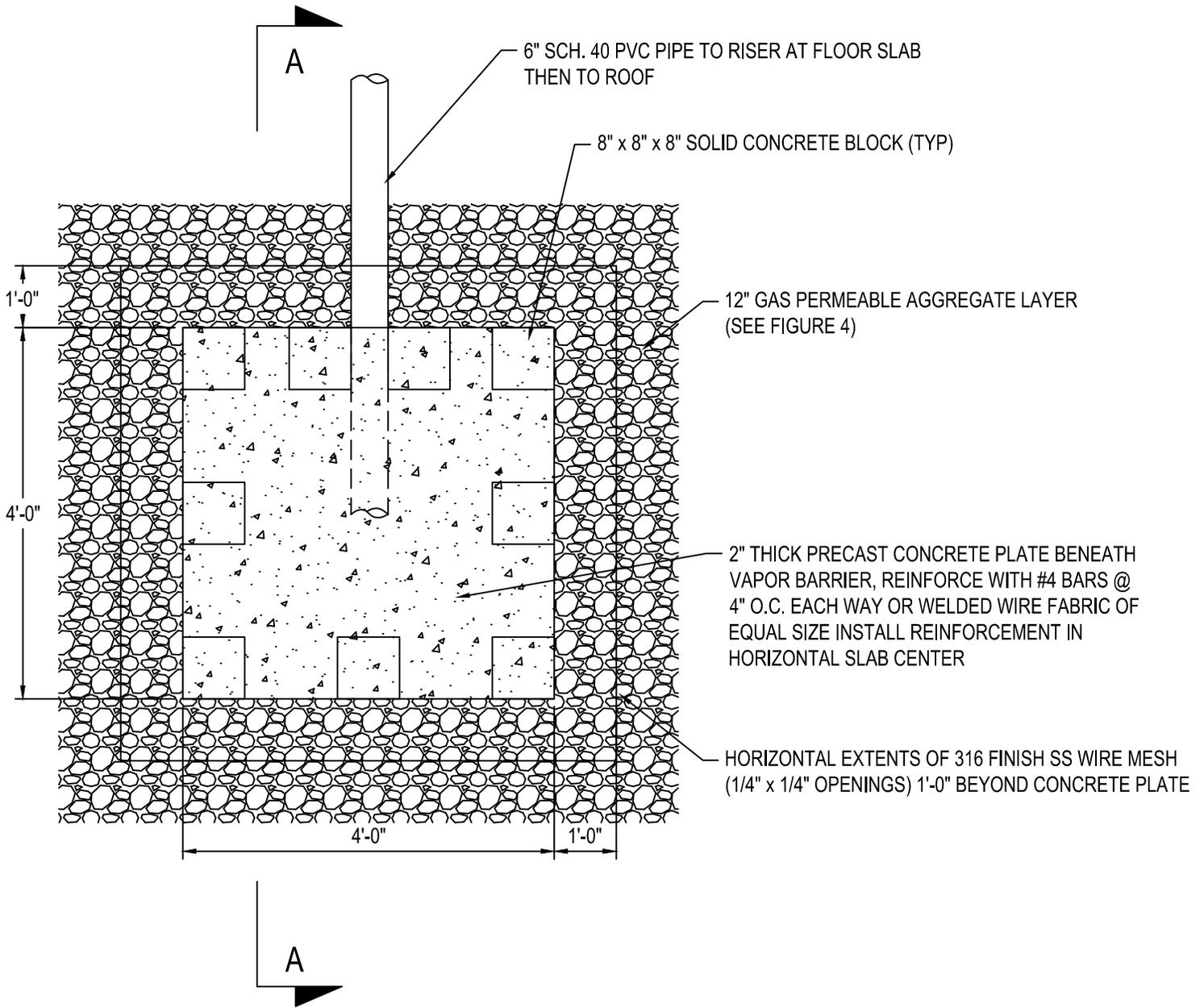
REV: 0

PREPARED BY: EMC

DATE: AUGUST 22, 2016

NOT TO SCALE

APPROVED BY: JPC



A
C-8.01

PLAN VIEW SUB-SLAB DEPRESSURIZATION PIT

NOT TO SCALE

FIGURE 2.dwg

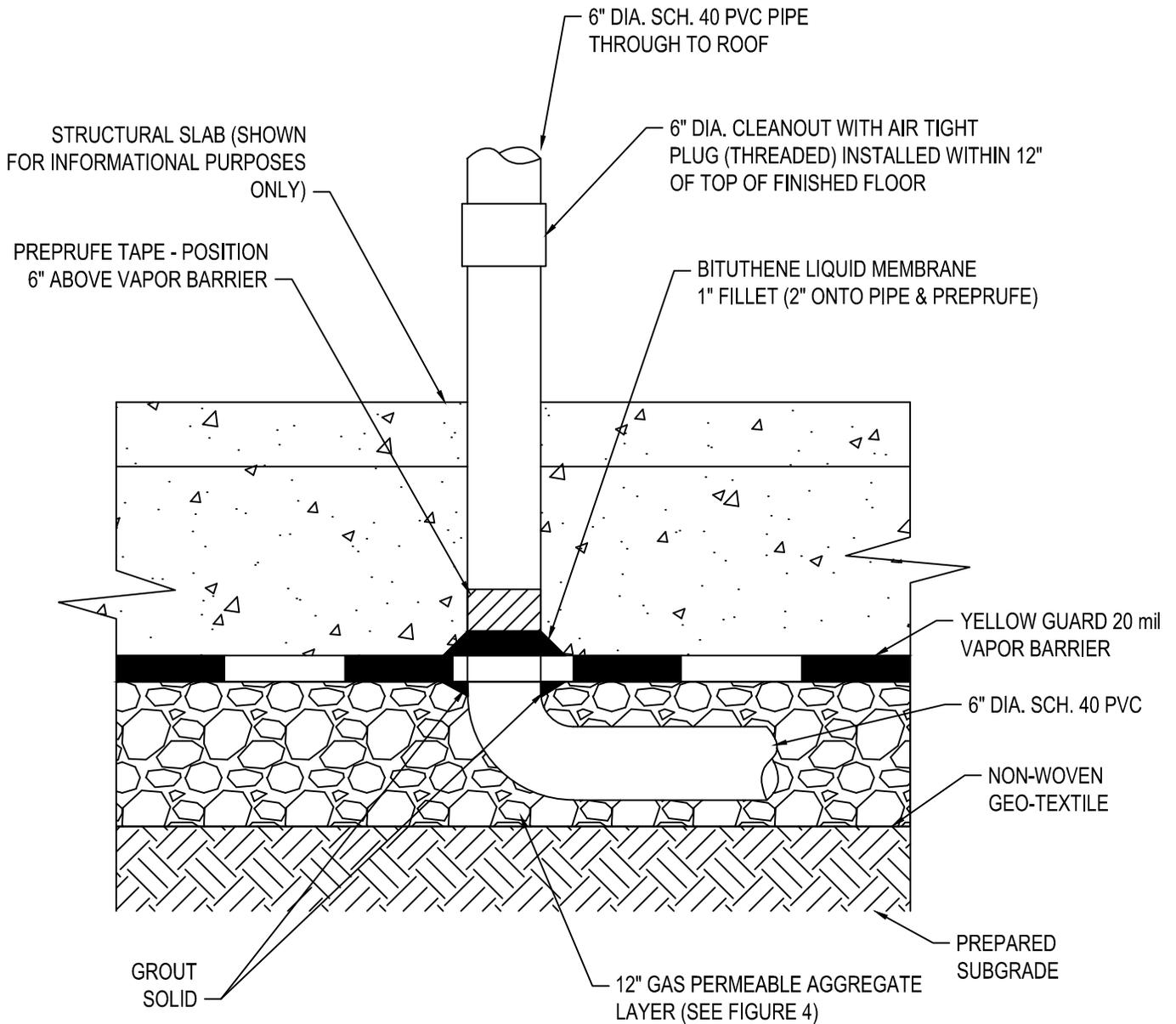


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Figure 7b - Sub-Slab Depressurization Design Diagram: Plan View Sub-Slab Depressurization Pit

Turkey Hill Minit Markets - Store #159
419 East Drinker Street
Dunmore Borough, Lackawanna County, Pennsylvania

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	NOT TO SCALE	APPROVED BY: JPC



A
C-8.01

RISER DETAIL AT FLOOR SLAB

NOT TO SCALE

FIGURE 3.dwg



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Figure 7c - Sub-Slab Depressurization Design Diagram: Riser Detail at Floor Slab

Turkey Hill Minit Markets - Store #159
419 East Drinker Street
Dunmore Borough, Lackawanna County, Pennsylvania

PROJECT NO.: 160020

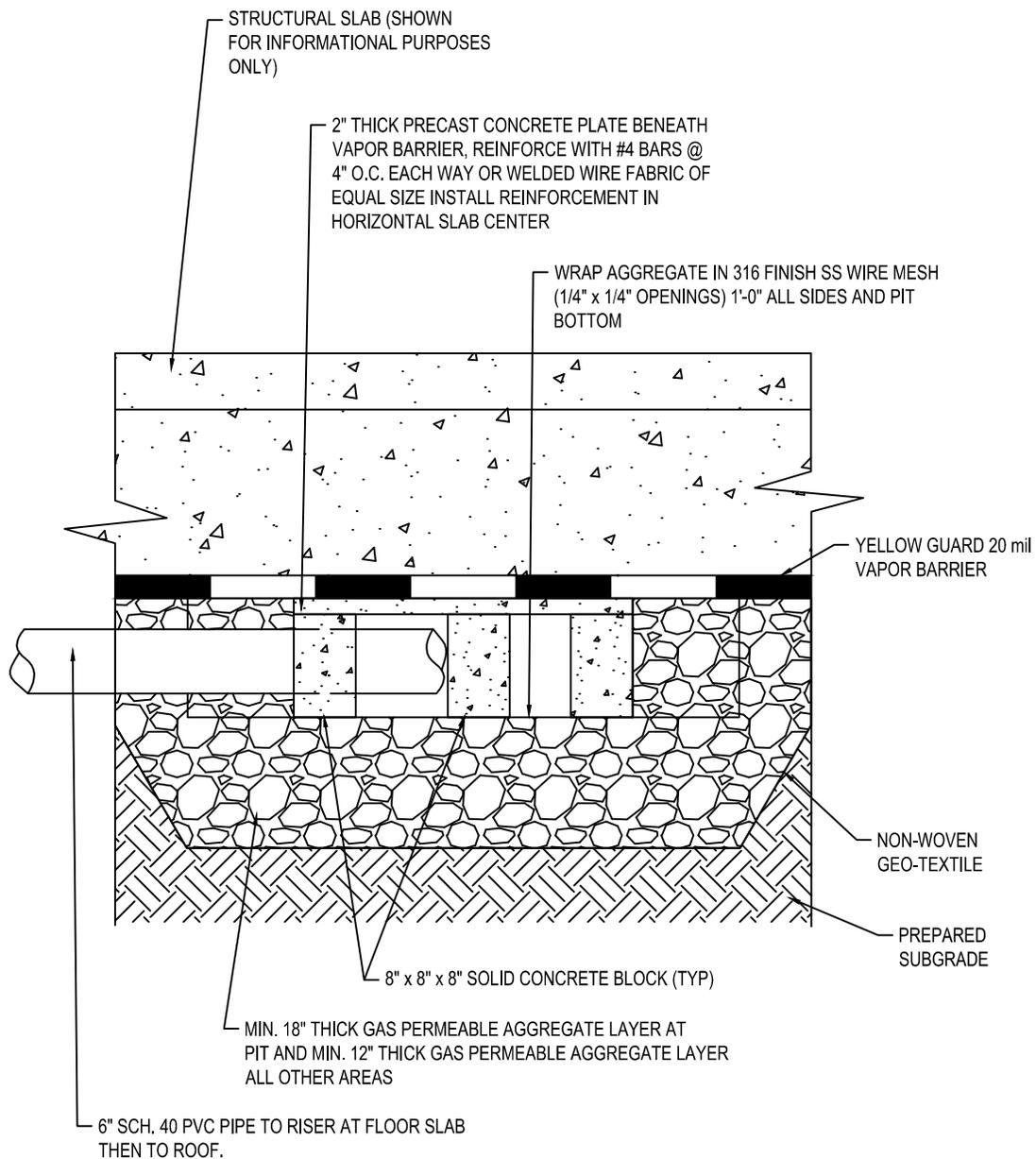
REV: 0

PREPARED BY: EMC

DATE: AUGUST 22, 2016

NOT TO SCALE

APPROVED BY: JPC



NOTES:

1. SLOPE HORIZONTAL PIPE A MINIMUM OF 1% UNIFORMLY TOWARD SUB-SLAB DEPRESSURIZATION PIT.

A
C-8.01

SECTION A-A SUB-SLAB DEPRESSURIZATION PIT

NOT TO SCALE

FIGURE 4.dwg



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Figure 7d - Sub-Slab Depressurization Design Diagram: Section A-A Sub-Slab Depressurization Pit

Turkey Hill Minit Markets - Store #159
419 East Drinker Street
Dunmore Borough, Lackawanna County, Pennsylvania

PROJECT NO.: 160020

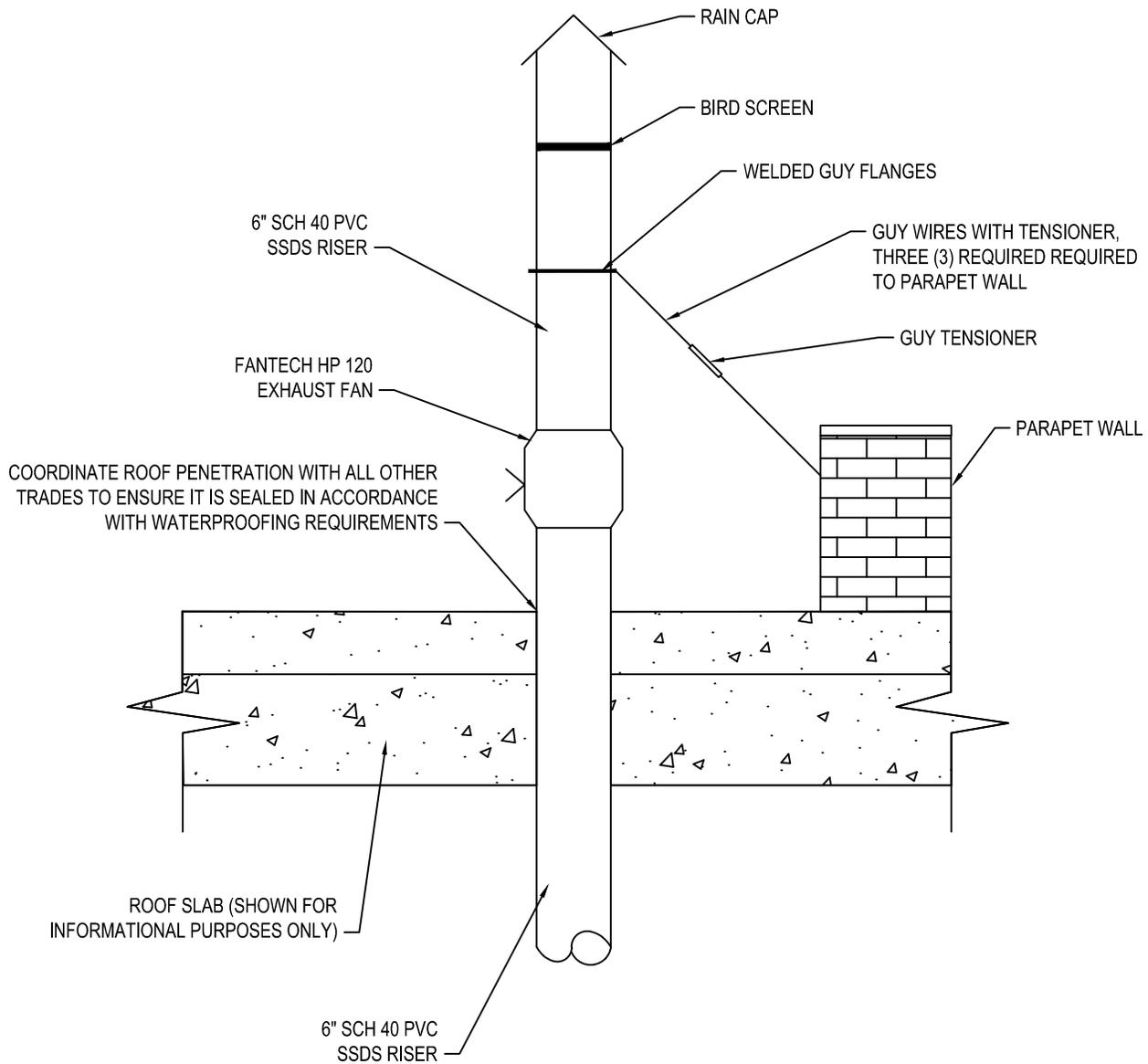
REV: 0

PREPARED BY: EMC

DATE: AUGUST 22, 2016

NOT TO SCALE

APPROVED BY: JPC



NOTES:

1. CONTRACTOR TO VERIFY THAT THE VENT STACK EXHAUST LOCATION IS A DISTANCE OF 25 FEET OF MEET FROM ANY FRESH AIR INTAKES OR OPERABLE WINDOWS (INCLUDING THOSE ON ADJOINING PROPERTIES). FINAL LOCATION AND HEIGHT OF VENT STACKS SHALL BE IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
2. VENT STACK SHALL BE SECURELY ANCHORED WITH ADEQUATE STRUCTURAL SUPPORTS AND FITTED WITH RAIN CAP, SEE DETAIL ON THIS SHEET.
3. CONTRACTOR TO COORDINATE INSTALLATION OF SSDS ROOF PENETRATION PRIOR TO WATERPROOFING OF THE ROOF.

