374 STOCKTON STREET/910-912 BROADWAY

BROOKLYN, NEW YORK 11206

Remedial Action Work Plan

NYC VCP Project: 16CVCP049K
OER Project Number: 15EHAN355K

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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
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, Wenqing Fang 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 374 Stockton Street/910-912 Broadway site, site number 16CVCP049K. 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.

Wenqing Fang
Name

095477
PE License Number

Signature

January 20, 2016
Date

PE Stamp

STATE OF NEW YORK
WENQING FANG
095477
LICENSED PROFESSIONAL ENGINEER

I, Sean O'Keefe am a qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the 374 Stockton Street/910-912 Broadway site, site number 16CVCP049K. 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.

Sean O'Keefe
QEP Name

QEP Signature

January 20, 2016
Date

EXECUTIVE SUMMARY

Broadway Stockton, LLC is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program to investigate and remediate a 21,123 square-foot site located at 910-912 Broadway in the Stuyvesant Heights section of 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 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 910-912 Broadway in the Stuyvesant Heights section of Brooklyn, New York, and is identified as Block 1584, Lot 11 on the New York City Tax Map. Figure 1 shows the Site location. Lot 11 is essentially a rectangular shaped lot consisting of 202 feet of street frontage on Stockton Street, 51 feet of street frontage on Broadway and a depth of approximately 100 feet for a total of approximately 21,123 ft^2. The Site is located on the west side of Broadway between Myrtle Avenue and Stockton Street and is bordered by commercial/residential buildings to the south, a vacant lot currently under construction to the west, Broadway to the east, and Stockton Street to the north. A map of the site boundary is shown on Figure 2.

The entire footprint of Lot 11 is currently undeveloped with no structures.

Summary of Redevelopment Plan

The development project consists of one new mixed-use building. The building will be a six-story mixed retail/commercial and residential structure with a basement. The footprint of the building will span the entire lot with no open space areas. The cellar and 1st through 3rd floors will consist of retail space and the 4th through 6th floors will contain residential units.

The entire Site will require excavation to a depth of approximately 14 feet below grade for construction of the building basement. Therefore, an estimated 10,952 cubic yards (15,333 tons)

of soil will require excavation. The water table is expected at approximately 60 feet below grade surface (bgs), and will therefore not be encountered during excavation.

Layout of the redevelopment plans for the basement level, as well as the proposed building front elevation drawing, is presented in Appendix 1. The current zoning designation is C4-4L. The proposed use is consistent with existing zoning for the property.

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

Summary of Surrounding Property

The Site is located within a primarily mixed-use residential and commercial area of Brooklyn, New York. The Site is located on the west side of Broadway between Myrtle Avenue and Stockton Street and is bordered by commercial/residential buildings to the south, a vacant lot currently under construction to the west, Broadway to the east, and Stockton Street to the north. There are no sensitive receptors (such as schools, hospitals or day-care facilities) within a 500-foot radius of the Site. Figure 3 shows the surrounding land usage.

Summary of Past Site Uses and Areas of Concern

A Phase I ESA was performed by The Home Inspection Group, Ltd. in 2015. The following Site history was established based on historic Sanborn maps. Thirty-five Sanborn Fire Insurance Maps were reviewed from the year 1887 through 2007 as part of this investigation. On the initial photo, the Site was not developed, though the block was labeled as stables and a repair shop. By 1904, there is a building on the Site, labeled “Broadway Theater”. On the 1918 map, the Site is re-labeled “Loew’s Broadway Theater ~ Built 1913”, and the label is corrected on the 1935 picture to say “Loew’s Broadway Theater ~ Built 1903”.

Copies of twelve historic aerial photographs were reviewed from 1924 through 2011 during the Phase I ESA. The Site and surrounding area appear heavily developed throughout the series, though the poor quality of the photographs made use of the properties difficult to discern. The

Site appears to have been occupied through 1994, but appears as vacant land from 2006 throughout the remainder of the series.

The inspections and background investigations conducted within the scope of the Phase I ESA revealed no evidence of RECs associated with the Site. No additional activities were recommended to define and/or enhance the environmental quality of the Site.

Summary of Work Performed under the Remedial Investigation

Metric Earth Services, LLC (MES) performed the following scope of work at the Site in May/June of 2015:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Conducted a Ground Penetrating Radar (GPR) survey of the Site to identify any subsurface structures (i.e. tanks, building foundations, vaults, utilities, etc.) in accordance with the New York City Department of Environmental Protection Office of Environmental Remediation (OER) suggestion that a GPR survey be conducted across any site where historic demolition activities had occurred;
3. Installed seven soil borings across the Site, and collected fourteen soil samples for chemical analysis from the soil borings to evaluate soil quality near the ground surface and at depths just below the anticipated excavation depth;
4. Groundwater samples were not collected, as groundwater was not encountered within fifty feet below grade on the Site (as stipulated in the approved OER Phase II Work Plan); and
5. Installed five soil vapor sampling points, and collected five soil vapor samples for chemical analysis.

Summary of Findings of Remedial Investigation

1. The elevation of the property is approximately 69 feet above mean sea level.
2. Depth to groundwater is approximately 60 feet at the Site.
3. Groundwater flow is generally south beneath the Site.

4. Bedrock was not encountered during the RI.

5. The stratigraphy of the Site, from the surface down, consists of approximately 8 to 20 feet of non-native urban fill underlain by fine-grained sand with trace amounts of fine gravel.

6. Soil/fill samples collected during the RI were compared to 6NYCRR Part 375-6.8 Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs) and Track 2 Restricted Residential Use SCOs. Soil sampling results showed no detectable concentrations of PCBs in any sample. Trace concentrations of two VOCs, including 1,2,4-trimethylbenzene and xylene (mixed) were detected in one soil sample; however, none of these VOCs were detected above their respective Unrestricted Use SCOs. No other VOCs were detected in the soil samples. Polycyclic Aromatic Hydrocarbon (PAH) SVOCs including, benz(a)anthracene (max of 39 ppm), benzo(a)pyrene (max of 25 ppm), benzo(b)fluyoranthene (max of 33 ppm), benzo(k)fluoranthene (max of 6.1 ppm), chrysene (max of 19 ppm), dibenzo(a,h)anthracene (max of 3.2 ppm), and indeno(1,2,3-cd)pyrene (max of 7.8 ppm) were detected above their respective Restricted Residential Use SCOs in all shallow (zero to 2 feet) soil samples and two deeper (14 to 16 feet) soil samples. Three (3) pesticides, 4,4'-DDT (max of 0.12 ppm), 4,4'-DDD (0.044 ppm), and dieldrin (0.0099 ppm) were detected above Unrestricted Use SCOs. Four (4) metals, including barium (max of 640 ppm), lead (max of 400 ppm), mercury (max of 0.59 ppm), and zinc (max of 280 ppm) were detected above their respective Unrestricted Use SCOs. Of these metals, only barium exceeded its respective Restricted Residential Use SCO in one shallow (zero to 2 feet) soil sample.

7. Groundwater in this area is about 60 feet below grade. Groundwater samples were not collected during the RI, as groundwater was not encountered within fifty feet below grade on the Site.

8. Soil vapor samples collected during the RI were compared to the compounds listed in Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion, dated October 2006. Soil vapor results detected low levels of petroleum compounds, including BTEX (max. of 50.2 $\mu g/m^3$). Chlorinated VOCs including methylene chloride (max of 560 $\mu g/m^3$), n-Hexane (max of

480 $\mu g/m^3$) detected at elevated levels in one soil vapor sample. Samples did not detect 1,1,1-trichloroethane or carbon tetrachloride in any of the soil vapor samples. Trichloroethylene (TCE) was detected at a max of 2.8 $\mu g/m^3$ and tetrachloroethylene (PCE) was detected at concentrations ranging from 3.7 to 440 $\mu g/m^3$ in all soil vapor samples. PCE was detected above the monitoring and mitigation levels established by NYSDOH matrix.

Summary of the Remedial Action

The preferred remedy for the site is Alternative 2, Track 4 Site-Specific SCOs. Data generated during the site investigation support the conclusion that Alternative 1 is not achievable because an active SSDS is required to be operated at this Site due to the lack of groundwater data as well as to mitigate elevated levels of the chlorinated compound, PCE in soil vapor. The Alternative 2 remedy will remove all soil/fill exceeding Track 4 Site-Specific SCOs throughout the Site, which will be confirmed with post-excavation sampling.

Engineering Controls are required for a Track 4 cleanup. A concrete slab covering the entire site and vapor barrier underneath the new building slab would be installed. Additional soil vapor management would include an active SSDS to address soil vapor contamination.

Use restrictions will be imposed on the site including use of groundwater from the Site; prohibitions of restricted Site uses, such as farming or vegetable gardening, to prevent future exposure pathways. The Site would continue to be encumbered with an E-Designation for hazardous material.

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 Site-Specific (Track 4) Soil Cleanup Objectives (SCOs).

4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s). A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.
6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. The entire footprint of the Site, excluding the sidewalk set-back will be excavated to a depth of approximately 14 feet below grade for the new building's basement level. An estimated 15,333 tons of soil will be removed.
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 actions. 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.
10. 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.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Construction of an engineered composite cover consisting of 6 inches of reinforced concrete slab underlain by 12 inches of clean gravel in building areas and 4-inch

concrete sidewalks with 7-inch thickness at loading berth entrance and corner quadrants over the remainder of the Site.