A
C-8.01

SSDS ROOF PENETRATION AND VENT

NOT TO SCALE

FIGURE 5.dwg



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Figure 7e - Sub-Slab Depressurization Design Diagram: SSDS Roof Penetration and Vent

Turkey Hill Minit Markets - Store #159
419 East Drinker Street
Dunmore Borough, Lackawanna County, Pennsylvania

PROJECT NO.: 160020

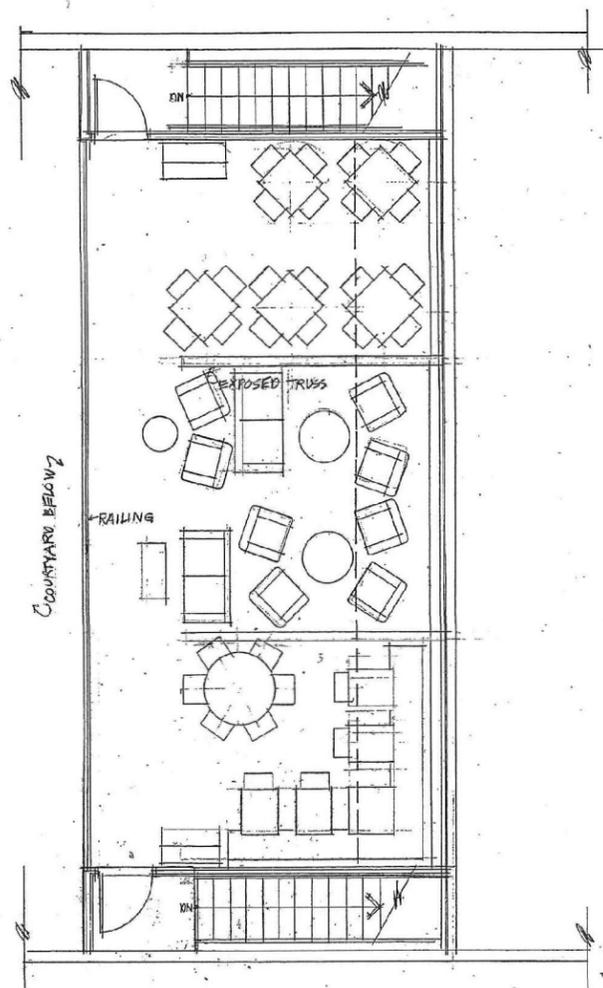
REV: 0

PREPARED BY: EMC

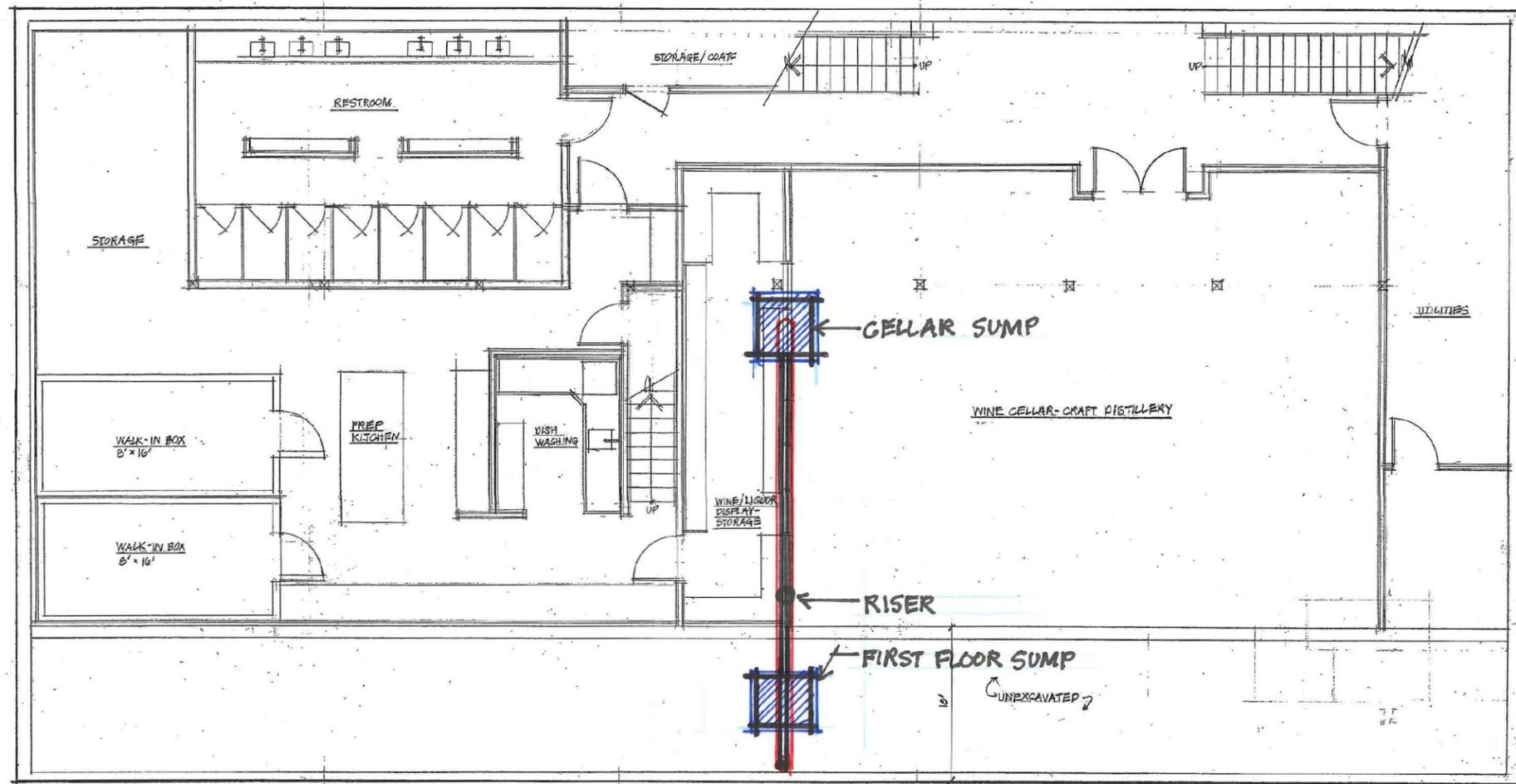
DATE: AUGUST 22, 2016

NOT TO SCALE

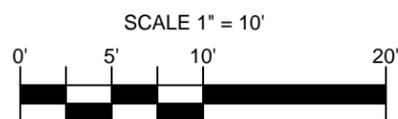
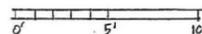
APPROVED BY: JPC



ROOF DECK PLAN



CELLAR PLAN

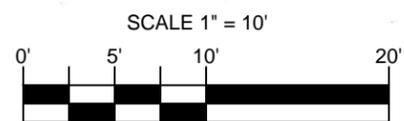
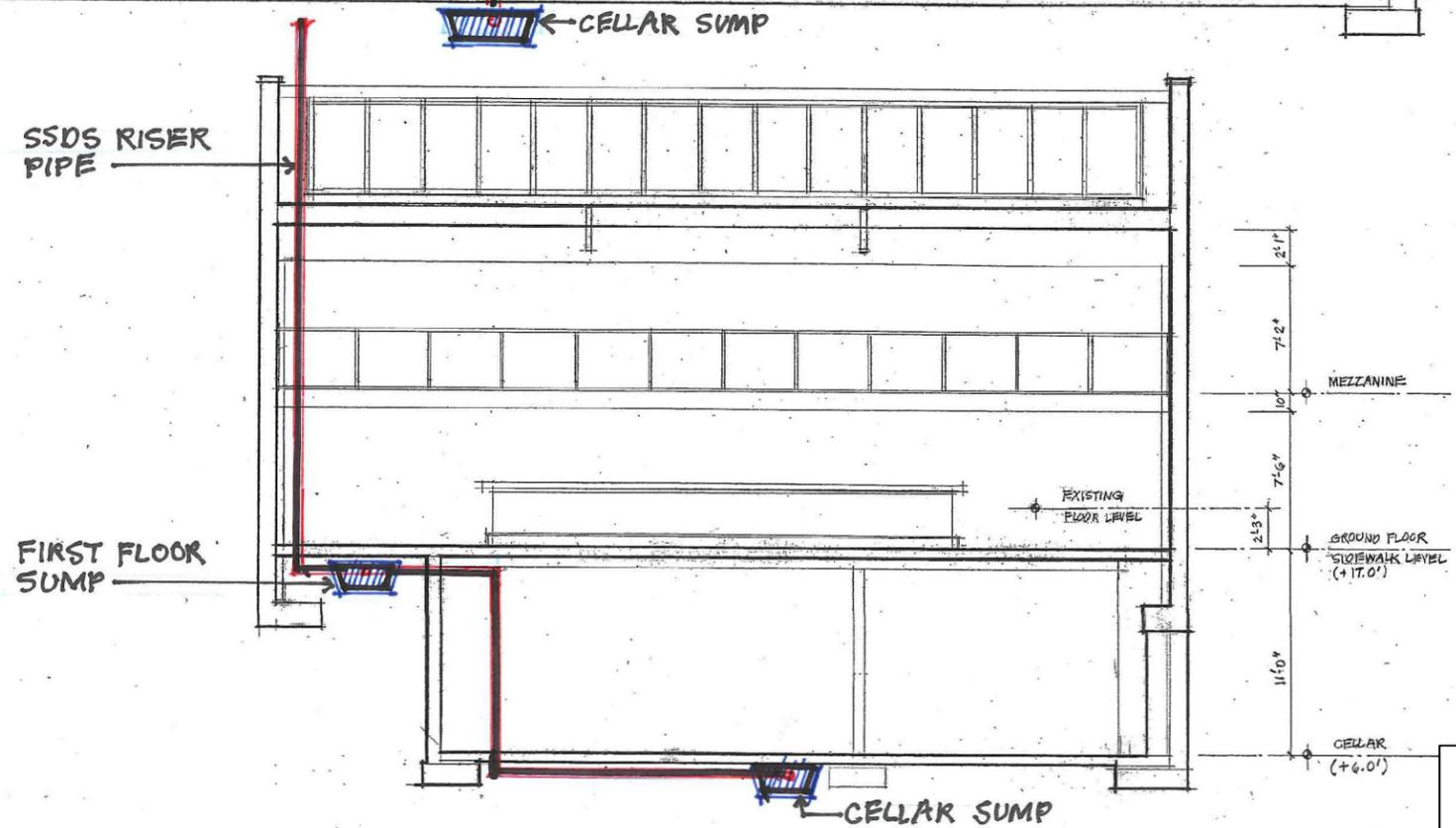
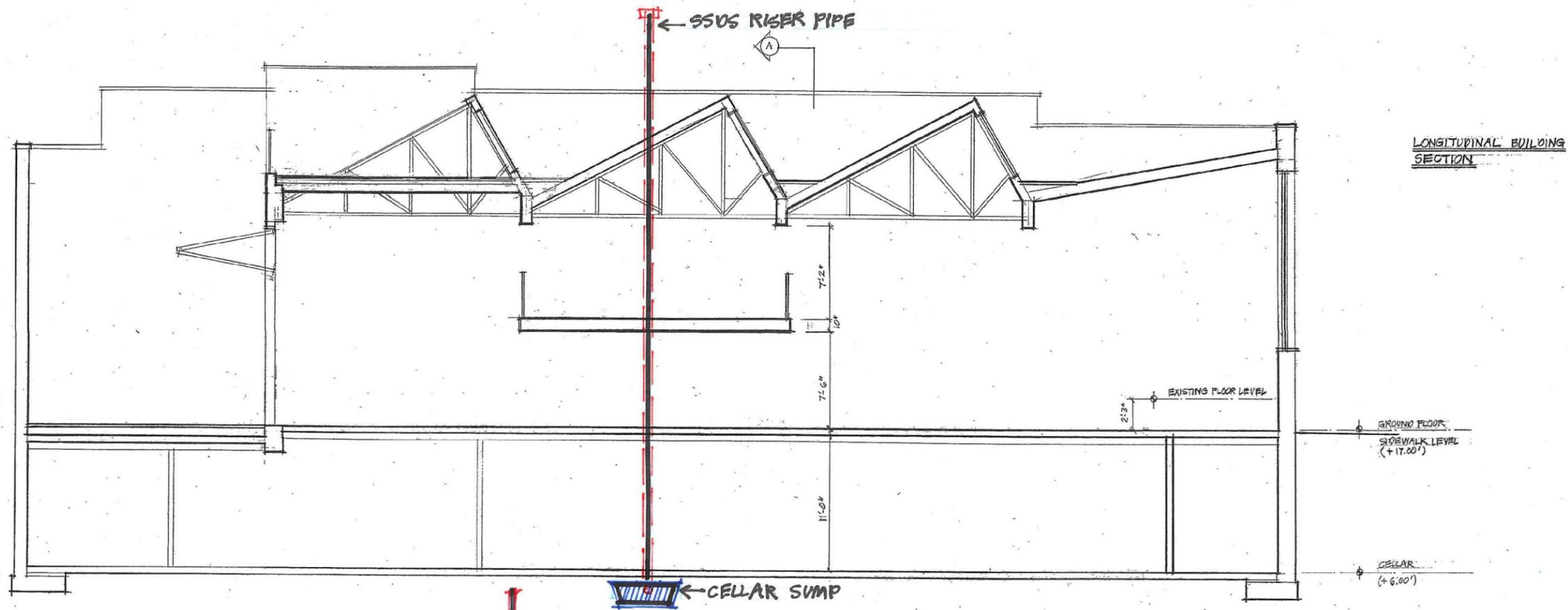


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**Figure 7f - Sub-Slab Depressurization
 Design Diagrams: Basement Plan**

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	SCALE: 1" = 10'	APPROVED BY: JPC



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Figure 7g - Sub-Slab Depressurization Design Diagram: Elevation

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 160020	REV: 0	PREPARED BY: EMC
DATE: AUGUST 22, 2016	SCALE: 1" = 10'	APPROVED BY: JPC

TABLE 1
SITE-SPECIFIC SOIL CLEANUP OBJECTIVES

Contaminant	Site-Specific SCOs
Total SVOCs	250 ppm
Arsenic	23 ppm
Barium	750 ppm
Lead	1,000 ppm
Mercury	3.5 ppm

Table 3
Soil Vapor Analytical Data Summary
76 Ainslie Street, Brooklyn, New York
OER Project No. 16EHAZ222K
Liberty Project No. 160020

Sample ID		New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion (2006 and Updates)	GP-4 16A0700-01 1/25/2016 8:15:00 AM Soil Vapor		GP-6 16A0700-02 1/25/2016 8:20:00 AM Soil Vapor		GP-7 16A0700-04 1/25/2016 8:27:00 AM Soil Vapor		GP-6 Duplicate 2 16A0700-05 1/25/2016 9:49:00 AM Soil Vapor	
York ID	CAS Number		Result	Q	Result	Q	Result	Q	Result	Q
Sampling Date	Compound		µg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
	Volatiles Organics, EPA TO15 Full List		21.45	18.67	1.68	18.67				
	Dilution Factor		690	43	6.80	39				
	1,1,1-Trichloroethane	71-55-6	16	U	14	U	1.30	D	14	U
	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	~		9.20	U	6.10	D	9.20	U
	1,2,4-Trimethylbenzene	95-63-6	11	U	9.20	U	1.50	D	9.20	U
	1,3,5-Trimethylbenzene	108-67-8	~		25	D	3.70	D	8.30	D
	2-Butanone	78-93-3	16	D	73	D	37	D	21	D
	Acetone	67-64-1	73	D	100	D	37	D	21	D
	Benzene	71-43-2	6.90	U	6	U	4.70	D	6	U
	Carbon disulfide	75-15-0	~		5.80	U	1.70	D	5.80	U
	Chloroform	67-66-3	12	D	9.10	U	5.70	D	9.10	U
	Cyclohexane	110-82-7	7.40	U	6.40	U	1.90	D	6.40	U
	Dichlorodifluoromethane	75-71-8	11	U	9.20	U	2.50	D	9.20	U
	Ethyl Benzene	100-41-4	9.30	U	8.10	U	3.20	D	8.10	U
	Methylene chloride	75-09-2	60	U	13	U	9	D	13	U
	n-Heptane	142-82-5	~		7.70	U	1.90	D	7.70	U
	n-Hexane	110-54-3	~		6.60	U	5.60	D	6.60	U
	o-Xylene	95-47-6	~		9.30	U	4.80	D	8.10	U
	p- & m- Xylenes	179601-23-1	~		19	U	16	U	16	U
	p-Ethyltoluene	622-96-8	~		11	U	9.20	U	9.20	U
	Propylene	115-07-1	~		70	D	120	D	44	D
	Tetrachloroethylene	127-18-4	30	D	15	D	37	D	3.20	U
	Toluene	108-88-3	~		21	D	17	D	11	D
	Trichlorofluoromethane (Freon 11)	75-69-4	~		12	U	10	U	10	U