14. 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 Raven Industries' 20-mil VaporBlock Plus which is a seven layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins applied below the slab throughout the full building area and outside all sub-grade foundation sidewalls. 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.
15. Installation of an active sub-slab depressurization system (SSDS) consisting of a network of 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 3-inch diameter schedule 80 slotted PVC screen. PVC screens shall be connected to a 4-inch diameter schedule 80 PVC solid pipe and steel risers that penetrate the slab and travels through the building to the roof. The gas permeable layer will consistent of a 12-inch thick layer of 1-inch trap rock stone. Vapor effluent sampling ports shall be installed on the risers. The risers shall be raised at least 3-feet above the roofline. Rain caps shall be installed on the roof at the end of the risers. The active SSDS will be hardwired and will include a Radon Away 4-inch Mitigation Fan (RP-145) in-line centrifugal fan unit installed on the roofline atop each stack pipe. A pressure gauge and alarm will also be included in the design. 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.
16. 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.

17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
18. 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.
19. 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.
20. 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 Address: 374 Stockton Street/910-912 Broadway, Brooklyn, NY 11206
- NYC Voluntary Cleanup Program Project Number: 16CVCP049K

Project Contacts:

- OER Project Manager: Sarah Pong, 212-788-8841
- Site Project Manager: Tony Ambrosino, 718-366-6528
- Site Safety Officer: TBD

Online Document Repository:
http://www.nyc.gov/html/oer/html/document-repository/document-repository.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 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

Broadway Stockton, LLC is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program and in the "E" Designation Program to investigate and remediate a property located at 374 Stockton Street/910-912 Broadway in the Stuyvesant Heights 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 910-912 Broadway in the Stuyvesant Heights section of Brooklyn, New York, and is identified as Block 1584, Lot 11 on the New York City Tax Map. Figure 1 shows the Site location. Lot 11 is essentially a rectangular shaped lot consisting of 202 feet of street frontage on Stockton Street, 51 feet of street frontage on Broadway and a depth of approximately 100 feet for a total of approximately 21,123 ft^2. The Site is located on the west side of Broadway between Myrtle Avenue and Stockton Street and is bordered by commercial/residential buildings to the south, a vacant lot currently under construction to the west, Broadway to the east, and Stockton Street to the north. A map of the site boundary is shown on Figure 2.

The entire footprint of Lot 11 is currently undeveloped with no structures.

1.2 Redevelopment Plan

The development project consists of one new mixed-use building. The building will be a six-story mixed retail/commercial and residential structure with a basement. The footprint of the

building will span the entire lot with no open space areas. The cellar and 1st through 3rd floors will consist of retail space and the 4th through 6th floors will contain residential units.

The entire Site will require excavation to a depth of approximately 14 feet below grade for construction of the building basement. Therefore, an estimated 10,952 cubic yards (15,333 tons) of soil will require excavation. The water table is expected at approximately 60 feet below grade surface (bgs), and will therefore not be encountered during excavation.

Layout of the redevelopment plans for the basement level, as well as the proposed building front elevation drawing, is presented in Appendix 1. The current zoning designation is C4-4L. The proposed use is consistent with existing zoning for the property.

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

1.3 Description of Surrounding Property

The Site is located within a primarily mixed-use residential and commercial area of Brooklyn, New York. The Site is located on the west side of Broadway between Myrtle Avenue and Stockton Street and is bordered by commercial/residential buildings to the south, a vacant lot currently under construction to the west, Broadway to the east, and Stockton Street to the north. There are no sensitive receptors (such as schools, hospitals or day-care facilities) within a 500-foot radius of the Site. Figure 3 shows the surrounding land usage.

1.4 Summary of Past Site Uses and Areas of Concern

A Phase I ESA was performed by The Home Inspection Group, Ltd. in 2015. The following Site history was established based on historic Sanborn maps. Thirty-five Sanborn Fire Insurance Maps were reviewed from the year 1887 through 2007 as part of this investigation. On the initial photo, the Site was not developed, though the block was labeled as stables and a repair shop. By 1904, there is a building on the Site, labeled “Broadway Theater”. On the 1918 map, the Site is re-labeled “Loew’s Broadway Theater ~ Built 1913”, and the label is corrected on the 1935 picture to say “Loew’s Broadway Theater ~ Built 1903”.

Copies of twelve historic aerial photographs were reviewed from 1924 through 2011 during the Phase I ESA. The Site and surrounding area appear heavily developed throughout the series, though the poor quality of the photographs made use of the properties difficult to discern. The Site appears to have been occupied through 1994, but appears as vacant land from 2006 throughout the remainder of the series.

The inspections and background investigations conducted within the scope of the Phase I ESA revealed no evidence of RECs associated with the Site. No additional activities were recommended to define and/or enhance the environmental quality of the Site.

1.5 Summary of Work Performed under the Remedial Investigation

Metric Earth Services, LLC (MES) performed the following scope of work at the Site in May/June of 2015:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Conducted a Ground Penetrating Radar (GPR) survey of the Site to identify any subsurface structures (i.e. tanks, building foundations, vaults, utilities, etc.) in accordance with the New York City Department of Environmental Protection Office of Environmental Remediation (OER) suggestion that a GPR survey be conducted across any site where historic demolition activities had occurred;
3. Installed seven soil borings across the Site, and collected fourteen soil samples for chemical analysis from the soil borings to evaluate soil quality near the ground surface and at depths just below the anticipated excavation depth;
4. Groundwater samples were not collected, as groundwater was not encountered within fifty feet below grade on the Site (as stipulated in the approved OER Phase II Work Plan); and
5. Installed five soil vapor sampling points, and collected five 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, 374 Stockton Street/910-912 Broadway", dated October 2015 (RIR).

1. The elevation of the property is approximately 69 feet above mean sea level.
2. Depth to groundwater is approximately 60 feet at the Site.
3. Groundwater flow is generally south beneath the Site.
4. Bedrock was not encountered during the RI.
5. The stratigraphy of the Site, from the surface down, consists of approximately 8 to 20 feet of non-native urban fill underlain by fine-grained sand with trace amounts of fine gravel.
6. Soil/fill samples collected during the RI were compared to 6NYCRR Part 375-6.8 Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs) and Track 2 Restricted Residential Use SCOs. Soil sampling results showed no detectable concentrations of PCBs in any sample. Only two VOCs, 1,2,4-trimethylbenzene and xylene (mixed) were detected in one soil sample; however, none of these VOCs were detected above their respective Unrestricted Use SCOs. No other VOCs were detected in the soil samples. Polycyclic Aromatic Hydrocarbon (PAH) SVOCs including, benz(a)anthracene (max of 39 ppm), benzo(a)pyrene (max of 25 ppm), benzo(b)fluyoranthene (max of 33 ppm), benzo(k)fluoranthene (max of 6.1 ppm), chrysene (max of 19 ppm), dibenzo(a,h)anthracene (max of 3.2 ppm), and indeno(1,2,3-cd)pyrene (max of 7.8 ppm) were detected above their respective Restricted Residential Use SCOs in all shallow (zero to 2 feet) soil samples and two deeper (14 to 16 feet) soil samples. Three (3) pesticides, 4,4'-DDT (max of 0.12 ppm), 4,4'-DDD (0.044 ppm), and dieldrin (0.0099 ppm) were detected above Unrestricted Use SCOs. Four (4) metals, including barium (max of 640 ppm), lead (max of 400 ppm), mercury (max of 0.59 ppm), and zinc (max of 280 ppm) were detected above their respective Unrestricted Use SCOs. Of these metals, only barium exceeded its respective Restricted Residential Use SCO in one shallow (zero to 2 feet) soil sample.

7. Groundwater in this area is about 60 feet below grade. Groundwater samples were not collected during the RI.

8. Soil vapor samples collected during the RI were compared to the compounds listed in Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion, dated October 2006. Soil vapor results detected low levels of petroleum compounds, including BTEX (max. of 50.2 $\mu g/m^3$). Chlorinated VOCs were detected at low concentrations with methylene chloride (max of 560 $\mu g/m^3$) and n-Hexane (max of 480 $\mu g/m^3$) detected at higher concentrations in one soil vapor sample. Samples did not detect 1,1,1-trichloroethane or carbon tetrachloride in any of the soil vapor samples. Trichloroethylene (TCE) was detected at a max of 2.8 $\mu g/m^3$ and tetrachloroethylene (PCE) was detected at concentrations ranging from 3.7 to 440 $\mu g/m^3$ in all soil vapor samples. PCE was detected above the monitoring and mitigation levels established by NYSDOH matrix.

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

2.0 Remedial Action Objectives

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

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.

Groundwater

- Remove contaminant sources causing potential impact to 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. As part of the development, a vapor barrier below the building slab and along the vertical foundation walls and a sub-slab depressurization system (SSDS) would be installed to prevent potential exposures from soil vapor in the future; and
- As part of development, placement of a final cover over the entire Site.