NOTES:

Any Regulatory Exceedences are color coded by Regulation

Q is the Qualifier Column with definitions as follows:

D=result is from an analysis that required a dilution

J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated

U=analyte not detected at or above the level indicated

B=analyte found in the analysis batch blank

NT=this indicates the analyte was not a target for this sample

~=this indicates that no regulatory limit has been established for this analyte

Table 4
Groundwater Analytical Data Summary
76 Ansley Street, Brooklyn, New York
OER Project No. 16EHA2222K
Liberty Project No. 160020

Sample ID York ID Sampling Date Client Matrix	Compound CAS Number	NYSDEC TOGS Standards and Guidance Values - GA	GP-8 16D0677-01 4/18/2016 5:56:00 PM			GP-9 16D0677-02 4/18/2016 6:58:00 PM			GP-10 16D0677-03 4/18/2016 7:47:00 PM			TRIP BLANK 16D0677-04 4/18/2016 3:00:00 PM		
			Water			Water			Water			Water		
			Result	Q		Result	Q		Result	Q		Result	Q	
Volatile Organics, 8260 - Comprehensive														
Dilution Factor														
1,1,1-Trichloroethane	71-55-6	5	0.20	U	0.20	U	0.74		0.20	U				
1,1-Dichloroethylene	75-35-4	5	0.20	U	0.20	U	0.26	J	0.20	U				
1,2,4-Trimethylbenzene	95-63-6	5	0.35	J	0.20	U	0.20	U	0.20	U				
Acetone	67-68-1	50	3.30		2.20		1.40	J	1.30	J				
Bromodichloromethane	75-27-4	50	0.63		0.40		0.20	U	0.20	U				
Bromoform	75-25-2	50	0.64		0.20	U	0.20	U	0.20	U				
Chloroform	67-66-3	7	1.20		5.10		0.28	J	0.20	U				
Dibromochloromethane	124-48-1	50	0.66		0.24	J	0.20	U	0.20	U				
Dichlorodifluoromethane	75-71-8	5	1.50		4.50		0.41	J	0.20	U				
Tetrachloroethylene	127-18-4	5	0.27	J	0.20	U	0.58		0.20	U				
Trichloroethylene	79-01-6	5	0.20	U	0.20	U	0.24	J	0.20	U				
Semi-Volatiles, 8270 - Comprehensive														
Dilution Factor														
Naphthalene	91-20-3	10	0.24		0.050	U	0.050	U	NT					
Phenanthrene	85-01-8	50	0.11		0.070		0.050	U	NT					
Pesticides, EPA TCL List														
Dilution Factor														
Dieldrin	60-57-1	0.004	0.0020	U	0.0020	U	0.0056		NT					
Polychlorinated Biphenyls (PCB)														
Dilution Factor														
Metals, Dissolved - Target Analyte (TAL)														
Dilution Factor														
Barium	7440-39-3	1000	1		1		1		NT					
Calcium	7440-70-2	~	43		44		44		NT					
Copper	7440-50-8	200	92,700		55,400		33,200		NT					
Iron	7439-89-6	~	62		56		163		NT					
Lead	7439-92-1	25	4		3	U	3	U	NT					
Magnesium	7439-95-4	35000	33,200		8,260		5,130		NT					
Manganese	7439-96-5	300	388		522		51		NT					
Potassium	7440-09-7	~	4,530		10,900		12,300		NT					
Sodium	7440-23-5	20000	50,800		59,000		109,000		NT					
Zinc	7440-66-6	2000	15		11	U	12		NT					
Mercury by 7473, Dissolved														
Dilution Factor														
			1		1		1							

NOTES:

Any Regulatory Exceedances are color coded by Regulation

Q is the Qualifier Column with definitions as follows:

D=result is from an analysis that required a dilution

J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated

U=analyte not detected at or above the level indicated

B=analyte found in the analysis batch blank

E=result is estimated and cannot be accurately reported due to levels encountered or interferences

NT=this indicates the analyte was not a target for this sample

~this indicates that no regulatory limit has been established for this analyte

APPENDIX 1

PROPOSED DEVELOPMENT PLANS

APPENDIX 2

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Horrigan Development 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, Horrigan Development 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, Alysha Alfieri, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

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 online. Internet access to view OER's document repositories is available at public libraries. 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. The library nearest the Site is:

Brooklyn Public Library – Leonard Library Branch
81 Devoe Street (at the intersection with Leonard Street)
Brooklyn, NY 11211
(718) 486-3365

Repository Hours of Operation

Monday: 10:00am – 6:00pm
Tuesday: 1:00pm – 8:00pm
Wednesday: 10:00am – 6:00pm
Thursday: 10:00am – 8:00pm
Friday: 10:00am – 6:00pm
Saturday: 10:00am – 5:00pm
Sunday: Closed

Digital Documentation: NYC OER requires the use of digital documents in our repository as a means of minimizing paper use while also increasing convenience in access and ease of use.

Issues of Public Concern: The major issues of concern to the public include potential impacts of nuisance odors and dust during disturbance soils impacted with historic fill at the site. These activities will be performed in accordance with procedures that will be specified under a Remedial Program and considers and takes preventive measures for exposure to future residents

of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure are required components of the remedial program. Implementation of these plans will be under the direct oversight of the NYCOER.

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 reviewed and approved by OER prior to distribution and mailed by the Enrollee. 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. 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.

APPENDIX 3

SUSTAINABILITY STATEMENT

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

Reuse of Clean, Recyclable Materials and Reduced Consumption of Non-

Renewable Resources: 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 (in tons) of clean, non-virgin materials (reported by type of material) reused 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. Natural gas will be utilized for fuel in the new building. 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.

Stormwater Retention: Stormwater retention improves water quality by lowering the rate of combined stormwater 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 stormwater 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 Voluntary Cleanup Program: Horrigan Development is participating in OER's Paperless Voluntary 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: Horrigan Development 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.

APPENDIX 4

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 final remedial report. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of final signoff by OER.

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 are described in the remedial report. 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 New York City 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 final remedial report.

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 final remedial report.

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 final remedial report. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the final remedial report. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the Soil Cleanup Objectives (SCOs) established in this plan may be reused on-Site. The SCOs for on-Site reuse are listed in Section 4.2 of this cleanup plan. '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 land with comparable levels of contaminants in soil/fill material, compliant with applicable laws and regulations, 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 remedial plan are followed. The expected location for placement of reused material is shown in Section 4.2.

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. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 remedial action projects will not exceed Track 1 SCO's.

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 remedial plan. The final remedial report 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.
- All material will be subject to source screening and chemical 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 final remedial report. 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 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this remedial plan (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 for Unknown Contamination Sources

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 semi-volatiles, 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 this remedial plan.

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 this remedial plan.

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

**76 Ainslie Street
Brooklyn, New York**

Prepared For:

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New York, NY 10018
(917) 922-2415

Prepared By:

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March 11, 2015

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ATTACHMENTS

ATTACHMENT 1 CONTAMINANTS OF CONCERN NIOSH PRINTOUTS

1. INTRODUCTION

This Health & Safety Plan (HASP) has been developed for the cleanup and redevelopment activities planned at the properties located at 76 Ainslie Street, in Brooklyn, New York. This HASP is intended to provide recommended health and safety procedures for personnel participating in on-site activities during cleanup and redevelopment of the site.

Procedures and protocols set forth in this plan are designed to reduce the risks of exposure to chemical substances and materials that may be present in the soils, water, and air at the site. The procedures contained herein were developed in accordance with the provisions set forth by 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response).

All personnel performing work activities on the site will read the HASP prior to performing any work activities. After reading the HASP, all personnel will sign the log sheet acknowledging they have read the HASP. This allows all personnel to have an opportunity to ask questions and discuss concerns with the Site Health & Safety Officer (SSO), and agree to perform all work activities in compliance with the HASP from the first day on-site. During this initial meeting the Health & Safety Officer will request a copy of the worker's OSHA 40-hour certification for OSHA 29 CFR 1910.120(e) Hazardous Waste Operations: Safety & Health 40-Hour Training Program for Site Personnel, and the most recent 8-hour refresher training certification. Copies of the certifications will be maintained in the site files.

The Remedial Action Contractor (RAC) shall be responsible for ensuring that the approved HASP is properly implemented, and that all activities conducted during the Remedial Activities (RA) are in compliance with the provisions indicated in the project Scope of Work. The recommended procedures and protocols outlined in the approved HASP may be modified during the course of the activities, as additional information becomes available during on-site characterization or through laboratory chemical analyses. These modifications shall be issued in the form of revisions to specific pages or sections of the HASP. A revised table of contents will also be issued for verification of updated pages, along with a document listing all revisions.

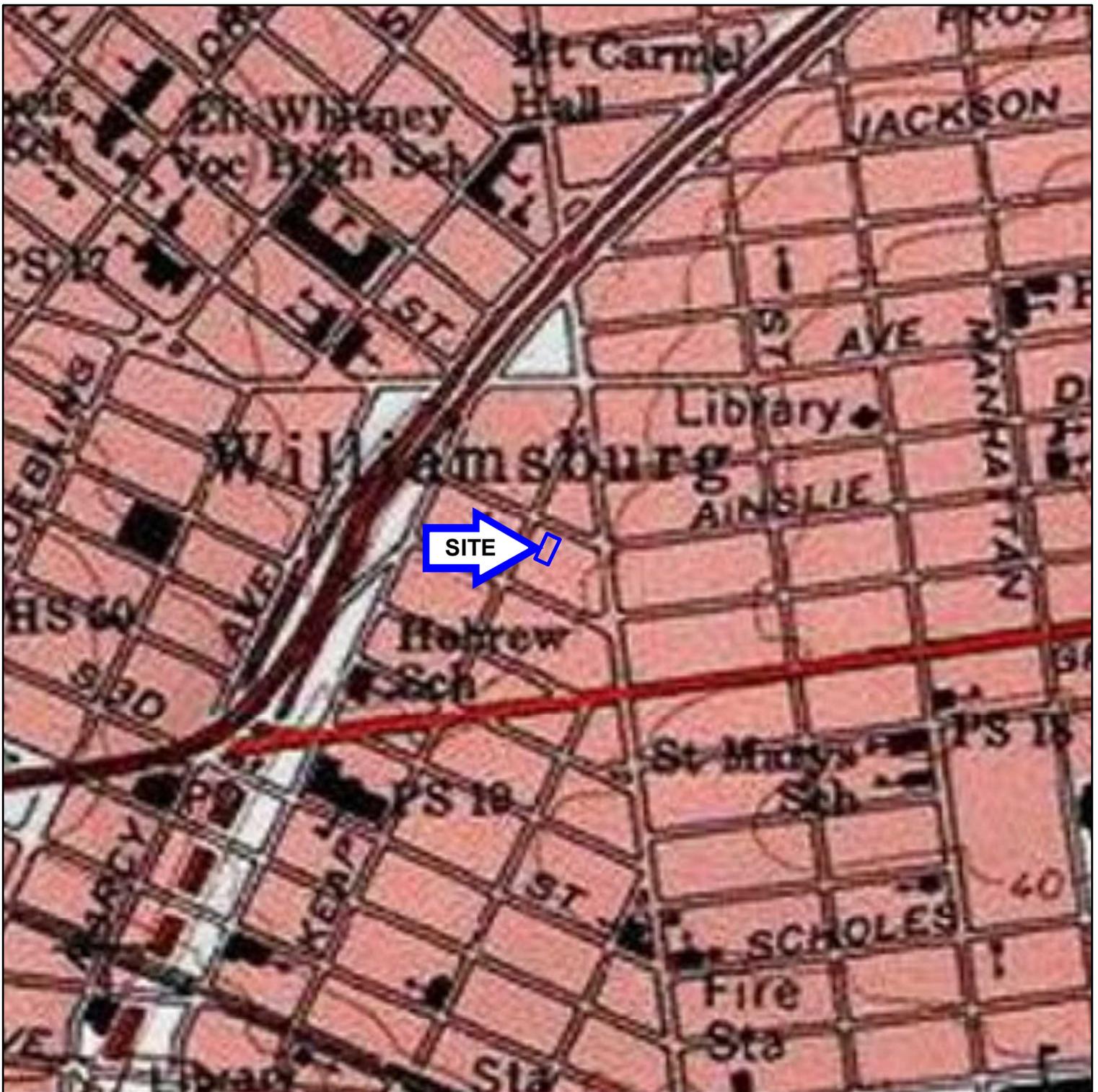
This plan has been developed as guidance to ensure that all field activities and site operations associated with the Site are in accordance with Federal regulations including the following key regulations and others which may apply:

<u>Regulations</u>	<u>Title</u>
29 CFR 1910.120	Hazardous Waste Site Operations and Emergency Response
29 CFR 1910.20	Access to Employee Exposure and Medical Records
29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910.1000	Air Contaminants
29 CFR 1926	Construction Activities
29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1200	Toxic & Hazardous Substances: Hazard Communication

2. SITE DESCRIPTION

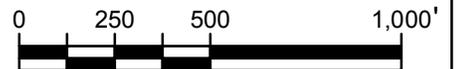
The Site is located at 76 Ainslie Street in the Williamsburg section of Brooklyn, New York and is identified as Block 2375 and Lot 10 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 5,000 square feet and is bounded by Ainslie Street to the north, Lot 3 to the south, Lot 12 to the east, and Lot 5 to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is used for warehousing and contains a single, high-ceiling former industrial building with a steel frame and masonry walls that covers the entire area of the Site.

Under the oversight of the New York City Office of Environmental Remediation (NYC OER), a remedial investigation (RI) has been performed to identify past property usage, to sample and test soils, and soil vapor, and to identify contaminant sources present on the property. The results of this investigation indicated that concentrations of PAHs and metals exceeding Track 1 Unrestricted Use SCOs and some compounds exceeding Track 4 Restricted Commercial Use SCOs are present in shallow soils and historic fill material at the site. To achieve Track 4 Restricted Commercial Use SCOs, it is anticipated that shallow soils, historic fill material, and soils in the partial basement area will be removed from the site and will be performed in conjunction with redevelopment activities. During construction activities, soil beneath most of the site will be removed to a depth of approximately 3 feet bgs (building footprint), and 11 feet bgs (partial basement). Additionally, two hot spot locations, GP-6 and GP-7, located along the southern portion of the property, will be excavated to remove impacted soils down to the 13 foot bgs interval at GP-6 and 6 foot bgs interval at GP-7. Approximately 2,500 tons of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility. The facility location is depicted in Figure 1. Areas of the site to be excavated are depicted in Figure 2.



SOURCE: USA TOPO MAPS - COPYRIGHT © 2013 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED.
 BROOKLYN (1995), NEW YORK 7.5-MINUTE QUADRANGLE.

SCALE: 1" = 500'



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Figure 1 - Site Location Map

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

PROJECT NO.: 123456

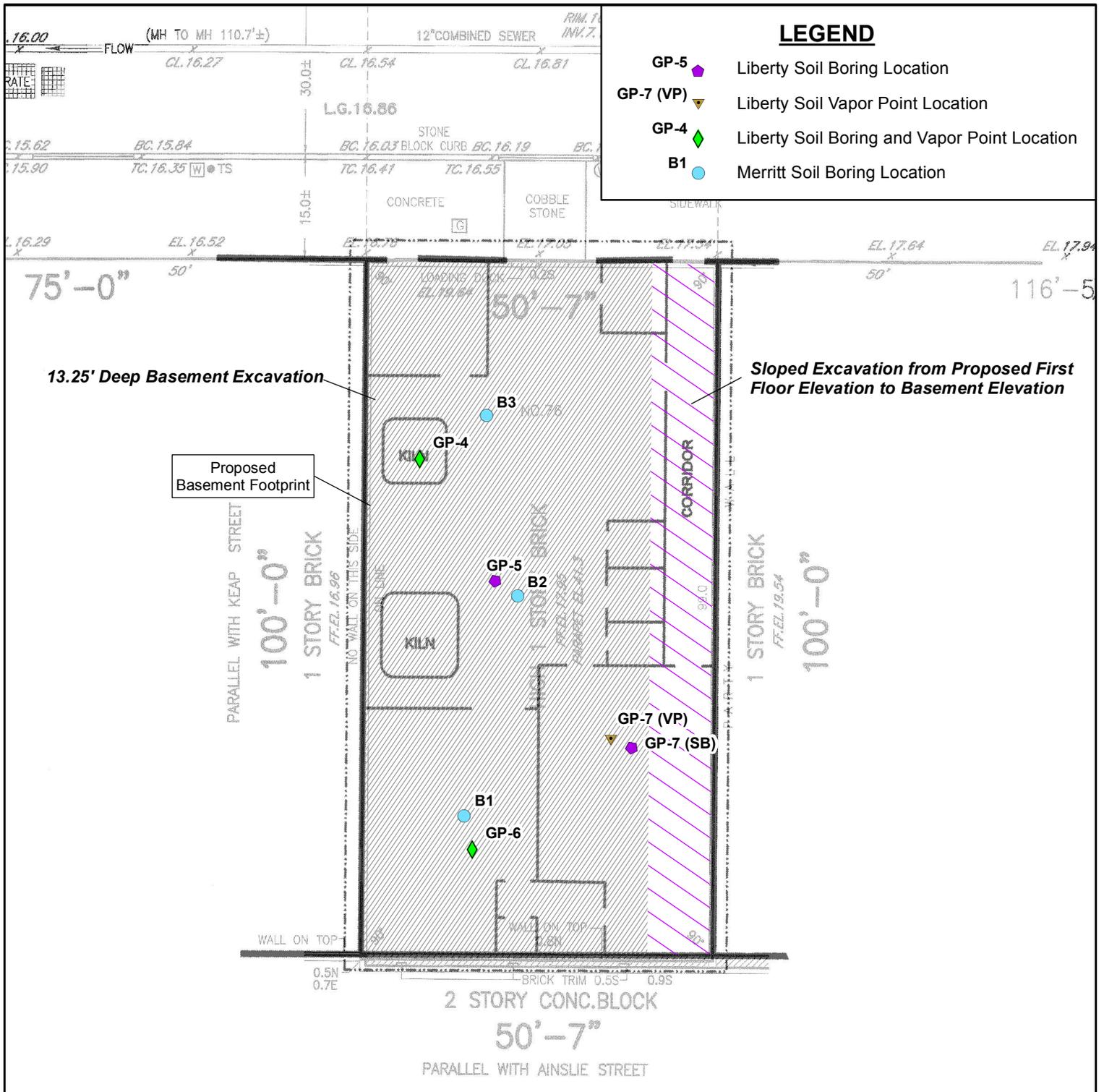
REV: 0

PREPARED BY: EMC

DATE: FEBRUARY 2, 2016

SCALE: 1" = 500'

APPROVED BY: JPC



NOTE: THIS DRAWING INTENDED FOR ILLUSTRATIVE PURPOSES ONLY, AS PART OF A SITE CHARACTERIZATION. NOT TO BE USED AS A BASIS FOR ENGINEERING OR DESIGN.
NOTE: DRAWING AFTER JOSEPH NICOLETTI ASSOCIATES' ARCHITECTURAL SURVEY, DATED JANUARY 9, 2014 AND MERRITT ENVIRONMENTAL CONSULTING CORP.'S SITE SKETCH.