Alternative 2:

- Establishment of Site-Specific (Track 4) SCOs.
- Removal of all soil/fill exceeding Track 4 Site-Specific 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 this alternative would be achieved by excavating for development purposes, which include excavation to a depth of approximately 14 feet across the Site for construction of the new building basement level. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal for all soil required for the development construction is complete, 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 system beneath the building slab and along foundation side walls to prevent future potential exposures from soil vapor.
- Installation of an active Sub Slab Depressurization System (SSDS) beneath the entire new building footprint to prevent any potential future exposures from soil vapor.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of 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.

- Continued registration with an E-Designation to memorialize the remedial action and the Engineering and Institutional Controls required by this RAWP.

3.1 Threshold Criteria

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls 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.

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 placement of Institutional and Engineering Controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. The active SSDS system, along with the vapor barrier system would mitigate any vapor from entering the building. 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 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 or groundwater 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 outside foundations walls below grade.

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 SCOs and Protection of Groundwater SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a sub-slab depressurization system and vapor barrier system below the new building's basement slab and continuing the vapor barrier outside 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 SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier system below the new building's basement slab and continuing the vapor barrier outside of subgrade foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term. In addition, an active sub-slab depressurization system will be installed under the building to ensure SCGs for soil vapor will be achieved.

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 Alternative 1 and 2 have similar short-term effectiveness during their implementation, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be 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. Approximately 580, 25-ton capacity truck trips would be necessary to transport fill and soil excavated during Site development. 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 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 SCOs. 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 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 SCOs.

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 SCOs.

Alternative 1 would remove a greater total mass of contaminants from the Site. The removal of soil to 14 feet across the Site for the new development 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 to a depth of up to 16 feet below grade along the western portion of the site during the RI, and the new building requires excavation of the entire Site to a depth of 14 feet, the costs associated with both Alternative 1 and Alternative 2 will likely be comparable. Costs associated with Alternative 1 could potentially be higher than Alternative 2 if soil with analytes above Track 1 Unrestricted Use SCOs is encountered 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 closest and most appropriate disposal facilities to reduce transportation and disposal costs during excavation of historic fill and other soils during 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 a new mixed-use building. The building will be a six-story mixed retail/commercial and residential structure with a basement. The footprint of the building will span the entire lot with no open space areas. 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 residential use. The proposed use is compliant with the property's zoning and is consistent with recent development patterns. The area surrounding the site is urban and consists of predominantly mixed residential and commercial buildings in zoning districts designated for commercial and residential uses. The development would remediate a vacant contaminated lot and provide a modern mixed-use residential/commercial building. The proposed development would clean up the property and make it safer, create new employment opportunities 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 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, included as Appendix 3.

Selection of the Preferred Remedy

The preferred remedy for the site is Alternative 2, Track 4 Site-Specific SCOs. Data generated during the site investigation support the conclusion that Alternative 1 is not achievable because an active SSDS is required to be operated at this Site due to the lack of groundwater data as well as to mitigate elevated levels of the chlorinated compound, PCE in soil vapor. The Alternative 2 remedy will remove all soil/fill exceeding Track 4 Site-Specifc SCOs throughout the Site, which will be confirmed with post-excavation sampling.

Engineering Controls are required for a Track 4 cleanup. A concrete slab covering the entire site and vapor barrier underneath the new building slab would be installed. Additional soil vapor management would include an active SSDS to address soil vapor contamination.

Use restrictions will be imposed on the site (including prohibitions on any use higher than Restricted Residential) e.g. the use of groundwater from the Site; prohibitions of restricted Site uses, such as farming or vegetable gardening, to prevent future exposure pathways. The Site would continue to be encumbered with an E-Designation for hazardous material.

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 Site-Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s). A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to start of remedial action.
6. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs. The entire footprint of the Site, excluding the sidewalk set-back will be excavated to a depth of approximately 14 feet below grade for the new building's basement level. An estimated 15,333 tons of soil will be removed.

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 actions. 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.
10. 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.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Construction of an engineered composite cover consisting of 6 inches of reinforced concrete slab underlain by 12 inches of clean gravel in building areas and 4-inch concrete sidewalks with 7-inch thickness at loading berth entrance and corner quadrants over the remainder of the Site.
14. 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 Raven Industries' 20-mil VaporBlock Plus, which is a seven layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins applied below the slab throughout the full building area and outside 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.

15. Installation and operation of an active sub-slab depressurization system (SSDS) consisting of a network of 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 3-inch diameter schedule 80 slotted PVC screen. PVC screens shall be connected to a 4-inch diameter schedule 80 PVC solid pipe and steel risers that penetrate the slab and travels through the building to the roof. The gas permeable layer will consistent of a 12-inch thick layer of 1-inch trap rock stone. Vapor effluent sampling ports shall be installed on the risers. The risers shall be raised at least 3-feet above the roofline. Rain caps shall be installed on the roof at the end of the risers. The active SSDS will be hardwired and will include a Radon Away 4-inch Mitigation Fan (RP-145) in-line centrifugal fan unit installed on the roofline atop each stack pipe. A pressure gauge and alarm will also be included in the design. 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.
16. 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.
17. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
18. 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.
19. 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.

20. 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 SCOs will be utilized for this project:

Contaminant	**Site-Specific SCO's**
Total SVOCs	100 ppm
Lead	800 ppm
Barium	650 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.

Soil/Fill Excavation and Removal

The entire footprint of the Site, excluding the sidewalk set-back will be excavated to a depth of approximately 14 feet below grade for development purposes. The locations of planned excavations are shown in Figure 5. The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 15,333 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:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

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. Confirmation samples and testing will be performed promptly following materials removal and completed prior to Site development activities. Fifteen confirmation samples will be collected from the base of the excavation at locations to be determined by OER. To evaluate attainment of Track 4 Site-Specific SCOs, analytes will include those for which SCOs have been developed, including SVOCs and Metals according to analytical methods described above. If Track 1 Unrestricted Use SCOs are pursued, samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals according to analytical methods described above. The approximate collection location of the endpoint soil samples is shown on 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 QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

Soil samples will be collected in pre-cleaned, laboratory-supplied glassware, stored in a cooler with ice and submitted for analysis under proper chain of custody to a New York State ELAP certified environmental laboratory. Soil samples will be collected using steel spatulas, which will be decontaminated using acetone and deionized water after the collection of each sample.

One blind duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. One trip blank will be submitted to the laboratory with each shipment of soil samples. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides. Field blanks will be prepared by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers.

The laboratory analytical detection limits to be used will be in accordance with the regulatory standards to ensure that the detection limits are low enough to meet the regulatory requirements, and all results will be compared to the appropriate regulatory standards in tabular form. Soil samples will be collected at the excavation endpoints for confirmation of removal of contaminated soils, and for disposal characterization only.

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 Residential or Commercial Use SCO's, and
- Groundwater Protection Standards in Part 375-6.8.

Soil import is not planned on this project.

Reuse of Onsite Soils

Reuse of onsite soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. Soil reuse is not planned on this project.

4.3 Engineering Controls

The excavation required for the proposed Site development will achieve Track 4 Site-Specific SCOs. 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 6 inches of reinforced concrete slab underlain by 12 inches of clean gravel in building areas. 4-inch concrete sidewalks with 7-inch thickness at loading berth entrance and corner quadrants will cover the remainder of the Site.

Figure 6 shows the typical design for each remedial cover type used on this Site. Figure 6 shows the location of each cover type built at the Site. 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.

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 system will consist of Raven Industries' 20-mil VaporBlock Plus a seven layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins. The vapor barrier will be installed prior to pouring the building's concrete slab, below the slab throughout the full building area and outside all sub-grade foundation sidewalls and will be installed in accordance with manufacturer specifications. 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. A plan view showing the location of the proposed vapor barrier system is provided in Figure 7. Typical design sections for the vapor barrier on slab and sidewalls are provided in Figure 7. Product specification sheets are provided in Appendix 6.

The Remedial Action Report will include as-built drawings and diagrams; photographs (maximum of two photos per page) of the installation process; PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections; and a copy of the manufacturers certificate of warranty.

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.

Sub-Slab Depressurization System

Migration of soil vapor into the building will be mitigated with the construction of an active Sub-Slab Depressurization System (SSDS). The SSDS will consist of a network of 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 3-inch diameter schedule 80 slotted PVC screen. PVC screens shall be connected to a 4-inch diameter schedule 80 PVC solid pipe and steel risers that penetrate the slab and travels through the building to the roof. The gas permeable layer will consistent of a 12-inch thick layer of 1-inch trap rock stone. Vapor effluent sampling ports shall be installed on the risers. The risers shall be raised at least 3-feet above the roofline. Rain caps shall be installed on the roof at the end of the risers. The active SSDS will be hardwired and will include a Radon Away 4-inch Mitigation Fan (RP-145) in-line centrifugal fan unit installed on the roofline atop each stack pipe. A pressure gauge and alarm will also be included in the design.

The active SSDS is a permanent 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 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 8. A typical section of the system is shown in Figure 8.