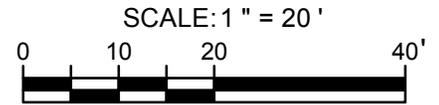


Figure 2 - Site Excavation Diagram

76 Ainslie Street
 Borough of Brooklyn, City of New York, New York

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PROJECT NO.: 160020

REV: 0

PREPARED BY: EMC

DATE: AUGUST 22, 2016

SCALE: 1" = 20'

APPROVED BY: JPC

3. SUMMARY OF PROPOSED FIELD TASKS

The following work is to be performed:

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. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. The entire footprint of the building area (100% of the property) will be excavated to a depth of approximately 3 feet bgs, for development purposes. In addition, a partial basement will be excavated in the western portion of the Site to approximately 11 feet bgs. It is estimated that approximately 2,500 tons of soil (including hotspots) will be excavated from the site and will be properly disposed at an appropriately licensed or permitted facility.
6. 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.
7. Transportation and off-site disposal of all soil/fill material at licensed or 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. Appropriate segregation of excavated media on-Site.
8. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

9. As part of development, construction of an engineered composite cover consisting of a concrete building slab in the cellar underlain by clean granular sub-base beneath all building areas, poured concrete on sub-base in sidewalk areas, and asphalt in the ground-level parking area to prevent human exposure to residual soil/fill remaining under the Site to prevent human exposure to residual soil/fill remaining under the Site. Exact depths of these construction elements are to be determined.

10. As part of development, installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a 20-mil vapor barrier below the slab throughout the full building area and a 20-mil vapor barrier outside all sub-grade foundation sidewalls. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration.

11. As part of development, installation of a sub-slab depressurization system (SSDS) consisting of a network of sub-slab horizontal pipe set in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. The horizontal piping will consist of fabric wrapped, perforated schedule 40 4-inch PVC pipe connected to a 6-inch steel riser pipe that penetrates the slab and travels through the building to the roof. The gas permeable layer will consist of a 6-inch thick layer of 2-inch trap rock stone. The pipe will be finished at the roof line with a 6-inch goose neck pipe to prevent rain infiltration. If indoor air samples after redevelopment of the Site detect elevated concentrations of the soil vapor COCs, then the active SSDS will be hardwired and will include a mechanical blower installed on the roof line and a pressure gauge and alarm located in an accessible area in the basement. The SSDS is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the active SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.

4. KEY PERSONNEL & RESPONSIBILITIES

The following personnel from Liberty Environmental, Inc., who will be acting as the owner's representative throughout the project, will be available for consultation.

Personnel	Title	Office Phone Number	Mobile Phone
James P. Cinelli, PE	Professional Engineer	(610) 375-9301	(610) 633-9780
Andrew R. Fetterman, P.G.	Site Project Manager Site Safety Officer	(610) 375-9301	(610) 310-5305
Raphael J. Rosenbaum	Project Scientist II	(212) 255-0374	(917) 690-6778

5. SITE HEALTH & SAFETY RISK ANALYSIS

The known contaminants at the site include SVOCs and metals in shallow soils and historic fill material, as well as CVOCs in soil vapor.

5.1 KNOWN AND EXPECTED CONTAMINANTS OF CONCERN

Based on the results of the RI, the contaminants of concern in soil are:

- SVOCs including benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded Unrestricted Use SCOs. SVOCs including benzo(a)pyrene and dibenzo(a,h)anthracene exceeded Restricted Commercial Use SCOs
- Metals including copper and zinc were detected above Unrestricted Use SCOs. Metals including arsenic, barium, lead, mercury and zinc were detected above Restricted Commercial Use SCOs.

Table 1 presents a listing of chemical compounds and potential physical hazards that are potentially present in the work area. Threshold Limit Values (TLVs) and Permissible Exposure Limits (PELs) are referenced in this table. When the TLV and PEL values differ, the more stringent values will be used. The substances listed have been selected for informational purposes, and are intended to provide a framework for the development of relevant exposure information that is easily recognizable by field personnel. This list is not all-encompassing, but is meant to serve as a guide for assessing exposure potential, possible routes of exposure, symptoms of overexposure, and relevant chemical-specific and physiologic information.

Specific action levels have been established for personnel involved in the RA field activities. These action levels apply to all on-site personnel. The action levels presented in Tables 2 and 3 below shall apply to site-related activities, and are to be observed by the RAC when determining the need to upgrade the required level of Personal Protective Equipment (PPE).

Table 1
Chemical Compounds & Potential Physical Hazards

Compounds of Concern	Physical Hazard	ACGIH TLVs	OSHA PELs
Benzo(a)anthracene	Inhalation, Ingestion, Skin/Eye Contact	0.2 mg/ M ³	0.2 mg/ M ³
Benzo(a)pyrene	Inhalation, Ingestion, Skin/Eye Contact	0.2 mg/ M ³	0.2 mg/ M ³
Benzo(b)fluoranthene	Inhalation, Ingestion, Skin/Eye Contact	Not Established	Not Established
Benzo(k)fluoranthene	Inhalation, Ingestion, Skin/Eye Contact	Not Established	Not Established
Chrysene	Inhalation, Ingestion, Skin/Eye Contact	0.2 mg/ M ³	0.2 mg/ M ³
Dibenzo(a,h)anthracene	Inhalation, Ingestion, Skin/Eye Contact	0.2 mg/ M ³	0.2 mg/ M ³
Indeno(1,2,3-cd)pyrene	Inhalation, Ingestion, Skin/Eye Contact	0.2 mg/ M ³	0.2 mg/ M ³
Arsenic	Inhalation, Ingestion, Skin/Eye Contact	0.01 mg/ M ³	0.01 mg/ M ³
Barium	Inhalation, Ingestion, Skin/Eye Contact	0.5 mg/ M ³	0.5 mg/ M ³
Copper	Inhalation, Ingestion, Skin/Eye Contact	0.05 mg/ M ³	1.0 mg/ M ³
Lead	Inhalation, Ingestion, Skin/Eye Contact	0.05 mg/ M ³	0.05 mg/ M ³
Mercury	Inhalation, Ingestion, Skin/Eye Contact	0.025 mg/ M ³	0.1 mg/ M ³
Zinc	Inhalation, Ingestion, Skin/Eye Contact	Not Established	Not Established

Table 2
Personal Protection Action Levels for Airborne Particulates

Total Particulates (mg/m ³)*	Required Level of Personnel Protection
0 to 5 mg/m ³	Level D protection, with respiratory protection readily available to all personnel.
5 mg/m ³ to 250 mg/m ³	Level C protection, with goggles and full-face respirator equipped with high-efficiency dust filters.
Greater than 250 mg/m ³	Suspend activities.

*Action levels assume a worst-case condition for airborne particulates. Action levels are based on the protection factors assigned to the specified respirators.

6. PERSONAL PROTECTIVE EQUIPMENT

All personnel must be provided with appropriate personal safety equipment and protective clothing, as described herein. Each individual will be properly trained in the use of this safety equipment before the start of field activities. Safety equipment and protective clothing shall be used as directed by the SSO. All such equipment and clothing will be cleaned and maintained in proper condition by project personnel. The SSO will monitor the maintenance of personnel protective equipment to ensure proper procedures are followed.

Personal protective equipment will be worn at all times, as designated by the HASP. All personnel coming in contact with the waste materials, removal activities, sampling, and other contact shall don Level D personal protective equipment at project start-up. The level of protection to be worn by field personnel will be defined and controlled by the SSO. When more than one hazard area is indicated during site operations, further delineation of the hazards shall be provided by the SSO after a complete review of operational requirements, operational conditions, and/or monitoring at the particular operations being conducted. Protection may be upgraded according to site-specific monitoring and action levels. Personnel may upgrade PPE, if warranted by conditions, without prior approval provided no additional hazards are posed (e.g., heat stress).

The HASP has been designed to allow for upgrading or downgrading the level of PPE to conservatively preclude any potential for human exposure. The SSO is solely responsible for determining the levels of PPE to be used during on-site activities, and has the option to upgrade the level of PPE protection based on air monitoring results or potential contact with contaminated media. Additionally, in some instances it may be appropriate to suspend work operations until particulate concentrations in the work area attenuate. Table 4 provides a summary of the anticipated PPE requirements.

**Table 3
Summary of Personal Protective Equipment Requirements**

Site Activity	Location	PPE Required
Site Preparation	Sitewide	Level D
Soil and Waste Excavation/Removal/Handling	Sitewide	Level D
Soil and Waste Staging/Opening/Sampling	Sitewide	Level D
Drum Sealing/Overpacking/Storage	Sitewide	Level D
Site Restoration	Sitewide	Level D
Equipment Decontamination	Sitewide	Level D
Post-Excavation Soil Sampling	Sitewide	Level D

Basic emergency equipment (i.e., first-aid kit, fire extinguisher, etc.) as appropriate will also be available in the field vehicle(s) and field office(s), as appropriate, during the performance of waste removal field activities.

The personal protective equipment levels designated below are in conformance with EPA criteria for Level B, C, and D protection. All respiratory protective equipment used will be approved by the National Institute of Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA).

6.1 “MODIFIED LEVEL C” PROTECTION

The SSO may require an upgrade of PPE from Level D to Modified Level C, if site conditions change mandating an upgrade of PPE.

- A. Chemical-resistant clothing (Tyvek®, Poly-coated Tyvek® or Saranex®). Suits will be one piece with hoods, booties and elastic wrist bands.
- B. Outer nitrile gloves and inner latex surgical gloves.
- C. Leather boots with rubber overboots.
- D. Options as required:
 - 1. Coveralls
 - 2. Disposable outer boots
 - 3. Face shield
 - 4. Hearing protection
 - 5. Safety glasses

6.2 LEVEL "D" PROTECTION

- A. Coveralls or long sleeve shirts and long pants.
- B. Outer nitrile gloves at a minimum for all material handling activities. Inner latex surgical gloves are recommended where practical.
- C. Steel-toed leather boots with rubber overboots.
- D. Hard hat.
- E. Safety glasses.
- F. Level C protection readily available.
- G. Options as required:
 - 1. Disposable outer boots.
 - 2. Hearing protection.
 - 3. Chemical-resistant gloves.

This HASP is intended to provide appropriate protection to individuals during planned drum removal activities such as decontamination of personnel and equipment, site layout, general preparatory activities, etc.

7. MEDICAL MONITORING

The Occupational Safety and Health Administration (OSHA) has established requirements for a medical surveillance program designed to monitor and reduce health risks for employees potentially exposed to hazardous materials (29 CFR 1910.120). This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations including field activities, and to determine his/her ability to wear personal protective equipment, such as chemical-resistant clothing and respirators. Employees who wear or may wear respiratory protection must be provided respirators as regulated by 29 CFR 1910.134. This Standard requires that an individual's ability to wear respiratory protection be medically certified before he/she performs designated duties. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the most stringent of the two will be enforced. Site activities are not expected to require the use of respiratory protection, therefore workers will not need to provide documentation of respiratory fitness. If respiratory protection is required, all medical requirements for respiratory protection will be implemented before site activities continue.

The medical examinations must be administered on a pre-employment and annual basis, and as warranted by symptoms of exposure or specialized activities. These examinations shall be provided by employers without cost or loss of pay to the employee. For the purposes of this Health and Safety Plan, all subcontractors shall assume the employer's responsibility in obtaining the necessary medical monitoring and training for their employees pursuant to this section of 29 CFR 1910.120.

The examining physician is required to make a report to the employer of any medical condition which would place such employees at increased risk of wearing a respirator or other personal protective equipment. Each employer engaged in site work shall assume the responsibility of maintaining site personnel medical records as regulated by 29 CFR 1910.120 where applicable. Exemption from the medical surveillance program may be allowed by the Manager of Safety and Health or his designee. These exemptions will be based on his interpretation of the requirements of 1910.120 relative to each individual exemption request.

All employees contracted to work at the site designated by this Plan will be responsible to insure their employees have received the proper medical tests as regulated by 29 CFR 1910.120 and shall provide the contractor with certifications.

Exit physicals will generally be required upon termination of employment for individuals working under the 29 CFR 1910.120 medical surveillance program, unless that individual has received a physical within the previous six months. Exit physicals may also be required at the completion of hazardous waste site work for workers who will no longer be working under the 29 CFR 1910.120 medical surveillance program.

All contractor and subcontractor personnel are required to participate in a medical surveillance program provided by a licensed qualified physician. The qualified physician will determine what tests and procedures are appropriate for the job description. The typical examination consists of the following:

- Medical History and Physical, including:
 - Medical questionnaire
 - Completion of medical history with occupational risk factor analysis
 - Examination by physician
 - Evaluation of test results
 - Brief report sent to employer covering specific requested areas as well as pertinent positive findings; report sent to family physician and employee by request
 - Pulmonary Function Testing (FEV₁, FVC)
 - EKG (12-lead)
- Lab tests, including:
 - Urinalysis
 - Blood "Chemzyme" Analysis (Chem 18)
 - Coronary Risk Screen
 - Complete Blood Count with differential
 - Audiometric testing (full-time field personnel only) - supervised by board-certified staff otolaryngologist

- Visual Acuity and Tonometry (full-time field personnel only) - supervised by board-certified staff ophthalmologist

Contractor and subcontractor personnel must maintain an accurate file of all medical records, and record personnel exposure monitoring data as required by Subpart C of 29 CFR 1910.120 (Occupational Safety and Health Administration regulations). These files should be made available for authorized individuals only to review.

Contractor and subcontractor personnel will be required to document their compliance with the applicable Medical Surveillance program requirements. Proof of medical monitoring will be provided to the SSO and will be required prior to subcontractor personnel going on site.

7.1 REQUIRED HEALTH AND SAFETY TRAINING

At a minimum, all applicable employees must meet the training requirements specified in 29 CFR 1910.120 by having been trained in the areas listed below. Contractors and subcontractors must acknowledge their compliance to the training requirements by providing certifications.

- Site Safety Officer and Site Management Responsibilities - personnel must understand Site Safety Officer and Site Management their role on the site, responsibilities and authority.
- Site-Specific Health and Safety Hazards - personnel must be informed of specific potential hazards related to the site and site operations. Prior to the start of construction activities, Contractor shall submit to Owner's representative a page signed by all on-site personnel indicating that they have read, understand, and shall conform to the requirements of the Health and Safety Plan.
- Personal Protective Equipment - personnel must be trained in proper use of personal protective equipment.
- Safe Work Practices/Engineering Controls - personnel must be informed of appropriate work practices and engineering controls that will reduce the risk of exposure to potential site hazards.

- Safety Equipment Use - personnel must understand the use of monitoring instruments and other safety equipment.
- Medical Surveillance Program - personnel must be informed of requirements for medical surveillance of hazardous waste site employees.
- Site Control Methods - personnel must understand site methods used to reduce exposure to on-site and off-site personnel, and must observe the established safety zones on-site.
- Decontamination Procedures - personnel must be trained in proper decontamination operations and procedures for personnel.
- Emergency Response - personnel must be trained in proper emergency response operations and procedures, and be able to access associated emergency contact numbers.
- Confined Space Entry/Special Hazards - personnel involved in specific hazardous activities, such as confined space entry and drum handling, must receive training in appropriate techniques to employ during such operations.

All on-site personnel will attend a safety and logistics briefing by the SSO before the commencement of field activities. Brief safety and logistics meetings will be held daily prior to the start of work for that day. As necessary, end of day meetings should be held to discuss safety and other issues.

8. HEALTH & SAFETY PROTOCOLS DURING SITE OPERATION

8.1 AIR MONITORING PROGRAM

Field activities associated with redevelopment activities may create potentially hazardous conditions, such as the release of compounds into the breathing space or contact with contaminated media. Airborne contaminant monitoring will be accomplished by several methods. The monitoring shall be conducted in a manner that will assess contaminant concentrations in the worker breathing zone and along the exclusion zone perimeter. These monitoring results will be the basis for PPE selection.

8.1.1 AIR MONITORING

A particulate meter will be used to measure the amount of dust present if visible dust clouds are noticed, or as required by the SSO. A Real-time Airborne Particulate Meter (RAM) may be utilized to monitor the breathing zone for dust in the workspace or surrounding area. Dust is not anticipated to be a problem within the work area.

If monitoring is implemented, results may indicate the need for more accurate personal exposure monitoring. The SSO, after consultation with an industrial hygienist, will make the determination of the need for personal exposure monitoring based upon screening results, likely exposure duration, and work operations.

8.2 SITE SAFETY ZONES

Site safety zones will be established for the performance of field activities. These locations may be subject to modification by the SSO dependent upon the type of activity performed, levels of contaminants encountered, air monitoring, etc.

Exclusion Zone - The area immediately surrounding any sampling or construction activity, as designated by the SSO, will be considered the Exclusion Zone (EZ). All entry/egress from this area will be through a single entry/exit point established in an upwind direction from the proposed activity. The EZ will not be accessed from any other direction or location without

explicit approval of the SSO, or unless an emergency situation has developed which necessitates immediate evacuation of the work area (contaminant release, fire, explosion, etc.). The proper levels of PPE will be worn at all times, as specified by the SSO, within the EZ. Only authorized personnel are permitted in the EZ.

Contaminant Reduction Zone - A primary Contaminant Reduction Zone (CRZ), designed to ensure the proper decontamination of all equipment entering and leaving the primary areas of RA activities, will be initially established immediately south of the EZ. An open area will serve as the decontamination pad for heavy equipment (backhoes, etc.) and sampling equipment. Materials storage will not be permitted within the CRZ. Certain equipment decontamination activities (including sampling equipment decontamination) will be performed in a separate portion of the CRZ. Sample containers and sampling equipment will be stored within the CRZ. Additionally, the proper levels of PPE will be worn at all times, as specified by the SSO, within the primary CRZ.

Support Zone - The Support Zone (SZ) will be initially established at the south end of the site, and will be used to stage support vehicles, emergency communication equipment, first-aid supplies, and other equipment needed to monitor or perform site sampling activities. This area will be thoroughly marked, and will remain as the "clean" area through strict enforcement of the decontamination procedures by the SSO. This area will also be used as an assembly point for on-site project personnel in the event of an evacuation from the EZ.

8.3 SITE COMMUNICATIONS

Telephones - A telephone shall be available at the site for communication with emergency support services/facilities.

Hand Signals - To be employed by downrange field teams, along with using the buddy system. These signals are also very important when working with heavy equipment (where audio contact may be difficult or impossible).

- Hand signals shall be known by the entire field team before operations commence and shall be covered during site-specific training and briefings.

- Hand gripping throat - out of air; cannot breath;

- Grip partner's wrists or place both hands around waist - leave immediately;
- Hands on top of head - need assistance;
- Thumbs up - OK; I am all right; I understand;
- Thumbs down - no; negative.

8.4 SITE ACCESS/SITE CONTROL

Access to the active work areas will be limited to only trained and authorized personnel, including work personnel, RAC personnel, State and Federal regulatory agency personnel, and designated client representatives. All persons who enter the immediate work area(s) will be required to follow sign-in procedures, as needed. Each worker is responsible to sign, indicate the time in and out, and indicate the intended work area on the Authorized Site Personnel List, held by the SSO or his designee. The Site Superintendent will be responsible for ensuring that this sign-in procedure is implemented and documented correctly in the site logbooks.

Access into established zones, including the EZ and CRZ will be limited to only those personnel wearing the appropriate PPE and those adequately trained and medically approved for their assignments.

Site control considerations dictate that specific procedures be followed to ensure adequate site control, so that persons who may be unaware of existing site conditions are informed of the possibility of being exposed to inherent site hazards. All heavy equipment shall be stored in a secured area upon the completion of each day's activities. Any excavations left unfilled and unattended by project personnel will be appropriately barricaded and visibly posted with the appropriate warning signs, temporary fencing, or necessary access restrictions and safety precautions. Additionally, all potentially contaminated materials generated during performance of the RA activities will be handled appropriately and placed in a secure area to prevent unauthorized access or tampering.

8.5 HEALTH AND SAFETY VIOLATION POLICY

Health and safety procedures have been established to protect site personnel and to prevent the spread of substances of concern. Therefore, it is imperative that all personnel adhere to the procedures outlined in this Health and Safety Plan and those issued by the SSO. Because of the potentially grave consequences as a result of personnel not complying with the health and safety procedures, a worker dismissal policy has been established.

Site employees are subject to site dismissal by the SSO or his designated representative based on a maximum of three minor health and safety violations of the same nature. Major violations may be subject to immediate dismissal at the discretion of the SSO. The procedure outlined below is applicable to all site personnel, regardless of position. A more stringent policy may be adopted by the employer or the SSO, although on-site personnel will be informed of any changes to the policy presented below.

- 1st violation: The worker is verbally instructed in the proper procedure and the offense is noted in the health and safety file. The worker's foreman or immediate supervisor is given written notice of these actions within 24 hours.
- 2nd violation: The worker is verbally instructed in the proper procedure and warned that the next offense will constitute grounds for dismissal from the site. The offense and warning are noted in the health and safety file. The worker's foreman or immediate supervisor will be given written notice of these actions within 24 hours.
- 3rd violation: The worker is given verbal and written instruction to depart the site following proper termination procedures (i.e. the turning in of company gear, reporting to foreman, setting up exit physical, etc.). The violation and termination action is noted in the health and safety file. The worker's foreman or immediate supervisor will receive immediate verbal notice and written notice within 24 hours of the dismissal.

If an employee wishes to contest a violation ruling, the employee shall do so through his/her foreman or immediate supervisor. The SSO or designated representative shall consider all points and either keep or rescind the original violation ruling.

8.6 DECONTAMINATION GENERAL CONSIDERATIONS

Personnel involved with hazardous material handling may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Personnel may come in contact with vapors, gases, mists, or particulates in the air, or may come in contact with site media while performing work tasks. Use of monitoring instruments and equipment can also result in exposure to hazardous substances.

In general, personnel decontamination involves scrubbing with a non-phosphate soap/water solution followed by clean water rinses. This rinse water will be drummed and staged on-site pending proper disposal. All disposable PPE items will be placed in a dry container and stored on-site at a secure location pending proper disposal. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be used again. The manufacturer's instructions should be followed in sanitizing the respirator masks. The SSO will be responsible for supervising the use and decontamination of protective equipment.

Avoidance of exposure to hazardous materials that may be at the site shall be practiced at all times during site activities. Personnel performing investigative tasks should be conscious of their potential for exposure caused by fatigue or unsafe work practices. Great care should be taken when removing potentially contaminated PPE, or when handling potentially contaminated sampling equipment, sample containers, etc.

Smoking, eating, and drinking, or other activities which promote hand to mouth contact will not be permitted in the EZ or the CRZ. Beverages for use in the event of heat stress/fatigue shall be located in the Support Zone. If work sites are far from the SZ, contaminants are minimal, and the SSO authorizes, beverages for heat stress may be located in a designated clean area of the EZ. Proper decontamination procedures for personnel entering the clean area must be followed.

9. EXCAVATION, TRENCHING, AND SHORING

The main concerns of trenching and excavation are ground control and fall prevention. Prior to excavation activities, a thorough effort will be made to determine whether underground obstructions (such as tanks, drums, utilities, water lines) or above ground hazards may be encountered. Utility lines, if encountered, will be properly supported during excavation. The appropriate utility personnel will be contacted to inform them of the proposed site excavation work and to receive any additional advice based on their experience. Natural hazards such as boulders and trees will be removed or controlled before excavation begins if it poses a hazard to workers.

The walls and faces of all excavations to which employees are exposed will be guarded by a shoring system, a sloping of the ground, or another equivalent means. All slopes should be excavated to a degree which accommodates the ground's unique ability to slide. Soil types listed below from most likely to least likely to slide:

- well-rounded loose sand,
- compacted sharp sand,
- average soils,
- compact angular gravel, and solid rock, shale, or
- cemented sand and gravels.

Not all excavations need to be shored or sloped. The purpose of these precautions is to prevent crushing injury or suffocation. Banks more than five feet high will be laid back to a stable slope based on ground type. Preliminary inspections of the site indicate a Type A soil (silty clay loam), for which a sideslope of 1 ½ to 1 is acceptable. A licensed Professional Engineer's approval must be obtained if steeper slopes are to be used. Walkways, sidewalks and runways will be free of excavated materials to prevent falls; planks used for raised walkways will be securely fastened at each end.

Additional precautions will be taken to prevent slides or cave-ins when trenches or excavations are made near backfilled excavations or where excavations are subject to external vibrations such as railway or highway traffic or machinery. Rainstorms may seriously compromise the

stability of excavation surfaces; a competent person will ensure that no weather-related decrease in safety has occurred.

Diversion ditches, dikes, or other suitable means will be used as necessary to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water will not be allowed to accumulate in an excavation. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation will be braced as necessary to resist the extra pressure from such loads. When mobile equipment is used next to excavations, substantial stop logs or barricades will be installed. If possible, the grade will be away from the excavation.

9.1 SOIL HAULING AND HANDLING

Soil excavation and placement into trucks or roll-off containers for the purpose of offsite hauling and disposal shall adhere to their respective weight limits for transport on public roadways. Transportation manifests and truck logs shall be updated as trucks leave the site. The RAC shall be responsible for the condition of the trucks and roll-off containers along with the weights and documentation of the materials being hauled.

10. EMERGENCY PROCEDURES CONTINGENCY PLAN

In the event of an emergency during implementation of field activities, the telephone contact numbers, as provided on Table 4, shall be readily available to all field personnel. A copy of these numbers shall be posted conspicuously near the telephones in the field vehicles and/or field offices (as applicable), and shall also be in the possession of the SSO and monitoring personnel.

Table 4
Emergency Contact Telephone Numbers

Emergency Contacts	Person or Agency	Telephone
Police:	Brooklyn Police Department	911 (718) 963-5311
Fire:	NYC Fire Department	911
Ambulance:	--	911
Hospital:	Woodull Medical Center	General: (718) 963-8000 Emergency Care: 911
NYC DEP	General Information	311
Project Manager	Andrew Fetterman – Liberty Environmental, Inc.	(610) 375-9301 (Office)

10.1 INCIDENT REPORTING PROCEDURES

Adherence to this site-specific Health and Safety Plan, and any additional safety rules and regulations, will significantly reduce the likelihood of personnel being exposed to toxic substances above permissible exposure limits. However, in the event an incident does occur, it is imperative that specific reporting procedures be followed so that appropriate corrective action can be taken by the SSO and the Project Manager. Upon notification of an incident, the SSO will contact the appropriate medical personnel (Occupational Health and Safety physicians) for recommended medical diagnosis and, if necessary, treatment. The chemical data provided in the HASP will be given to the physician to help aid in determining the appropriate medical treatment.

If required, the physician may also request a copy of applicable Material Safety Data Sheets (MSDSs) to further aid in the diagnosis.

The Project Manager and the SSO will investigate facility/site conditions to determine: (1) whether and at what levels the incident actually occurred, (2) the cause of the incident, and (3) the means to prevent the incident from recurring.

An Incident Report Form has been developed so that consistent and appropriate information is obtained regarding employee exposures. The form will be completed by the SSO and the exposed individual. The form will be filed with the employee's medical and safety records to serve as documentation of the incident and the actions taken. Also, a copy of this form will be submitted the Project Manager.

A meeting will be conducted prior to the start of field activities to develop an appropriate notification or call down procedure for incident/emergency response. This call down procedure will be posted at the site. The Contractor shall be trained on the specifics of Site emergency procedures at this time; appropriate elements of these procedures shall be incorporated into the Contractor's call down procedure.

10.2 EMERGENCY RESPONSE PROCEDURES

In the event of an emergency, the SSO will assume responsibility for coordinating the response to all emergencies. The SSO responsibilities will also include:

1. Notification of appropriate individuals and/or authorities required for initial assistance or response;
2. Notification of the Project Manager and the Site Representative;
3. Ensuring that the following safety equipment is available at all times at the site: eyewash station, first aid supplies, and fire extinguishers;
4. Having a working knowledge of all safety equipment available at the site;
5. Ensuring that a map which details the most direct route to the nearest hospital is prominently posted on-site, in addition to the emergency telephone numbers; and
6. Conducting a follow-up investigation of the incident as appropriate.

10.3 ACCIDENTS AND INJURIES

In the event of a safety or health emergency at the site, appropriate emergency measures will immediately be taken to assist those who have been injured or exposed and to protect others from hazards. The SSO will be immediately notified, and will respond according to the seriousness of the injury. Personnel trained in first-aid will be present at all times during site activities to provide appropriate treatment of injuries or illness incurred during operations. The Project Manager will be immediately informed of any serious injuries. The project field personnel shall take the injured party and transport (if possible) to the nearest hospital for treatment, after determining whether personnel decontamination can be performed on the injured party. If a particular injury precludes the possibility of personnel decontamination, the SSO shall notify all emergency personnel of the potentially contaminated PPE and provide any assistance necessary in properly decontaminating or removing the PPE. In situations of minor injuries, an injured party may be transported to the nearest hospital.

In the event of an environmental release, the field personnel shall make an initial effort to control or stop the spread of the release, if at all possible, without compromising personnel health and safety. The SSO should immediately contact the Health and Safety Manager or Plant Manager to report the release to prevent health impact to surrounding businesses.

In the event of potential fire, explosion, or other imminent hazard, the SSO shall initiate evacuation procedures using an appropriate warning device readily audible to all field personnel (i.e., walkie-talkie system, car horn, air horn, etc.) and will sound the device for a minimum of ten seconds. Field personnel will be informed of the alarm signal prior to initiation of activities. All personnel on-site will evacuate to the support zone, and will assist the SSO in controlling access to the site once the emergency evacuation has been initiated. The SSO will assist the emergency response personnel, and document all activities occurring during an evacuation or emergency in the site logbook. Should the incident affect or potentially affect areas/personnel not directly associated with the DRA activities, the SSO shall also call the appropriate emergency phone number and shall contact the contractor's representative.

10.4 DIRECTIONS TO NEAREST HOSPITAL

In the event of a serious injury to Site personnel, an ambulance shall be used for transportation to the nearest hospital if possible. In the event of minor injuries or illness, the Safety Officer/designee may elect to have the injured transported to the nearest hospital by company vehicle. If there is any doubt about the severity of the injury, an ambulance shall be used, if possible.

Directions to Reading Hospital from the site:

Existing the facility, turn right, heading southeast on Ainslie St toward Union Ave

In 0.2 mile turn right at the 3rd cross street onto Leonard Street.

In 0.7 mile turn left onto Broadway.

The Emergency Room entrance is on the right.

Woodhull Medical Center, 760 Broadway, Brooklyn, NY

10.5 OVERT PERSONNEL EXPOSURE

Generic first-aid procedures, designed to address initial actions to be taken with the victim in the event of a personnel exposure, are briefly outlined below. Typical responses to overt personnel exposure include:

Skin/Eye Contact: Use copious amounts of soap and water, and flush skin for at least 15 minutes. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eyewash and drench system (water hoses) will be provided on site at the CRZ and/or SZ as appropriate. Eyes should be rinsed for 15 minutes after contact with any chemical contamination.

Inhalation Exposure: Move to fresh air immediately and/or, if necessary, decontaminated and transport to hospital.

Accidental Ingestion: Contact the American Association of Poison Control Centers at (800) 222-1222, and perform PPE decontamination and transport to emergency medical facility.

11. ADDITIONAL HEALTH & SAFETY PRECAUTIONS AND PROCEDURES

11.1 HEAT STRESS OR COLD EXPOSURE

The timing of this project may be such that heat stress or cold exposure may pose a threat to the health and safety of site personnel. Work/rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat stress or cold exposure. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce these temperature-related hazards. The work/rest regimens will be developed following the guidelines in the ACGIH Threshold Limit Values and Biological Exposure Indices.

11.2 HEAT STRESS

The following should be used as guidelines in controlling heat stress. The SSO has the responsibility to monitor heat stress throughout each day and to make work/rest recommendations as appropriate. All workers are expected to follow the work/rest cycles.

Heat stress decisions will be based mostly on physiological measurements (pulse rate, skin temperature) and environmental measurements by the Wet Bulb Globe Temperature (WBGT) monitors. As noted in the American Conference of Governmental Industrial Hygienists (ACGIH) 1992-1993 “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices”, measurement of body temperature is impractical for monitoring a worker’s heat load. Therefore, measurement of environmental factors is required. The ACGIH states that the WBGT is the simplest and most suitable technique to measure environmental factors. Additional environmental data will also be recorded daily and considered in heat stress evaluations.