4.4 Institutional Controls

A series of Institutional Controls (ICs) are required under this Remedial Action to assure permanent protection of public health by elimination of exposure to residual materials. These ICs 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 ICs. 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(l)(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/residential 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 SMP 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 SMP 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

Based on the results of the RIR, historic fill was encountered at the Site to a depth of approximately 8-20 feet. The following contaminants of concern were detected within the historic fill:

Soil

- Pesticides, including 4,4'-DDD, 4,4'-DDT, and dieldrin were identified but did not exceed Restricted Residential Use SCOs;
- SVOCs (PAH compounds) including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeding Restricted Residential Use SCOs; and
- One metal, barium exceeding Restricted Residential Use SCOs.

Soil Vapor

- Petroleum VOCs detected at moderate concentrations including benzene, ethylbenzene, xylenes and toluene; and
- Elevated levels of chlorinated VOCs, PCE detected at concentrations above NYS DOH Soil Vapor Matrix

Nature, Extent, Fate and Transport of Contaminants

The information compiled during previous investigations has confirmed the presence of contaminated fill material to an approximate depth of 8-20 feet bgs. Pesticides, SVOCs, and metals above SCOs were present mostly in the shallow soil samples representing the historic fill materials. Soil contaminants do not appear to have affected the soil vapor at the Site and whether or not the soil contaminants on site have affected the groundwater beneath the Site is unknown.

Receptor Populations

On-Site Receptors: The Site is currently vacant and undeveloped and access to the Site is restricted by an 8-foot high, chained and locked, perimeter fence. 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 and child building residents, workers and 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. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/ Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists – existing and future
5. School - 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 an undeveloped and uncapped vacant lot. There are 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. Because the site is currently undeveloped, there is no potential for soil vapor to accumulate on site.

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 (vapor barrier/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/residential structure, site-wide surface cover, and a subsurface vapor barrier system for the building. 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 Wenqing Fang Professional Engineer (PE) and Sean O'Keefe Qualified Environmental Professionals (QEP).

5.2 Site Security

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

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 determined by the owner. 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. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

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 incompliance 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

Due to the depth of groundwater, dewatering is not anticipated during remediation and construction. In the event that dewatering of groundwater or surface water during construction will be necessary, the water will be disposed into the New York City combined sanitary/storm sewer system. A permit to discharge will be obtained from the New York City Department of Environmental Protection (NYCDEP). As part of the permit to discharge, the location of discharge will be based on the Site-Specific requirements of the DEP. The need for pretreatment will be determined by DEP's requirements for the discharge permit. If pretreatment is required by the DEP, it will be performed in accordance with the requirements of the DEP.

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 Broadway Stockton, LLC 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 9.

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 and the disposal locations of exported materials;
- 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;
- 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;
- 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;
- 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 and Remedial Investigation Report will be included as appendices to the RAR; and
- Reports and supporting material will be submitted in digital form and final PDF's will include bookmarks for each appendix.

CERTIFICATION

I, Wenqing Fang 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 374 Stockton Street/910-912 Broadway site, site number 16CVCP049K. 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.

Wenqing Fang
Name

095477
PE License Number

Signature

January 20, 2016
Date

PE Stamp

STATE OF NEW YORK
WENQING FANG
095477
LICENSED PROFESSIONAL ENGINEER

I, Sean O'Keefe am a qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the 374 Stockton Street/910-912 Broadway site, site number 16CVCP049K. 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.

Sean O'Keefe
QEP Name

QEP Signature

January 20, 2016
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 4 month remediation period is anticipated.

Schedule Milestone	**Weeks from Remedial Action Start**	**Duration (weeks)**
OER Approval of RAWP	0	1
Fact Sheet 2 announcing start of remedy	0	1
Mobilization	0	2
Remedial Excavation	2	9
Demobilization	11	2
Submit Remedial Action Report	15	3

Figure 1
Site Location Map

910-912 Broadway
Brooklyn, New York

Figure 2
Site Boundary Map

910-912 Broadway
Brooklyn, New York

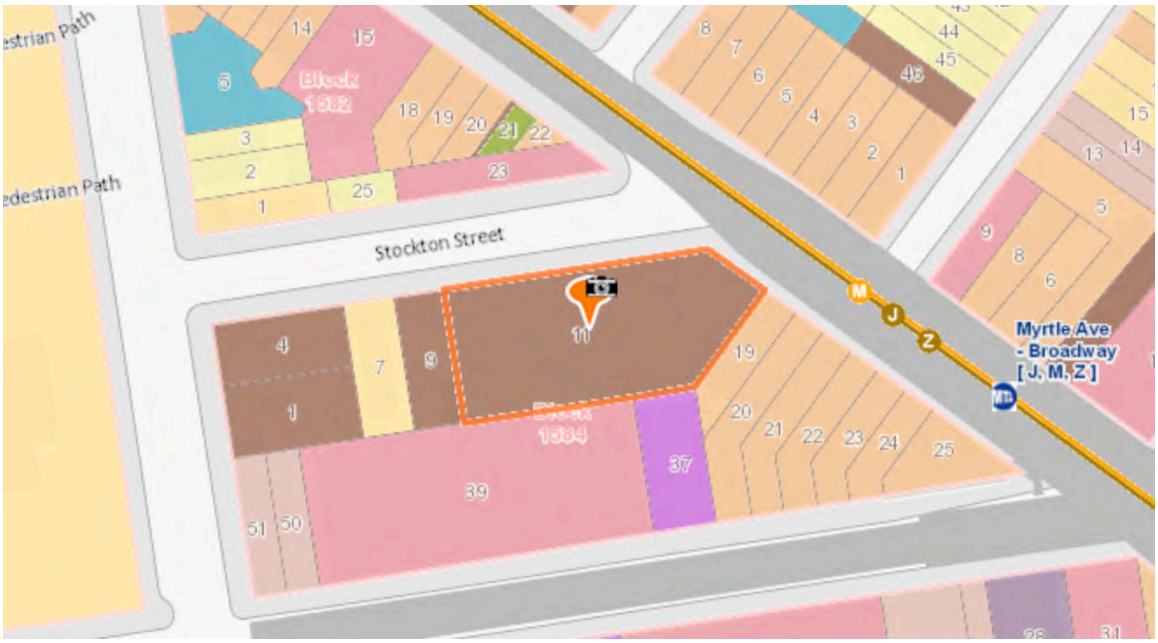
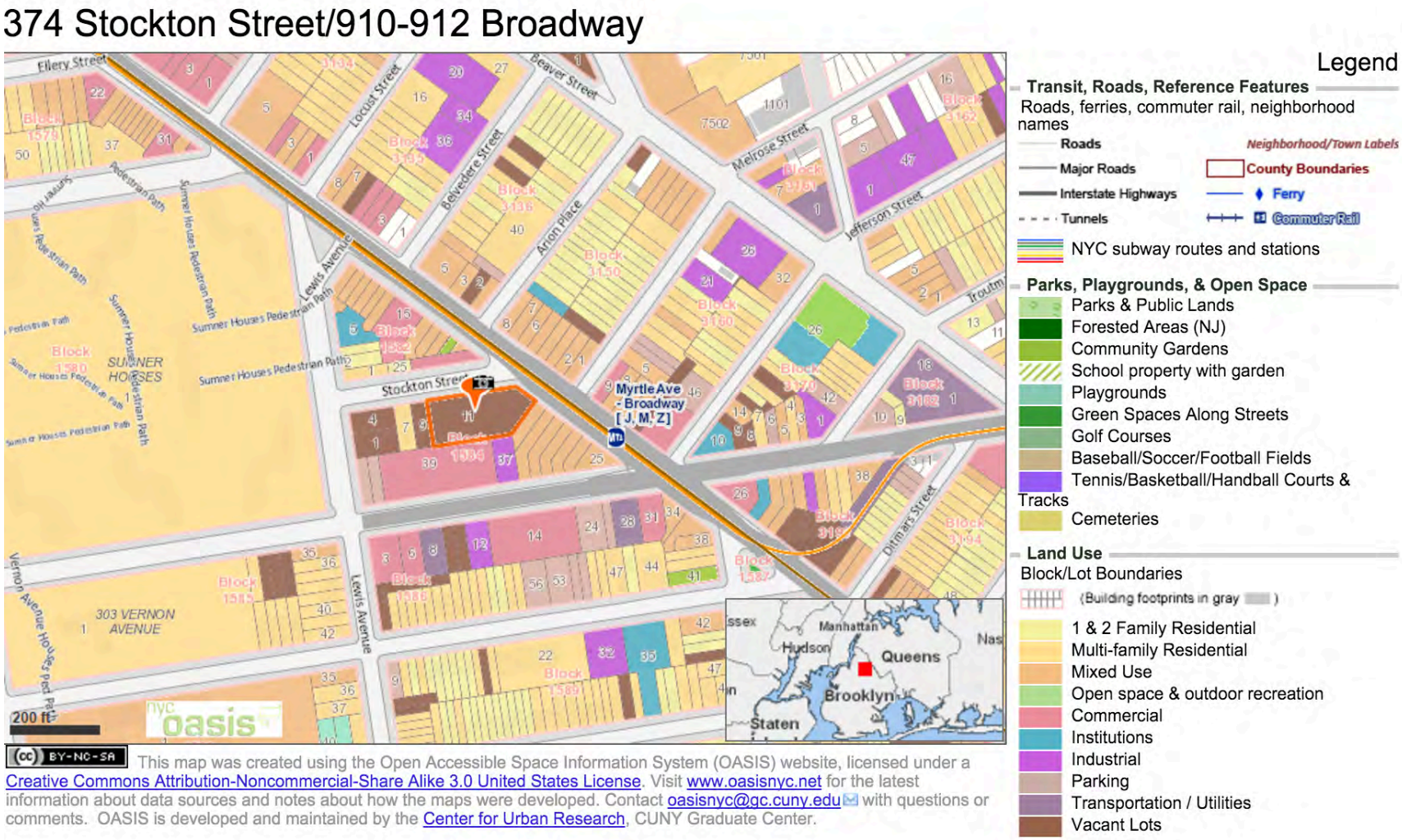


Figure 3
Surrounding Land Usage

910-912 Broadway
Brooklyn, New York



(cc) BY-NC-SA This map was created using the Open Accessible Space Information System (OASIS) website, licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 United States License. Visit www.oasisnyc.net for the latest information about data sources and notes about how the maps were developed. Contact oasisnyc@gc.cuny.edu with questions or comments. OASIS is developed and maintained by the Center for Urban Research, CUNY Graduate Center.