Initially, work/rest cycles will be established using pulse rates and the guidelines on Table 1. The work/rest schedule may be modified at the discretion of the SSO. The work/rest schedule is based upon guidance set by the ACGIH along with the professional judgment of the responsible Industrial Hygienist. The WBGT readings in the table are actual readings, no additional factors should be added:

Table 5
Work/Rest Schedule During the Use of Personal Protective Equipment

<i>Level of Personal Protective Equipment</i>	<i>WBGT (°F)</i>	<i>Work/Rest (Minutes)</i>
Levels B and C	<72.6	Normal
	72.5-75.92	60/15
	76.1-79.52	45/15
	79.7-84.92	30/30
	85.1-86.72	15/45
	86.9-89.6	15/60
	>89.6	Cease Work
Level C Modified (No Respirator Required)	<75.2	Normal
	75.2-78.62	60/15
	78.8-82.22	45/15
	82.4-87.62	30/30
	87.8-89.42	15/45
	89.6-92.3	15/60
	>92.3	Cease Work
Level D	<78.44	Normal
	78.44-81.5	60/15
	81.68-85.28	45/15
	85.46-90.5	30/30
	90.68-92.30	15/45
	92.48-95.36	15/60
	>95.36	Cease Work

11.3 DAILY PROTOCOL

- WBGT Readings will be taken:
 - at the beginning of the workday
 - mid-morning
 - noon
 - mid-afternoon
 - at the end of the workday
- WBGT readings will be taken at least at all major work areas and at outside rest stations.

- At the SSO's discretion employee body weights (semi-nude) will be taken immediately before work and at the end of the workday. If the weight loss exceeds 1.5%, the worker should be told to drink more liquids during that evening and the following workdays. The worker will also be monitored during the next few workdays to insure the weight loss does not continue at an unacceptable rate.
- Pulse rates will be monitored routinely throughout the workday, frequency depending upon WBGT readings. At minimum, the most active member of each work crew will be monitored during the first two breaks in the morning and the first break after lunch.
 - Pulse rates will be taken as follows:
 - At the end of a cycle of work, the worker goes to a nearby location and sits on a stool or straight chair. At the moment he is seated the observer starts a stopwatch. At 30 seconds the observer begins a pulse count, having previously palpate the radial pulse. This count is continued until one minute. The 30-second count is multiplied by 2 and recorded as "P₁"
 - if P₁ exceeds 120, an additional pulse will be taken starting at 2 minutes, 30 seconds to 3 minutes; multiplied by 2 and recorded as P₃.
- Pulse rates readings:
 - 120 and below (P₁) - Worker will be allowed to continue the scheduled work/rest cycle.
 - Exceeding 120 (P₁) - Worker will remain in the rest area until pulse rate returns to 90, or below; additional monitoring will depend upon the pulse rate recovery.
- Pulse rate recovery - for individual with P₁ greater than 120.

<u>Patterns</u>	<u>P₃</u>	<u>P₁-P₃</u>
Satisfactory (S)	<90	-
High (H)	≥90	≥10
No recovery (N)	≥90	<10

- Satisfactory patterns need no further comment.
- High recovery patterns indicate work at a high metabolic level with little or no accumulated body heat. Individuals showing this condition should be monitored during the next breaks while work periods are reduced until P₁ is 120 or below.
- No recovery patterns indicate too much personal stress. Individuals showing "no recovery" heart rate patterns return to the decon trailers and rest for a period no less than

one hour. The SSO must monitor the workers and determine if additional medical assistance is needed.

- Fluid intake should be encouraged for workers throughout the day. Workers should frequently drink small amounts; the equivalent of one cup every 15-20 minutes. Workers should also be encouraged to salt their food abundantly.
- Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during the first week of exposure to hot environments. For this reason, the following work schedule applies for workers new to the site when conditions are such that controlled work/rest cycles are being used:

		<u>Suggested Maximum Work</u>
Day 1	-	2 hours
Day 2	-	3 hours
Day 3	-	4 hours
Day 4	-	6 hours
Day 5	-	8 hours

Deviations from this schedule may be done based on evaluations by the SSO.

Use sterile soft gauze or material to cover the affected area. Keep the victim warm and get medical attention.

11.4 HEAVY MACHINERY/EQUIPMENT

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. If respiratory protection and protective eyewear are worn during site activities, it may significantly reduce peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

11.5 CONSTRUCTION MATERIALS AND SITE REFUSE

All construction materials and site refuse should be contained in appropriate areas or facilities. Site personnel should make certain that fencing, cement, etc. are not scattered throughout the area of activity and that all trash and scrap materials are immediately and properly disposed.

11.6 SPILL RESPONSE PROCEDURES

Equipment failures consisting of fuel tank or fuel line breaks, oil pan ruptures, radiators or hydraulic oil line breaks may result in a release of contaminants to the ground surface. Absorbent materials will be readily available and used to soak up the spilled material if the spill occurs on a paved area. The released substance will be immediately contained and reported. Additional cleanup and excavation may be required according to State regulations. Absorbent material and PPE will be placed in a properly labeled 55-gallon drum, which will then be staged for disposal transportation. The SSO shall notify all affected personnel when the emergency spill response is complete and shall ensure that an incident report is completed.

11.7 ADDITIONAL SAFETY PRACTICES

The following important safety precautions will be enforced during this work:

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
4. No facial hair which interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure a proper seal is obtained by the wearer.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles, mud, or other discolored surfaces; kneel on ground; or lean, sit or place equipment on drums, containers, vehicles, or the ground.
6. Medicine and alcohol can potentiate the effect of exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in field activities.
7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.

8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.
10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker.
11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
13. Noise mufflers on equipment and/or hearing protection for personnel may be required for all work around heavy equipment. This requirement will be made at the discretion of the SSO.
14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.
15. Self-contained breathing apparatus and air-purifying respirators will be inspected daily by the SSO.
16. All activities in the exclusion zone will be conducted using the "Buddy System". The Buddy is another worker fully dressed in the appropriate PPE, who can perform the following activities:
 - Provide his/her partner with assistance;
 - Observe his/her partner for signs of chemical or heat exposure;
 - Periodically check the integrity of his/her partner's PPE; and
 - Notify others if emergency help is needed.

12. DECONTAMINATION PROCEDURES

12.1 PERSONAL DECONTAMINATION

Personnel involved with hazardous material handling may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Personnel may come in contact with vapors, gases, mists, or particulates in the air, or may come in contact with site media while performing work tasks. Use of monitoring instruments and equipment can also result in exposure to hazardous substances. Decontamination procedures are described below.

In general, decontamination involves scrubbing with a non-phosphate soap/water solution (Alconox), followed by clean water rinses. This rinse water will be drummed, labeled and staged on-site pending proper disposal. All other disposable items will be placed in dry containers and also staged on-site pending proper disposal. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be re-used. The manufacturer's instructions should be followed in sanitizing the respirator masks. The SSO will be responsible for supervising the use and decontamination of proper protective equipment.

12.2 STANDARD PPE DECONTAMINATION

The SSO will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the SSO observations.

12.3 EQUIPMENT DECONTAMINATION

Prior to leaving the EZ, all vehicles will be decontaminated by spraying or dry scrubbing all soil from the wheels and undercarriage. This will be performed in the CRZ, in a decontamination pad. Sediment will be periodically removed from the decontamination pad and incorporated into the waste soil pile for proper disposal.

ATTACHMENT 1
CONTAMINANTS OF CONCERN NIOSH PRINTOUTS

Chemical Sampling Information / Coal Tar Pitch Volatiles (benzene soluble fraction)

Coal Tar Pitch Volatiles (benzene soluble fraction)

General Description

Synonyms: Coal tar pitch; Oil pitch; Pitch; CTPV; Coal tar distillates

Components (contains detectable quantities of one or more of the following polycyclic aromatic hydrocarbons [PAHs]): Benz[a]anthracene; Benzo[b]fluoranthene; Chrysene; Anthracene; Benzo[a]pyrene; Phenanthrene; Acridine; Pyrene

OSHA IMIS Code Number: 0700

Chemical Abstracts Service (CAS) Registry Number: 65996-93-2

NIOSH Registry of Toxic Effects of Chemical Substances (RTECS) Identification Number: GF8655000

Department of Transportation Regulation Number (49 CFR 172.101) and Emergency Response Guidebook : 1136 128

NIOSH Pocket Guide to Chemical Hazards, Coal Tar Pitch Volatiles: Chemical description, physical properties, potentially hazardous incompatibilities, and more

Exposure Limits and Health Effects

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
OSHA Permissible Exposure Limit (PEL) - General Industry See 29 CFR 1910.1000 Table Z-1	0.2 mg/m ³ TWA (benzene soluble fraction)	HE2	Lung and other tumors
OSHA PEL - Construction Industry See 29 CFR 1926.55 Appendix A	0.2 mg/m ³ TWA (benzene soluble fraction)	HE2	Lung and other tumors
OSHA PEL - Shipyard Employment See 29 CFR 1915.1000 Table Z-Shipyards	0.2 mg/m ³ TWA (benzene soluble fraction)	HE2	Lung and other tumors
National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)	0.1 mg/m ³ TWA (cyclohexane extractable fraction) Ca	HE2	Cancer of the respiratory tract, kidney, bladder, and skin
American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (2001)	0.2 mg/m ³ TWA (benzene soluble fraction)	HE2	Lung and other tumors

	A1; BEI		
CAL/OSHA PEL	0.2 mg/m ³ TWA	HE2	Lung and other tumors

Carcinogenic Classification:

National Toxicology Program (NTP) carcinogenic classification: Known to be human carcinogens (coal tars and coal-tar pitches) (PDF)

International Agency for Research on Cancer (IARC) carcinogenic classification: Group 1 (PDF) (carcinogenic to humans [coal-tar pitch])

U.S. Environmental Protection Agency (EPA) carcinogenic classification: Not listed

EPA Inhalation Reference Concentration (RFC): Not established

Agency for Toxic Substances and Disease Registry (ATSDR) Inhalation Minimal Risk Level (MRL): Not established

NIOSH Immediately Dangerous To Life or Health Concentration (IDLH): 80 mg/m³ (as the benzene soluble fraction)

Notes:

1. Coal tar pitch is combustible and decomposes when heated above 400°C, producing toxic fumes. It reacts with strong oxidants (NIOSH/IPCS 2002).
2. Researchers found a mathematical relationship between polycyclic aromatic hydrocarbon air concentrations and 1-hydroxypyrene concentration (biological monitoring) in urine. Researchers determined that coke oven workers with a urinary concentration of 1-hydroxypyrene of 2.3 µmol/mol creatinine after three work days were exposed to the coal tar pitch volatile TLV air concentration (Jongeneelen 1992).
3. Deaths have been reported from atherosclerosis among Norwegian aluminum smelter workers due to cumulative exposure to coal tar pitch volatiles (Bingham et al. 2001).

Literature Basis:

- o ACGIH: Documentation of the Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) - Coal Tar Pitch Volatiles. 2001.
- o Bingham, E., Cohrssen, B., Powell, C.H.: Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. p. 1:773, 2001.
- o California Occupational Safety & Health Standards Board: Initial (PDF) and Final (PDF) Statement of Reasons August 3, 2010.
- o Jongeneelen, F.: Biological exposure limit for occupational exposure to coal tar pitch volatiles at cokeovens. Int Arch Occup Environ Health. 63(8):511-516, 1992.
- o NIOSH: Occupational Health Guideline for Coal Tar Pitch Volatiles. 1978
- o NIOSH/IPCS: International Chemical Safety Cards - Coal Tar Pitch. March 2002.

Date Last Revised: 09/06/2012

Monitoring Methods used by OSHA

Primary Laboratory Sampling/Analytical Method (SLC1):

Sampling Media

Pre-cleaned Glass Fiber Filter (Gelman Type A/E)

maximum volume: 960 Liters

minimum flow rate: 1.5-2.0 L/min

current analytical method: Extraction-gravimetric

method reference: 2 (OSHA 58)

sampling and analytical error: 0.15

method classification: Fully Validated

note: OSHA personnel can obtain pre-cleaned filters, vials, and Teflon-lined caps from SLTC. After sampling, filter must be transferred to a vial with a Teflon-lined cap. Sample must be protected from direct sunlight. If chemicals are present that may be soluble in Benzene, such as Sulfur, please note them on the 91A form, because additional analyses may be possible to determine the extent of interference.

Bulk Method:

Notes

Limit the amount of bulk submitted to one gram or one mL.

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Enter search terms separated by spaces.

Arsenic (organic compounds, as As)

Synonyms & Trade Names Synonyms vary depending upon the specific organic arsenic compound.

CAS No.	RTECS No.	DOT ID & Guide
	Conversion	IDLH N.D. See: IDLH INDEX (/niosh/idlh/intridl4.html)
Exposure Limits NIOSH REL : none OSHA PEL : TWA 0.5 mg/m ³		Measurement Methods NIOSH 5022  (/niosh/docs/2003-154/pdfs/5022.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)  (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Appearance and odor vary depending upon the specific organic arsenic compound.

Properties vary depending upon the specific organic arsenic compound.

Incompatibilities & Reactivities Varies

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

Symptoms In animals: irritation skin, possible dermatitis; resp distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage

Target Organs Skin, respiratory system, kidneys, central nervous system, liver, gastrointestinal tract, reproductive system

Personal Protection/Sanitation (See [protection codes \(protect.html\)](#))
Recommendations regarding personal

First Aid (See [procedures \(firstaid.html\)](#))
Eye: Irrigate immediately
Skin: Soap wash immediately

protective clothing vary depending upon the specific compound.

Recommendations regarding eye protection vary depending upon the specific compound.

Recommendations regarding washing the skin vary depending upon the specific compound.

Recommendations regarding the removal of personal protective clothing that becomes wet or contaminated vary depending upon the specific compound.

Recommendations regarding the daily changing of personal protective clothing vary depending upon the specific compound.

Recommendations regarding the need for eyewash or quick drench facilities vary depending upon the specific compound.

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

Not available.

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#)

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Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

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Barium nitrate (as Ba)

Synonyms & Trade Names Barium dinitrate, Barium(II) nitrate (1:2), Barium salt of nitric acid**CAS No.** 10022-31-8**RTECS No.**
CQ9625000 (/niosh-
rtecs/CQ92DDA8.html)**DOT ID & Guide** 1446 141 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide141/>)
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** Ba(NO₃)₂**Conversion****IDLH** 50 mg/m³ (as Ba)
See: [IDLH INDEX \(/niosh/idlh/intridl4.html\)](/niosh/idlh/intridl4.html)**Exposure Limits** **NIOSH REL** *: TWA 0.5 mg/m³ [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]**OSHA PEL** *: TWA 0.5 mg/m³ [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]**Measurement Methods****NIOSH 7056** (/niosh/docs/2003-154/pdfs/7056.pdf);**OSHA ID121**(<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>) (<http://www.cdc.gov/Other/disclaimer.html>)See: [NMAM \(/niosh/docs/2003-154/\)](/niosh/docs/2003-154/) or [OSHA Methods](http://www.osha.gov/dts/sltc/methods/index.html)(<http://www.osha.gov/dts/sltc/methods/index.html>) (<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** White, odorless solid.**MW:**
261.4**BP:**
Decomposes**MLT:**
1094°F**Sol:**
9%**VP:** Low**IP:** ?**Sp.Gr:**
3.24**Fl.P:** NA**UEL:** NA**LEL:**
NA

Noncombustible Solid, but will accelerate the burning of combustible materials.

Incompatibilities & Reactivities Acids, oxidizers, aluminum-magnesium alloys, (barium dioxide + zinc) [Note: Contact with combustible material may cause fire.]**Exposure Routes** inhalation, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia**Target Organs** Eyes, skin, respiratory system, heart, central nervous system**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](http://www.cdc.gov/niosh/npg/protect.html))**Skin:** Prevent skin contact**Eyes:** Prevent eye contact**Wash skin:** When contaminated**Remove:** When wet or contaminated**Change:** Daily**First Aid** (See [procedures \(firstaid.html\)](http://www.cdc.gov/niosh/npg/firstaid.html))**Eye:** Irrigate immediately**Skin:** Water flush immediately**Breathing:** Respiratory support**Swallow:** Medical attention immediately

Respirator Recommendations**NIOSH/OSHA****Up to 5 mg/m³:**

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 12.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 25 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [1480 \(/niosh/ipcsneng/neng1480.html\)](#)

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Copper (dusts and mists, as Cu)

Synonyms & Trade Names Copper metal dusts, Copper metal fumes

CAS No. 7440-50-8	RTECS No. GL5325000 (/niosh-rtecs/GL5140C8.html)	DOT ID & Guide
Formula Cu	Conversion	IDLH 100 mg/m ³ (as Cu) See: 7440508 (/niosh/idlh/7440508.html)
Exposure Limits NIOSH REL *: TWA 1 mg/m ³ [*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.] OSHA PEL *: TWA 1 mg/m ³ [*Note: The PEL also applies to other copper compounds (as Cu) except copper fume.]		Measurement Methods NIOSH 7029 (/niosh/docs/2003-154/pdfs/7029.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf); OSHA ID121 http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html (http://www.cdc.gov/Other/disclaimer.html), ID125G http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods http://www.osha.gov/dts/sltc/methods/index.html http://www.cdc.gov/Other/disclaimer.html

Physical Description Reddish, lustrous, malleable, odorless solid.

MW: 63.5	BP: 4703°F	MLT: 1981°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 8.94	Fl.P: NA	UEL: NA	LEL: NA		

Noncombustible Solid in bulk form, but powdered form may ignite.

Incompatibilities & Reactivities Oxidizers, alkalis, sodium azide, acetylene**Exposure Routes** inhalation, ingestion, skin and/or eye contact**Symptoms** irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia**Target Organs** Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](http://www.cdc.gov/niosh/npg/npgd0150.html))**First Aid** (See [procedures \(firstaid.html\)](http://www.cdc.gov/niosh/npg/npgd0150.html))
Eye: Irrigate immediately

Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 5 mg/m³:

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.*

Up to 10 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.*

(APF = 10) Any supplied-air respirator*

Up to 25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.*

Up to 50 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 100 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0240](#)

[\(/niosh/ipcsneng/nengo240.html\)](#) See MEDICAL TESTS: [0057 \(/niosh/docs/2005-110/nmed0057.html\)](#)

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Enter search terms separated by spaces.

Lead

Synonyms & Trade Names Lead metal, Plumbum

CAS No. 7439-92-1	RTECS No. OF7525000 (/niosh-rtecs/OF72D288.html)	DOT ID & Guide
Formula Pb	Conversion	IDLH 100 mg/m ³ (as Pb) See: 7439921 (/niosh/idlh/7439921.html)

Exposure Limits **NIOSH REL** *: TWA (8-hour) 0.050 mg/m³ See [Appendix C \(nengapdx.html\)](#) [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

OSHA PEL *: [1910.1025] TWA 0.050 mg/m³ See [Appendix C \(nengapdx.html\)](#) [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods

NIOSH 7082 (</niosh/docs/2003-154/pdfs/7082.pdf>), **7105** (</niosh/docs/2003-154/pdfs/7105.pdf>), **7300** (</niosh/docs/2003-154/pdfs/7300.pdf>), **7301** (</niosh/docs/2003-154/pdfs/7301.pdf>), **7303** (</niosh/docs/2003-154/pdfs/7303.pdf>), **7700** (</niosh/docs/2003-154/pdfs/7700.pdf>), **7701** (</niosh/docs/2003-154/pdfs/7701.pdf>), **7702** (</niosh/docs/2003-154/pdfs/7702.pdf>), **9100** (</niosh/docs/2003-154/pdfs/9100.pdf>), **9102** (</niosh/docs/2003-154/pdfs/9102.pdf>), **9105** (</niosh/docs/2003-154/pdfs/9105.pdf>);

OSHA ID121

(<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>)
<http://www.cdc.gov/Other/disclaimer.html>, **ID125G**
(<http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html>)
<http://www.cdc.gov/Other/disclaimer.html>, **ID206**
(<http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html>)
<http://www.cdc.gov/Other/disclaimer.html>)

See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods**
(<http://www.osha.gov/dts/sltc/methods/index.html>)
(<http://www.cdc.gov/Other/disclaimer.html>)

Physical Description A heavy, ductile, soft, gray solid.

MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 11.34	FLP: NA	UEL: NA	LEL: NA		

Noncombustible Solid in bulk form.

Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids**Exposure Routes** inhalation, ingestion, skin and/or eye contact

Symptoms 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

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

Personal Protection/Sanitation (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: Daily

Remove: When wet or contaminated

Change: Daily

First Aid (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap flush promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

(See [Appendix E \(nengapdx.html\)](#))

NIOSH/OSHA

Up to 0.5 mg/m³:

(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 2.5 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0052 \(/niosh/ipcsneng/neng0052.html\)](#) See MEDICAL TESTS: [0127 \(/niosh/docs/2005-110/nmedo127.html\)](#)

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Search the NIOSH Pocket Guide

Enter search terms separated by spaces.

Mercury compounds [except (organo) alkyls] (as Hg)

Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.**CAS No.** 7439-97-6 (metal)**RTECS No.**
[OV4550000 \(metal\)](#)
[\(/niosh-rtecs/OV456D70.html\)](#)**DOT ID & Guide** 2809 172 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide172/>)
(<http://www.cdc.gov/Other/disclaimer.html>)(metal)**Formula** Hg
(metal)**Conversion****IDLH** 10 mg/m³ (as Hg)
See: [7439976 \(/niosh/idlh/7439976.html\)](#)**Exposure Limits** **NIOSH REL** :
Hg Vapor: TWA 0.05 mg/m³ [skin]
Other: C 0.1 mg/m³ [skin]
OSHA PEL † ([nengapdxg.html](#)): TWA 0.1 mg/m³**Measurement Methods****NIOSH 6009** ([/niosh/docs/2003-154/pdfs/6009.pdf](#));
OSHA ID140
(<http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html>)
 (<http://www.cdc.gov/Other/disclaimer.html>)
See: **NMAM** ([/niosh/docs/2003-154/](#)) or **OSHA Methods**
(<http://www.osha.gov/dts/sltc/methods/index.html>)
(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]**MW:**
200.6**BP:**
674°F**FRZ:**
-38°F**Sol:**
Insoluble**VP:** 0.0012 mmHg**IP:** ?**Sp.Gr:**
13.6
(metal)**Fl.P:**
NA**UEL:**
NA**LEL:** NA

Metal: Noncombustible Liquid

Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** 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**Target Organs** Eyes, skin, respiratory system, central nervous system, kidneys

Personal Protection/Sanitation (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: No recommendation

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

First Aid (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor:

NIOSH

Up to 0.5 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern[†]

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern[†](canister)

Up to 2.5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern[†]

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern[†]

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern

Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern[†]

(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern

Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0056](#)

[\(/niosh/ipcsneng/neng0056.html\)](#) See MEDICAL TESTS: [0136 \(/niosh/docs/2005-110/nmed0136.html\)](#)

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Zinc oxide

Synonyms & Trade Names Zinc peroxide

CAS No. 1314-13-2	RTECS No. ZH4810000 (/niosh-rtecs/ZH496510.html)	DOT ID & Guide 1516 143 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide143/) (http://www.cdc.gov/Other/disclaimer.html)
Formula ZnO	Conversion	IDLH 500 mg/m ³ See: 1314132 (/niosh/idlh/1314132.html)

Exposure Limits NIOSH

REL : Dust: TWA 5 mg/m³ C 15 mg/m³
Fume: TWA 5 mg/m³ ST 10 mg/m³
OSHA PEL † (nengapdxg.html): TWA 5 mg/m³ (fume) TWA 15 mg/m³ (total dust) TWA 5 mg/m³ (resp dust)

Measurement Methods

NIOSH [7303](/niosh/docs/2003-154/pdfs/7303.pdf) (</niosh/docs/2003-154/pdfs/7303.pdf>), [7502](/niosh/docs/2003-154/pdfs/7502.pdf) (</niosh/docs/2003-154/pdfs/7502.pdf>);
OSHA ID121
(<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>)
 (<http://www.cdc.gov/Other/disclaimer.html>), **ID143**
(<http://www.osha.gov/dts/sltc/methods/inorganic/id143/id143.html>)
 (<http://www.cdc.gov/Other/disclaimer.html>)
See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods**
(<http://www.osha.gov/dts/sltc/methods/index.html>)
(<http://www.cdc.gov/Other/disclaimer.html>)

Physical Description White, odorless solid.

MW: 81.4	BP: ?	MLT: 3587°F	Sol(64°F): 0.0004%	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 5.61	Fl.P: NA	UEL: NA	LEL: NA		

Noncombustible Solid

Incompatibilities & Reactivities Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]**Exposure Routes** inhalation**Symptoms** Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function**Target Organs** respiratory system

Personal Protection/Sanitation ([See protection codes \(protect.html\)](#))

Skin: No recommendation

Eyes: No recommendation

Wash skin: No recommendation

Remove: No recommendation

Change: No recommendation

First Aid ([See procedures \(firstaid.html\)](#))

Breathing: Respiratory support

Respirator Recommendations

NIOSH/OSHA

Up to 50 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0208](#)

[\(/niosh/ipcsneng/nengo208.html\)](#) See MEDICAL TESTS: [0246 \(/niosh/docs/2005-110/nmed0246.html\)](#)

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APPENDIX 6

Vapor Barrier Manufacturer Specifications

Yellow Guard®

20 MIL VAPOR BARRIER

Husky® Yellow Guard® premium vapor barriers are waterproofing membranes manufactured using top-quality polyethylene (polyolefin) resins. Husky® Yellow Guard® vapor barriers are manufactured to be used in contact with soil and granular fill under concrete slabs, beams, and footings, and provide exceptionally low water vapor permeance. Husky® Yellow Guard® vapor barriers are manufactured by Poly-America, an industry leader in the manufacture of polyethylene films. Poly-America utilizes state-of-the-art processing equipment.



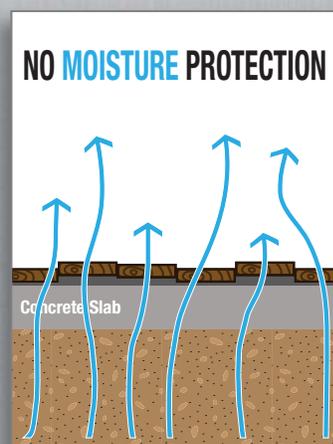
VAPOR BARRIER HIGHLIGHTS

- Developed for use as a durable vapor barrier.
- Multi-layer product formulated from top-quality polyethylene (polyolefin) resins.
- Exceeds industry-standard ASTM E 1745 Class A, Class B, and Class C specifications.
- Restricts migration of soil gases such as radon and methane.
- Exceptionally low water vapor permeance, ten times lower than industry-standard ASTM E 1745 Class A requirement.
- Manufactured by Poly-America on state-of-the-art manufacturing equipment with full-time on-line quality monitoring and routine laboratory testing.
- Maintains low water vapor permeance even after exposure to severe field conditions.
- Outstanding tensile properties and puncture resistance.
- Excellent resistance to low-temperature brittleness.
- Available nationwide.

Manufacturing Quality Control & Quality Assurance

All resins, additives, and concentrates for use in Husky® Yellow Guard® vapor barrier must meet Poly-America's stringent raw material specifications. Husky® Yellow Guard® vapor barrier is manufactured with continuous process-control monitoring and is routinely tested in Poly-America's state-of-the-art laboratory during and after production.

In addition, Husky® Yellow Guard® vapor barrier has been tested by accredited, independent laboratories to ensure that it meets ASTM E 1745 Class A, Class B, and Class C specifications.



PROPERTIES OF 20 MIL HUSKY® YELLOW GUARD® VAPOR BARRIER

Properties	Test Method	ASTM E 1745 Class A Requirements	Yellow Guard® Vapor Barrier Test Result*	Measures
Permeance	ASTM F 1249	0.1 perms	0.0073 perms/**0.0033 WVTR	Resistance to water vapor
Puncture Resistance	ASTM D 1709 Method B	2200 g	3577 g	Impact energy required to cause failure
Tensile Strength	ASTM D 882	45.0 lbf/in	101.5 lbf/in	Force required to break/rupture film
Permeance After Conditioning (ASTM F 1249)	ASTM E 154			Resistance to water vapor after:
	Section 8	0.1 perms	0.0056 perms	-wetting, drying, and soaking
	Section 11	0.1 perms	0.0066 perms	-heat conditioning
	Section 12	0.1 perms	0.0068 perms	-low-temperature conditioning
	Section 13	0.1 perms	0.0073 perms	-soil organism exposure
Thickness			20 mils	
Roll Dimensions			14 ft x 105 ft	
Roll Weight			142.4 lbs	

*All values are typical values and may vary within industry tolerances.

**WVTR (Water Vapor Transmission Rate) in g/(100 in² • day)

Perm = grains/(ft² • hr • inHg)



Installation

Installation of Husky® Yellow Guard® vapor barrier, including placement, lap joints, pipe penetrations, protection, repair, and suggested field check list, shall be in accordance with ASTM E 1643 standard practice and the project plans and specifications.

Availability

Husky® Yellow Guard® 20 mil vapor barriers are available nationwide. Visit www.yellowguard.com for more information.

Limited Replacement Warranty

Poly-America provides a limited replacement warranty on Husky® Yellow Guard® vapor barrier representing that the vapor barrier is free from material defects for a period of 1 year from the date of sale. The specific details of Poly-America's limited replacement warranty are available at <http://www.yellowguard.com/limitedwarranty.pdf>.

Poly-America

2000 W. Marshall Dr. • Grand Prairie, TX 75051

800-527-3322 • 972-337-7654 • Fax 972-337-7016 • www.yellowguard.com • yellowguard@poly-america.com

The information provided herein has been compiled by Poly-America, L.P. and to the best of our knowledge accurately represents Poly-America's Yellow Guard® vapor barriers at the time of publication. This publication is offered "as is," for preliminary planning purposes only, without any warranties of any kind. Final determination of suitability of this information or these products for the use contemplated and its manner of use is the sole responsibility of the end user. Poly-America, L.P. assumes no liability in connection with the use of this information and these products. This information is subject to change without notice.

57-023-0094 Rev 08/15

APPENDIX 7

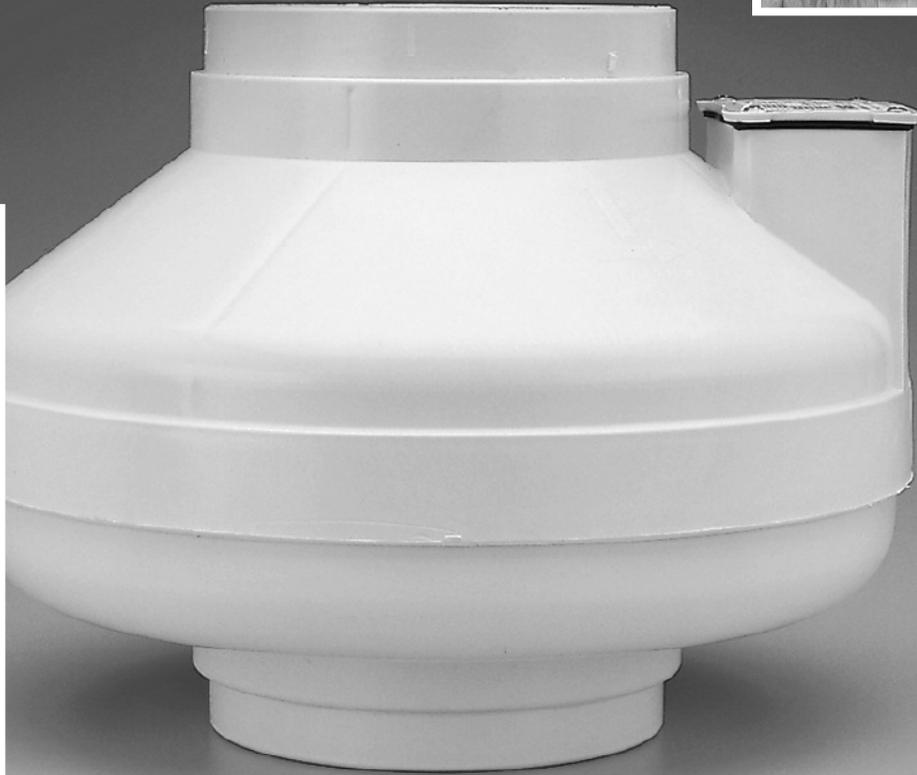
SSDS Equipment Specification Sheets



HP SERIES

FANS FOR RADON APPLICATIONS

WITH IMPROVED UV RESISTANCE!



TRUST THE INDUSTRY STANDARD. **HERE'S WHY:**

Don't put your reputation at stake by installing a fan you know won't perform like a Fantech! For nearly twenty years, Fantech has manufactured quality ventilation equipment for Radon applications. Fantech is the fan Radon contractors have turned to in over 1,000,000 successful Radon installations worldwide.



Fantech external rotor motor

FANTECH HP SERIES FANS MEET THE CHALLENGES OF RADON APPLICATIONS:

HOUSING

- UV resistant, UL Listed durable plastic
- UL Listed for use in commercial applications
- Factory sealed to prevent leakage
- Watertight electrical terminal box
- Approved for mounting in wet locations - i.e. Outdoors

MOTOR

- Totally enclosed for protection
- High efficiency EBM motorized impeller
- Automatic reset thermal overload protection
- Average life expectancy of 7-10 years under continuous load conditions

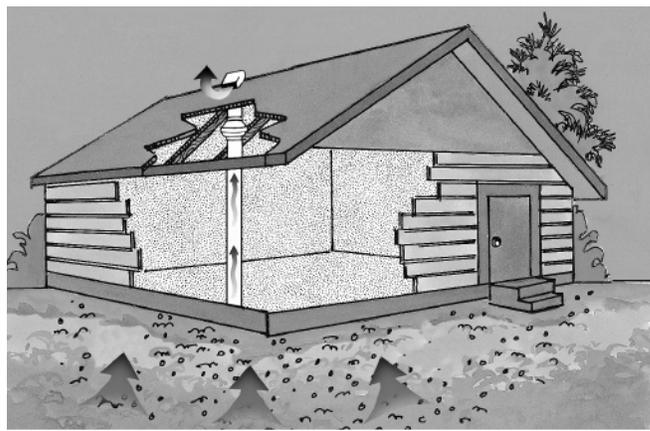
RELIABILITY

- Five Year Full Factory Warranty
- Over 1,000,000 successful radon installations worldwide



HP Series Fans are Specially Designed with Higher Pressure Capabilities for Radon Mitigation Applications

MOST RADON MITIGATORS WHO PREVIOUSLY USED THE FANTECH FR SERIES FANS HAVE SWITCHED TO THE NEW HP SERIES.