Figure 4
Map of Endpoint Sample Locations

910-912 Broadway
Brooklyn, New York

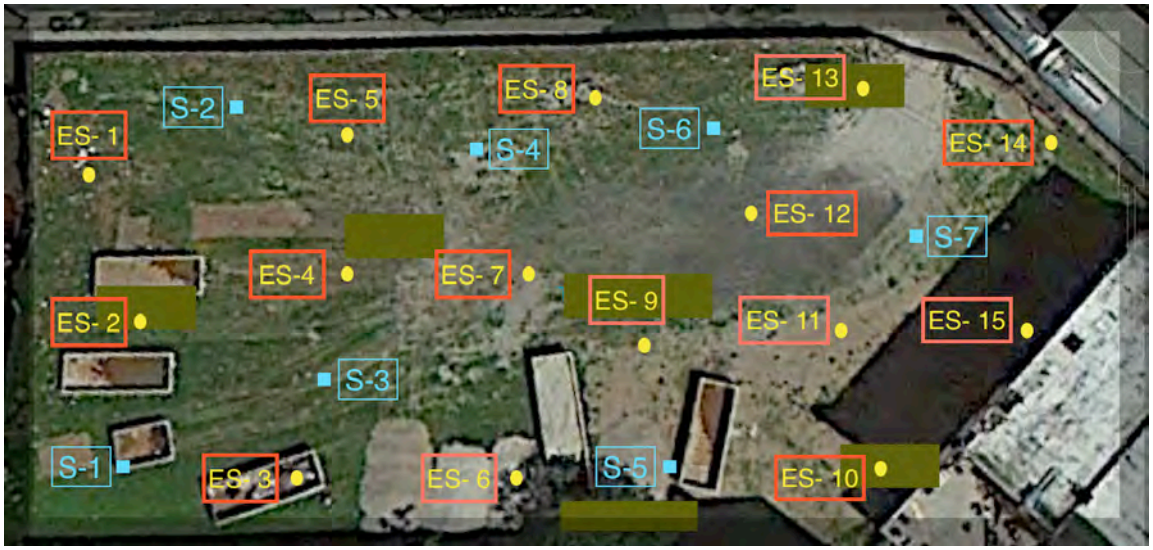


Figure 5
Site Excavation Diagram

910-912 Broadway
Brooklyn, New York

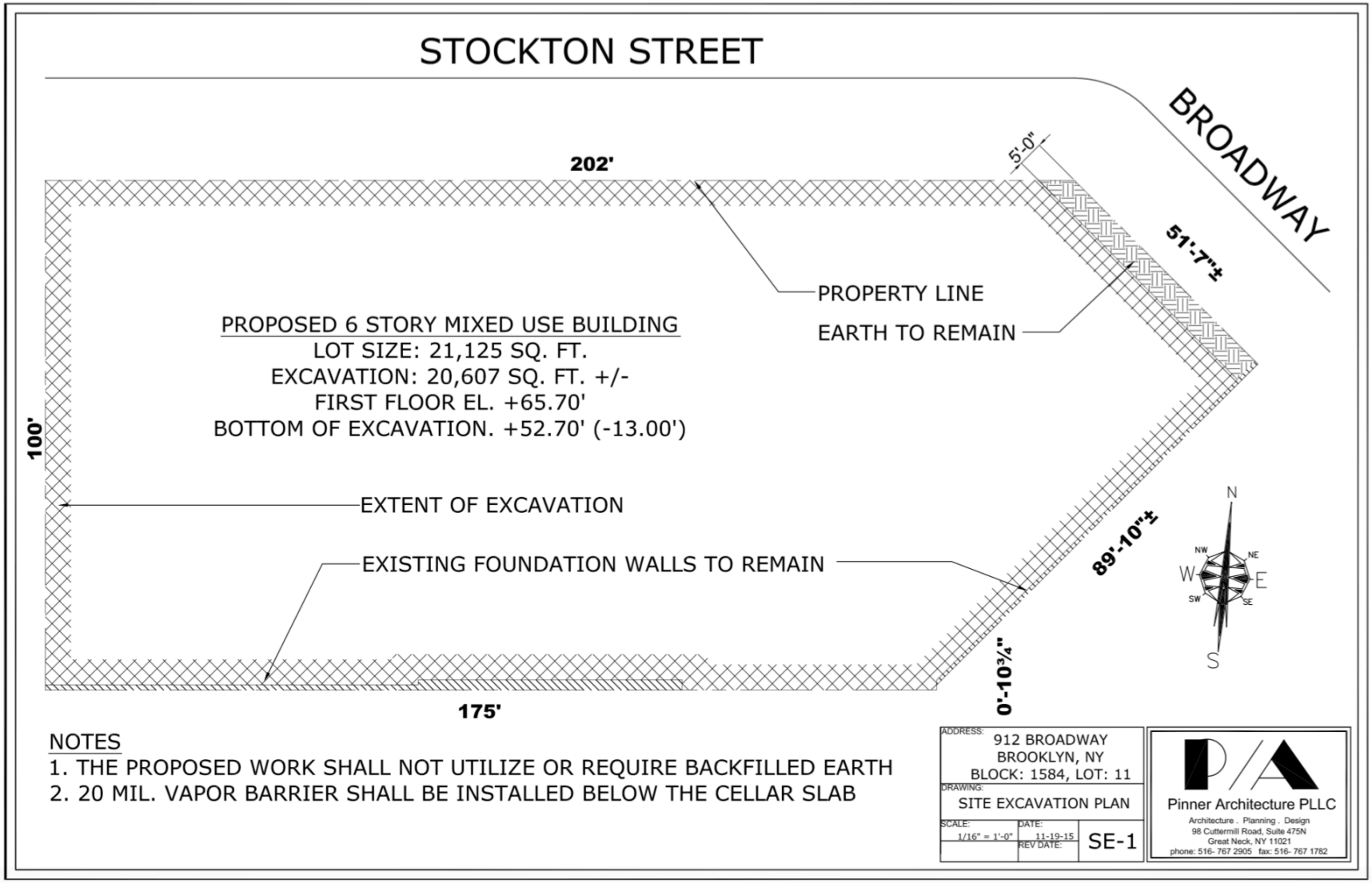


Figure 6
Typical Cover Detail for All Cover Types

910-912 Broadway
Brooklyn, New York

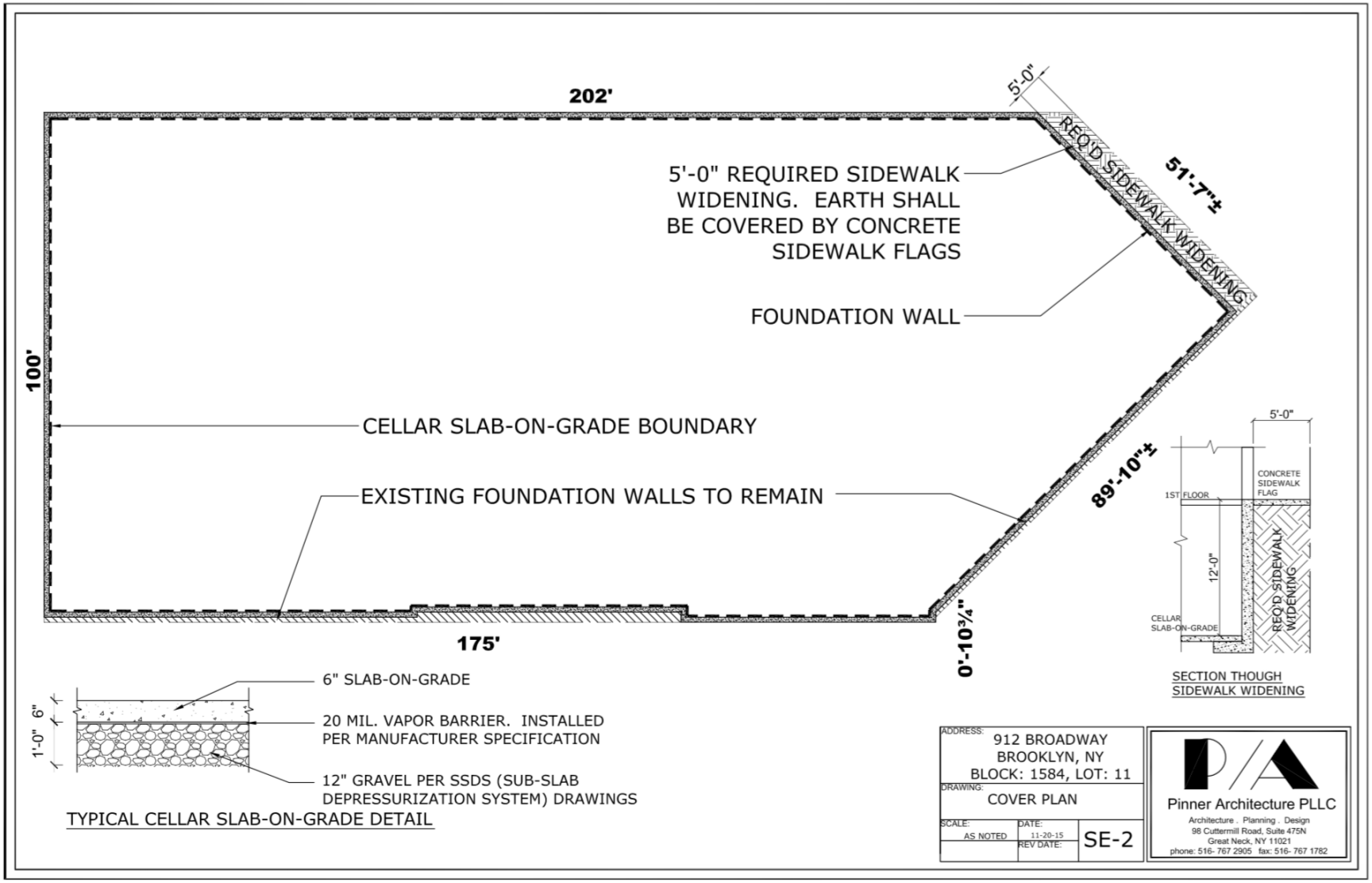


Figure 7
Vapor Barrier/Waterproofing Membrane Diagram

910-912 Broadway
Brooklyn, New York

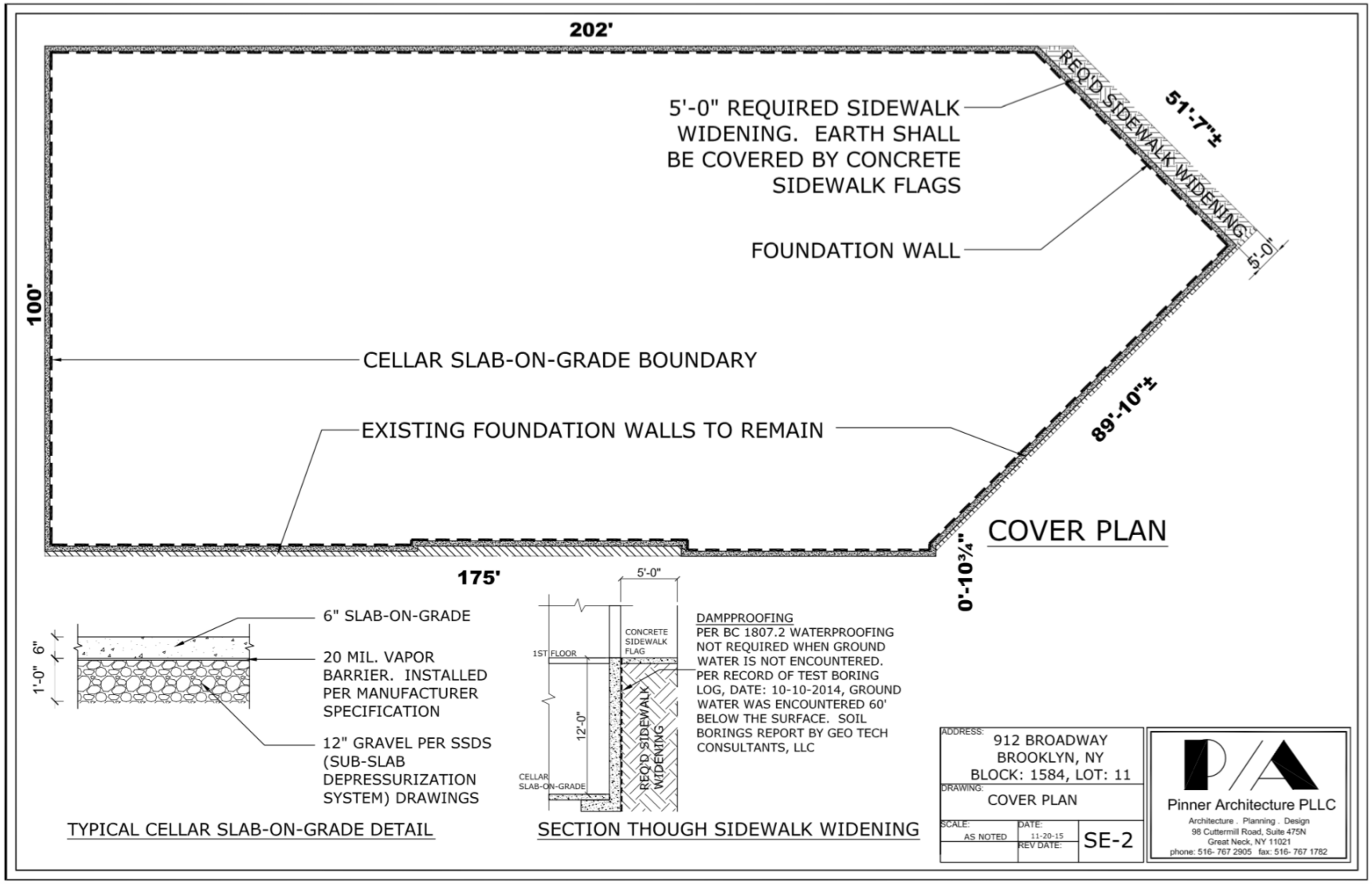
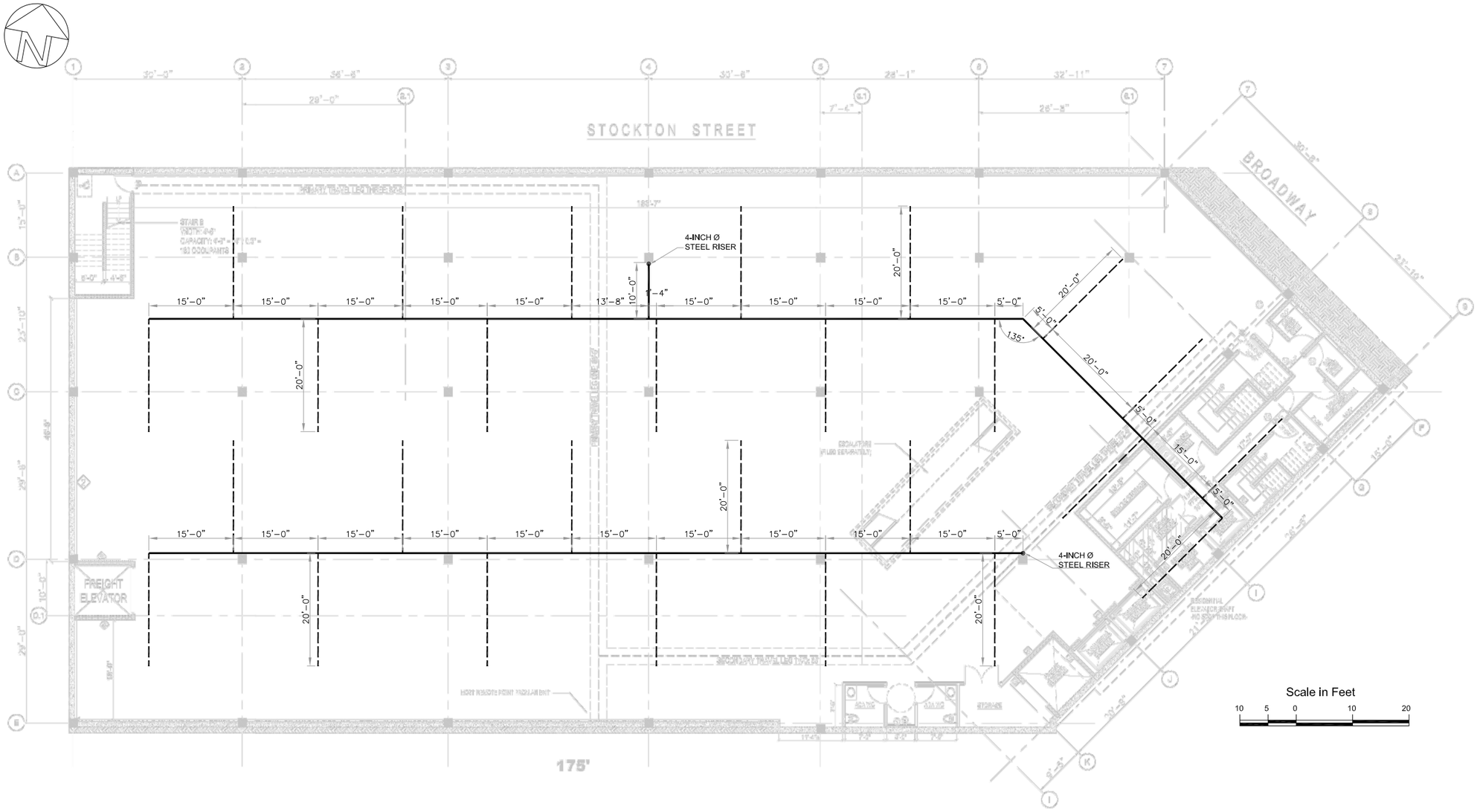