PERFORMANCE DATA

Fan Model	Volts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.								Max. Ps
				0"	0.5"	0.75"	1.0"	1.25"	1.5"	1.75"	2.0"	
HP2133	115	14 - 20	0.17	134	68	19	-	-	-	-	-	0.84
HP2190	115	60 - 85	0.78	163	126	104	81	58	35	15	-	1.93
HP175	115	44 - 65	0.57	151	112	91	70	40	12	-	-	1.66
HP190	115	60 - 85	0.78	157	123	106	89	67	45	18	1	2.01
HP220	115	85 - 152	1.30	344	260	226	193	166	137	102	58	2.46



PERFORMANCE CURVES

Fantech provides you with independently tested performance specifications.

The performance curves shown in this brochure are representative of the actual test results recorded at Texas Engineering Experiment Station/Energy Systems Lab, a recognized testing authority for HVI. Testing was done in accordance with AMCA Standard 210-85 and HVI 916 Test Procedures. Performance graphs show air flow vs. static pressure.

Use of HP Series fans in low resistance applications such as bathroom venting will result in elevated sound levels. We suggest FR Series or other Fantech fans for such applications.

HP FEATURES INCLUDE

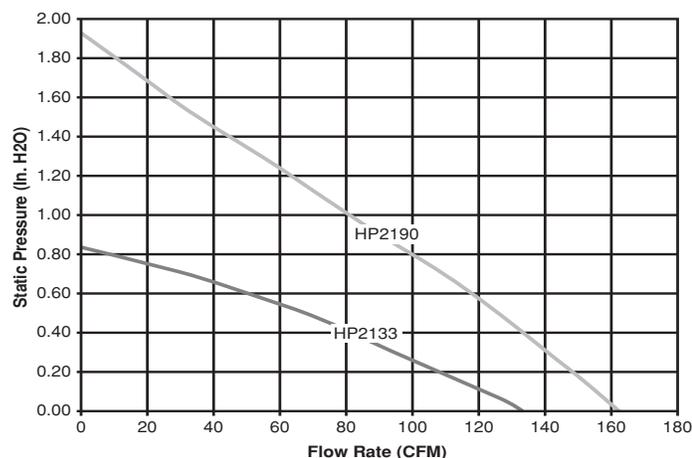
- Improved UV resistant housings approved for commercial applications.
- UL Approved for Wet Locations (Outdoors)
- Sealed housings and wiring boxes to prevent Radon leakage or water penetration
- Energy efficient permanent split capacitor motors
- External wiring box
- Full Five Year Factory Warranty



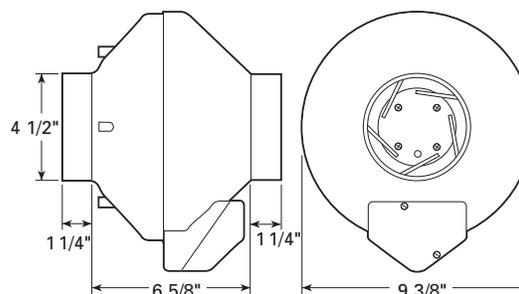
NOTE:

Installations that will result in condensate forming in the outlet ducting should have a condensate bypass installed to route the condensate outside of the fan housing. Conditions that are likely to produce condensate include but are not limited to: outdoor installations in cold climates, long lengths of outlet ducting, high moisture content in soil and thin wall or aluminum outlet ducting. Failure to install a proper condensate bypass may void any warranty claims.

HP2133 & HP2190 RADON MITIGATION FANS



Tested with 4" ID duct and standard couplings.



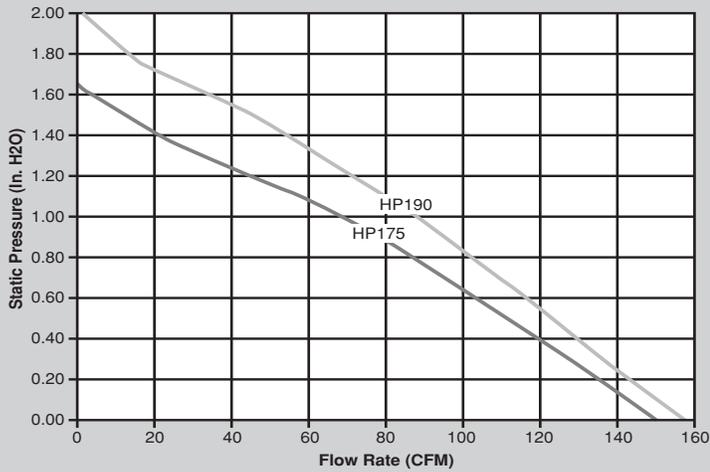
HP2133 – For applications where lower pressure and flow are needed. Record low power consumption of 14-20 watts! Often used where there is good sub slab communication and lower Radon levels.

HP2190 – Performance like the HP190 but in a smaller housing. Performance suitable for the majority of installations.

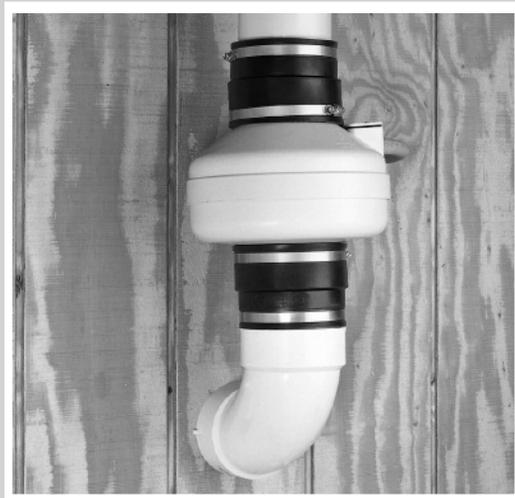
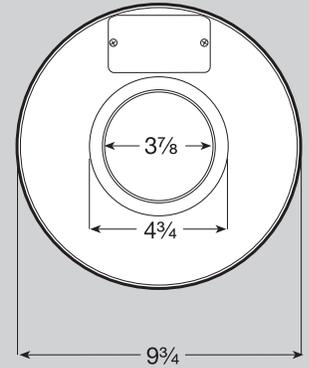
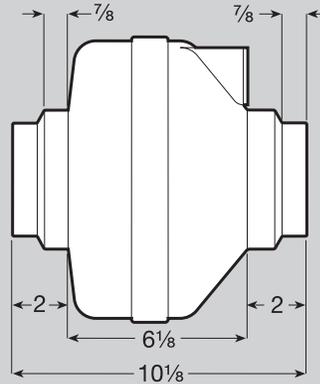
Fans are attached to PVC pipe using flexible couplings.

For 4" PVC pipe use Indiana Seals #156-44, Pipeconx PCX 56-44 or equivalent.
For 3" PVC pipe use Indiana Seals #156-43, Pipeconx PCX 56-43 or equivalent.

HP175 & HP190 RADON MITIGATION FANS



Tested with 4" ID duct and standard couplings.



HP175 – The economical choice where slightly less air flow is needed. Often used where there is good sub slab communication and lower Radon levels.

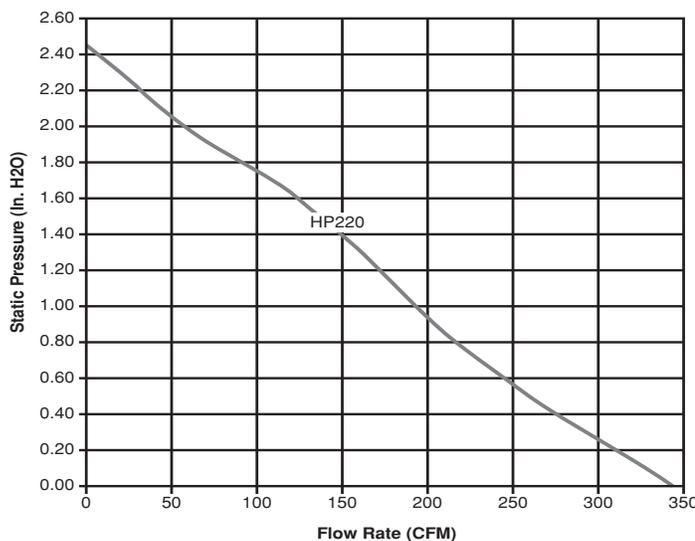
HP190 – The standard for Radon Mitigation. Ideally tailored performance curve for a vast majority of your mitigations.

Fans are attached to PVC pipe using flexible couplings.

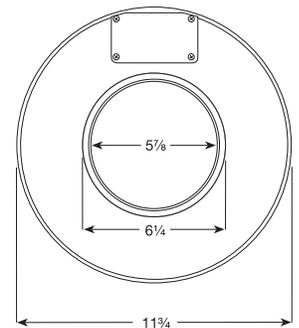
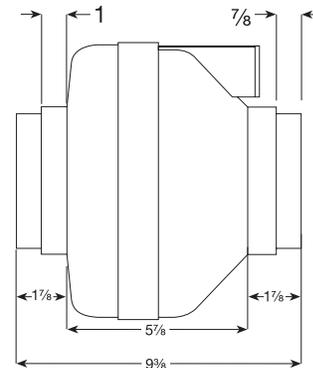
For 4" PVC pipe use Indiana Seals #151-44, Pipeconx PCX 51-44 or equivalent.

For 3" PVC pipe use Indiana Seals #156-43, Pipeconx PCX 56-43 or equivalent.

HP220 RADON MITIGATION FAN



Tested with 6" ID duct and standard couplings.



HP 220 – Excellent choice for systems with elevated radon levels, poor communication, multiple suction points and large subslab footprint. Replaces FR 175.

Fans are attached to PVC pipe using flexible couplings.

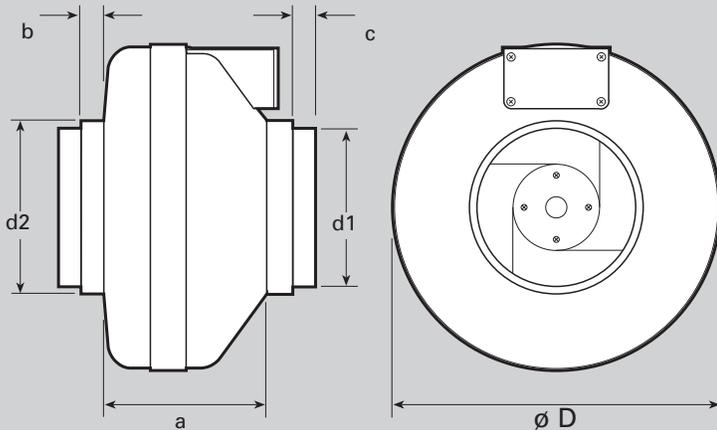
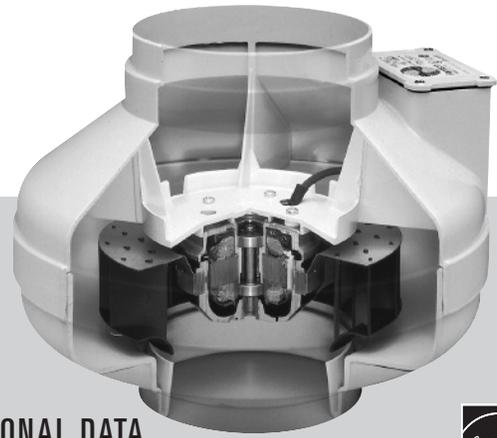
For 4" PVC pipe use Indiana Seals #156-64, Pipeconx PCX 56-64 or equivalent.

For 3" PVC pipe use Indiana Seals #156-63, Pipeconx PCX 56-63 or equivalent.



FR SERIES

THE ORIGINAL MITIGATOR



DIMENSIONAL DATA

model	øD	d1	d2	a	b	c
FR100	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR110	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR125	9 1/2	-	4 7/8	6 1/8	7/8	-
FR140	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR150	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR160	11 3/4	5 7/8	6 1/4	6 3/8	1	7/8
FR200	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR225	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR250	13 1/4	-	9 7/8	6 1/4	-	1 1/2

All dimensions in inches



PERFORMANCE DATA

Fan Model	Energy Star	RPM	Volts	Rated Watts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.							Max. Ps	Duct Dia.
							0"	.2"	.4"	.6"	.8"	1.0"	1.5"		
FR100	✓	2950	120	21.2	13 - 22	0.18	137	110	83	60	21	-	-	0.90"	4"
FR125	✓	2950	115	18	15 - 18	0.18	148	120	88	47	-	-	-	0.79"	5"
FR150	✓	2750	120	71	54 - 72	0.67	263	230	198	167	136	106	17	1.58"	6"
FR160	-	2750	115	129	103 - 130	1.14	289	260	233	206	179	154	89	2.32"	6"
FR200	✓	2750	115	122	106 - 128	1.11	408	360	308	259	213	173	72	2.14"	8"
FR225	✓	3100	115	137	111 - 152	1.35	429	400	366	332	297	260	168	2.48"	8"
FR250*	-	2850	115	241	146 - 248	2.40	649	600	553	506	454	403	294	2.58"	10"

FR Series performance is shown with ducted outlet. Per HVI's Certified Ratings Program, charted air flow performance has been derated by a factor based on actual test results and the certified rate at .2 inches WG.
* Also available with B* duct connection. Model FR 250-8. Special Order.

NOTE:

Installations that will result in condensate forming in the outlet ducting should have a condensate bypass installed to route the condensate outside of the fan housing. Conditions that are likely to produce condensate include but are not limited to: outdoor installations in cold climates, long lengths of outlet ducting, high moisture content in soil and thin wall or aluminum outlet ducting. Failure to install a proper condensate bypass may void any warranty claims.

FIVE YEAR WARRANTY

DURING ENTIRE WARRANTY PERIOD:

FANTECH will replace any fan which has a factory defect in workmanship or material. Product may need to be returned to the Fantech factory, together with a copy of the bill of sale and identified with RMA number.

FOR FACTORY RETURN YOU MUST:

- Have a Return Materials Authorization (RMA) number. This may be obtained by calling FANTECH either in the USA at 1.800.747.1762 or in CANADA at 1.800.565.3548. Please have bill of sale available.
- The RMA number must be clearly written on the outside of the carton, or the carton will be refused.
- All parts and/or product will be repaired/replaced and shipped back to buyer; no credit will be issued.

OR

The Distributor may place an order for the warranty fan and is invoiced. The Distributor will receive a credit equal to the invoice only after product is returned prepaid and verified to be defective.

FANTECH WARRANTY TERMS DO NOT PROVIDE FOR REPLACEMENT WITHOUT CHARGE PRIOR TO INSPECTION FOR A DEFECT. REPLACEMENTS ISSUED IN ADVANCE OF DEFECT INSPECTION ARE INVOICED, AND CREDIT IS PENDING INSPECTION OF RETURNED MATERIAL. DEFECTIVE MATERIAL RETURNED BY END USERS SHOULD NOT BE REPLACED BY THE DISTRIBUTOR WITHOUT CHARGE TO THE END USER, AS CREDIT TO DISTRIBUTOR'S ACCOUNT WILL BE PENDING INSPECTION AND VERIFICATION OF ACTUAL DEFECT BY FANTECH.

THE FOLLOWING WARRANTIES DO NOT APPLY:

- Damages from shipping, either concealed or visible. Claim must be filed with freight company.

- Damages resulting from improper wiring or installation.
- Damages or failure caused by acts of God, or resulting from improper consumer procedures, such as:
 1. Improper maintenance
 2. Misuse, abuse, abnormal use, or accident, and
 3. Incorrect electrical voltage or current.
- Removal or any alteration made on the FANTECH label control number or date of manufacture.
- Any other warranty, expressed, implied or written, and to any consequential or incidental damages, loss or property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

WARRANTY VALIDATION

- The user must keep a copy of the bill of sale to verify purchase date.
- These warranties give you specific legal rights, and are subject to an applicable consumer protection legislation. You may have additional rights which vary from state to state.

DISTRIBUTED BY:



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Item #: 411741
Rev Date: 021010

Fantech, reserves the right to modify, at any time and without notice, any or all of its products' features, designs, components and specifications to maintain their technological leadership position.

NORTHERN PLUMBING SUPPLY

0-4.5" U-Tube Radon Manometer with Labels



Part# **50017**

Easy Read U-Tube DynaMeter Manometer Vacuum Gauge w/ Labels

Technical Specifications:

- Reads 0-4" W.C.
- Non-Toxic Fluid
- Adjustable Zero
- Vinyl write-on radon system sticker included
- Includes mounting screw - and peel-away sticky back for easy mounting
- Includes small length of tubing for connection to PVC pipe
- Compact - only 7-3/4" H x 1-1/2" W
- In many areas - code requires a radon system to include a visual indicator that the system has failed or is operating properly. This gauge is a cost effective way to meet this requirement.
- ** This device does NOT measure radon levels **

Instructions:

1. Select location on the vertical suction pipe where vacuum gauge is to be mounted. Pipe surface should be clean and dry.
2. Remove end caps from both tub ends. Hold gauge upright to prevent loss of gauge fluid.
3. Remove protective backing from the foam tape on the back of the unit and firmly press into place on piping.
4. Allow fluid to settle in gauge for several minutes and then zero the gauge by sliding the tube until the tops of both columns align with the zero mark on the pressure scale. The gauge may be fixed in this position using the provided mounting screw.
5. Drill a 3/16" hole in piping 2 inches below the top of the gauge.
6. Insert vinyl tubing into either opening in the gauge tube and push firmly.
7. Install the end of the tubing into the drilled hole - apply caulking for airtight connection.