Figure 8

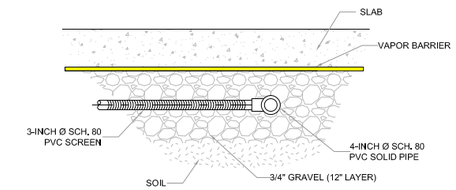
Sub-Slab Depressurization Design Diagram

910-912 Broadway
Brooklyn, New York



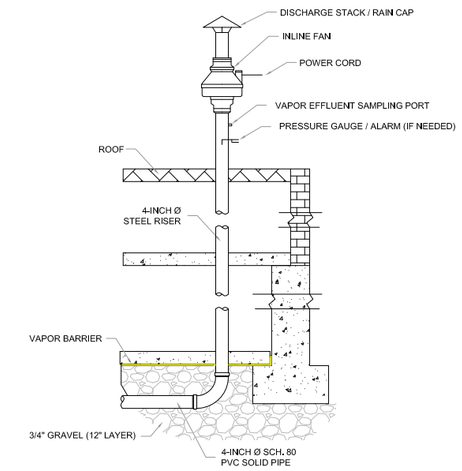
DEPRESSURIZATION SCREEN PIPING DETAIL

N.T.S.



SYSTEM PIPING AND EXHAUST DETAIL (INSIDE BUILDING)

N.T.S.



Scale in Feet

10 5 0 10 20

Legend

- - - - - - SCH. 80 Ø 3-INCH PVC SCREEN

——— SCH. 80 Ø 4-INCH PVC SOLID PIPE

Note:
Site development plan, dated 12-16-2014 prepared by Pinner Architecture, LLC

ACTIVE SUB-SLAB DEPRESSURIZATION SYSTEM CONSTRUCTION NOTES:

1. PROPOSED LOCATIONS OF DEPRESSURIZATION SYSTEM RISER PIPES TO BE VERIFIED BY ARCHITECT.

2. PREPARE SUBSOIL AS SPECIFIED BY PROJECT GEOTECHNICAL OR STRUCTURAL ENGINEER, OR IN ACCORDANCE WITH ACI 302.1R-04 SECTION 4.1. PLACE, LEVEL, AND COMPACT GRAVEL BED CONSISTING OF CLEAN 3/4-INCH PEA GRAVEL, OR AN EQUIVALENT APPROVED BY THE DESIGN ENGINEER. GRAVEL TO BE NO MORE THAN 1-INCH IN DIAMETER, WITH NO SHARP AGGREGATE. LEVEL GRAVEL BED TO ELEVATION OF BOTTOM OF PVC PIPING TO BE INSTALLED.

3. 3-INCH DIAMETER SCHEDULE 80 SLOTTED PVC SCREEN SHALL BE INSTALLED 6 INCH BENEATH THE BUILDING SLAB. BACKFILL AND COMPACT OVER SUPPORTED SCREEN WITH CLEAN 3/4-INCH PEA GRAVEL. TOTAL DEPTH OF COMPACTED GRAVEL SURROUNDING PIPING SHALL BE MINIMUM 12-INCHES THICK. PVC SCREENS SHALL BE CONNECTED TO 4-INCH DIAMETER SCHEDULE 80 PVC SOILD PIPE AND STEEL RISERS. VAPOR EFFLUENT SAMPLING PORTS SHALL BE INSTALLED ON THE RISERS. THE RISERS SHALL RAISE AT LEAST 3-FEET ABOVE THE ROOF. RAIN CAPS SHALL BE INSTALLED ON THE ROOF AT THE END OF THE RISERS.

4. PVC PIPING TO BE NEW, CLEAN SLOTTED SCREEN AND SOLID PIPE. 20-FOOT LENGTHS OF PIPE SHALL BE USED TO THE EXTENT PRACTICABLE. SCREEN TO BE 40-SLOT (0.040 INCH WIDE SLOTS). STEEL RISER PIPE AND FITTINGS FOR THE VERTICAL STACK TO BE PRIMED AND PAINTED WITH WEATHER RESISTENT PAINT. A MINIMUM OF TWO UNIONS SHALL BE INSTALLED ON THE STACK PIPE TO PROVIDE FOR FUTURE MODIFICATION.

5. PLUMBING, PRIMING, GLUING, PAINTING, FASTENING, AND SUPPORTING PVC AND STEEL PIPES, SCREENS, RISERS, AND FITTINGS TO BE CONDUCTED IN ACCORDANCE WITH EXISTING PROJECT PLANS AND SPECIFICATIONS, INDUSTRY STANDARDS, AND MANUFACTURERS INSTRUCTIONS, UNLESS OTHERWISE APPROVED BY THE PROJECT ENGINEER. THE INSTALLATION SHALL COMPLY WITH ALL FEDERAL, STATE, AND LOCAL CODES.

6. CONTRACTOR SHALL STORE MATERIALS IN A CLEAN AND DRY AREA, AND SHALL PROTECT MATERIALS FROM DAMAGE DURING HANDLING AND INSTALLATION.

7. INSTALL ONE IN-LINE CENTRIFUGAL FAN UNIT, RADON AWAY 4-INCH MITIGATION FAN (RP-145), OR AN EQUIVALENT APPROVED BY THE DESIGN ENGINEER, ON EACH STACK PIPE. THESE FAN UNITS CONSUME ABOUT 41-72 WATTS OF POWER, AND ARE CAPABLE OF INDUCING 2.1 INCHES OF WATER VACUUM, WHILE MOVING 166 CUBIC FEET PER MINUTE (CFM) OF AIR.

8. INSTALL AN IN-LINE PRESSURE GAUGE OR MANOMETER ON EACH STACK PIPE. THE GAUGE OR MANOMETER MUST HAVE A CLEARLY MARKED LINE OR LINES SHOWING MINIMUM ACCEPTABLE VACUUM LEVELS. WHERE APPROPRIATE, IN ADDITION TO A MANOMETER OR GAUGE, A VISIBLE AND/OR AUDIBLE ALARM SHOULD BE CONSIDERED, INDICATING LOSS OF SYSTEM VACUUM OR POWER. IN ALL CASES, CLEAR INSTRUCTIONS, WITH THE NAME AND PHONE NUMBER OF A PERSON TO BE CONTACTED IN SUCH EVENT, SHOULD BE VISIBLE AT THE EXTRACTION POINTS.

New York State Professional Engineer STAMP:

TITLE:
Active Sub-Slab Depressurization System Design Diagrams

912 Broadway, Brooklyn, New York

DRAWN BY:	WF	REVISED BY:		PROJECT No. 2015-177
CHECKED BY:	JC	REVISED DATE:		
DATE:	11-18-2015	APPROVED BY:		FIGURE No. 08
SCALE:	1" = 20'	FILE NAME:		

Tel: (631) 616-4000 Fax: (631)980-7972
www.CiderEnvironmental.com
6268 Jericho Tpke, Suite 12, Commack, NY 11725

CIDER ENVIRONMENTAL

Figure 9

Truck Route Map

910-912 Broadway
Brooklyn, New York

bing maps

From: 374 Stockton St, Brooklyn, NY 11206

To: Broadway & Rodney St, Brooklyn, NY 11211

Notes: From Rodney Street the trucks can gain access to the Williamsburg Bridge, Brooklyn Queens Expressway East or West depending on which disposal facility they are going to.

12 min, 1.3 mi

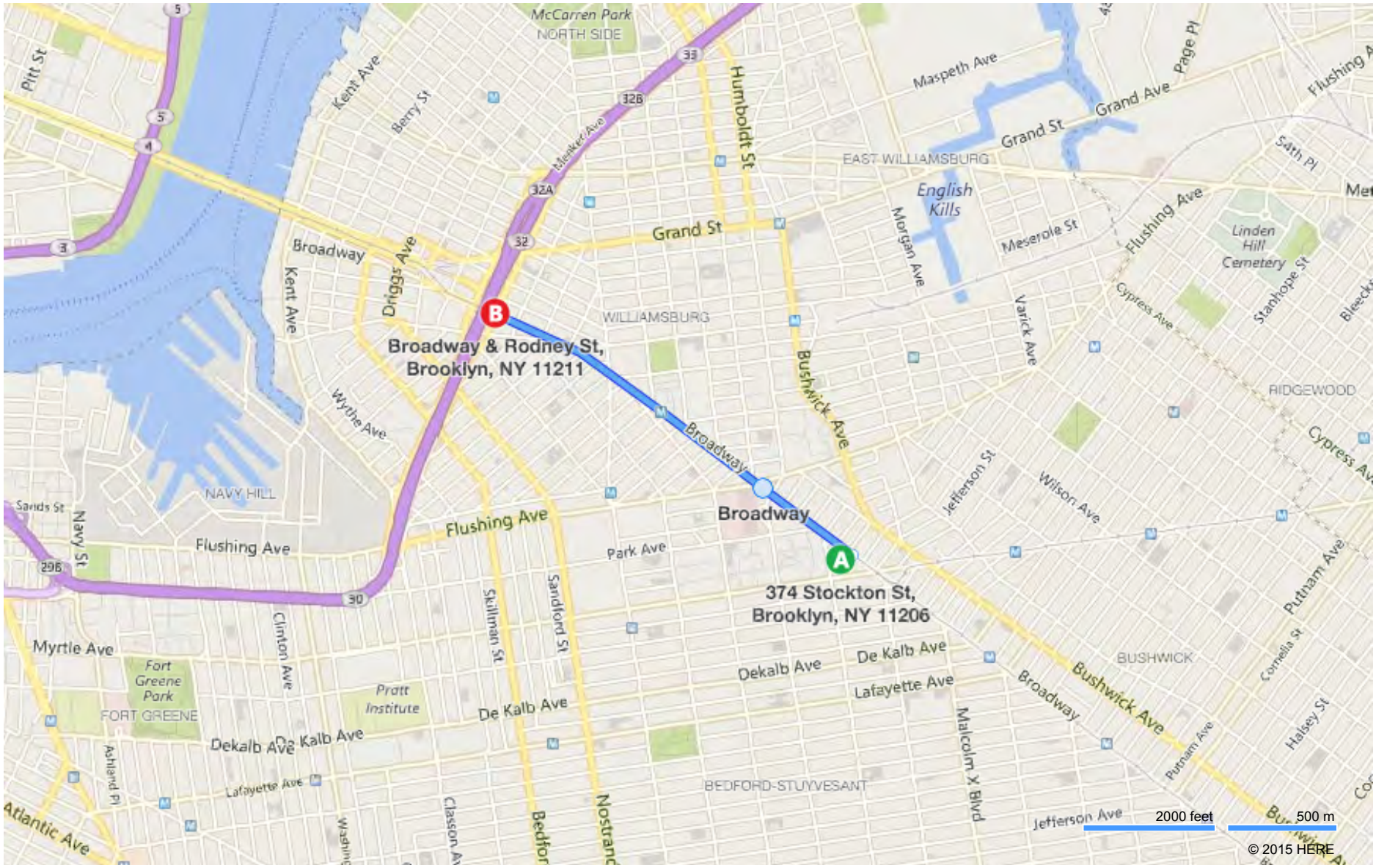
Heavy traffic
7 min without traffic
Via Stockton St, Broadway

374 Stockton St, Brooklyn, NY 11206

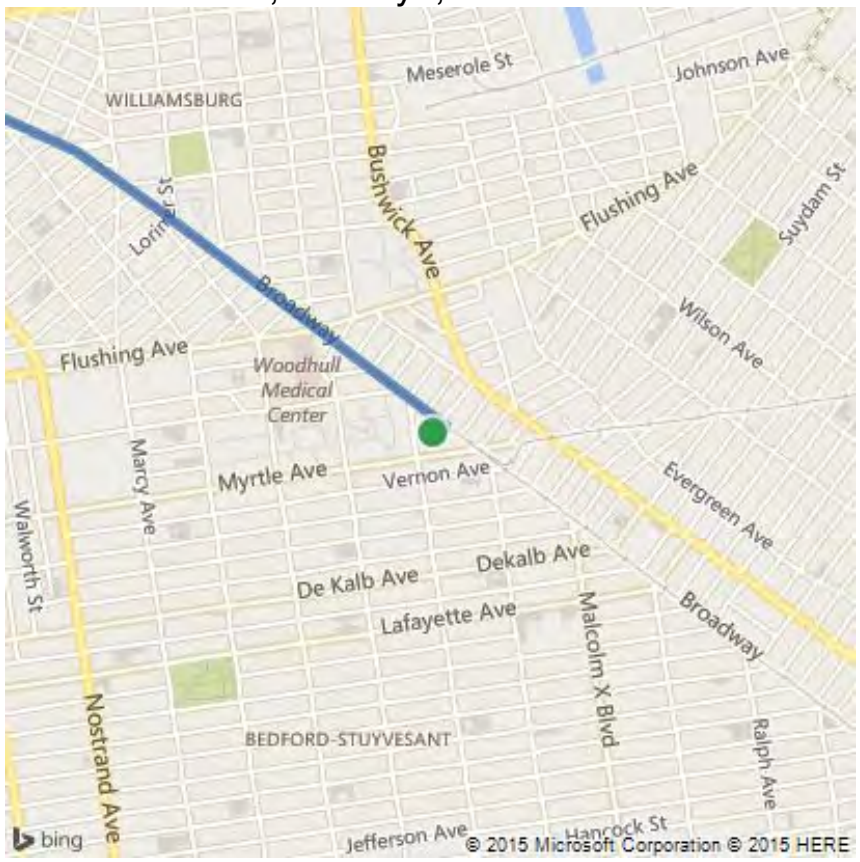
via Broadway

↑	Depart Stockton St toward Broadway	223 ft
↰	Turn left onto Broadway Pass McDonald's in 0.5 mi	1.3 mi
	Arrive at Broadway The last intersection is S 9th St If you reach Rodney St, you've gone too far	

Broadway & Rodney St, Brooklyn, NY 11211


B
Broadway & Rodney St,
Brooklyn, NY 11211
A
374 Stockton St,
Brooklyn, NY 11206
Broadway
McCarren Park
NORTH SIDE
WILLIAMSBURG
EAST WILLIAMSBURG
English Kills
Grand St
Grand Ave
Maspeth Ave
Humboldt St
Bushwick Ave
Broadway
Flushing Ave
Park Ave
Dekalb Ave
De Kalb Ave
Lafayette Ave
Myrtle Ave
Fort Greene Park
FORT GREENE
Pratt Institute
NAVY HILL
Navy St
Kent Ave
Berry St
Driggs Ave
Wythe Ave
Sandford St
Skillman St
Clinton Ave
Classon Ave
Bedford
Nostrand
Malcolm X Blvd
BEDFORD-STUYVESANT
BUSHWICK
RIDGEWOOD
Linden Hill Cemetery
Meserole St
Morgan Ave
Varick Ave
Jefferson St
Wilson Ave
Putnam Ave
Halsey St
Cornelia St
Cypress Ave
Stanhope St
Jefferson Ave
Atlantic Ave
Pitt St
Sands St
Ashland Pl
Page Pl
54th Pl
2000 feet
500 m
© 2015 HERE

374 Stockton St, Brooklyn, NY 11206



Broadway & Rodney St, Brooklyn, NY 11211

These directions are subject to the Microsoft® Service Agreement and are for informational purposes only. No guarantee is made regarding their completeness or accuracy. Construction projects, traffic, or other events may cause actual conditions to differ from these results. Map and traffic data © 2015 HERE™.

APPENDIX 1

PROPOSED DEVELOPMENT PLANS

NEW SIX STORY + CELLAR MIXED USE BUILDING
912 BROADWAY, BROOKLYN - BLOCK: 1584 - LOT: 11

SCOPE OF WORK

NEW SIX STORY + CELLAR MIXED USE BUILDING

MISCELLANEOUS NOTES

1. ALL ELEVATORS FILED SEPARATELY
2. ALL ESCALATORS FILED SEPARATELY. ESCALATORS SHALL COMPLY WITH BC 707.2
3. ALL EXTERIOR OUTDOOR SIGNAGE FILED SEPARATELY
4. PROPOSED WORK IS NOT LOCATED WITHIN A SPECIAL FLOOD HAZARD AREA

ZONING DATA

ADDRESS: 912 BROADWAY
BOROUGH: BROOKLYN
BLOCK: 1584
LOT: 11
MAP: 13b
ZONE: C4-4L
LOT SIZE: 21,125 SQ. FT
PROPOSED USE GROUP: CELLAR - 3RD: U.G.10A
4TH-7TH: U.G.2

FLOOR AREA
-COMMERCIAL MAX FAR (33-122): 4
-RESIDENTIAL MAX FAR: 4
-(35-23) FOR C4-4L USE FAR FOR R7A
-(23-145) R7A MAX FAR: 4
MAX PERMITTED FA: 4.0 x 21,125 = 84,500 SF
TOTAL FLOOR AREA: 84,435 SQ. FT. < 84,500 THUS OK

YARD REQUIREMENTS
SIDE YARD (33-25): NONE
REAR YARD (33-26): 20' REQ'D, 20' PROVIDED (NOT REQ'D WITHIN 100' OF CORNER PER 33-301)

HEIGHT & SETBACK REGULATIONS (33-432(b) DIRECTS TO (35-24)
(b) STREET WALL LOCATION
(1) 70% MIN. OF STREET WALL LOCATED WITHIN 8' OF STREET LINE & EXTEND TO MIN. / MAX. BASE HGT. IN TABLE A
(4) ABOVE APPLIES ONLY TO STREET WALL NOT LOCATED UNDER ELEVATED TRAIN. BELOW PROVISIONS APPLY FOR UNDER ELEVATED TRAIN
(i) 5' SIDEWALK WIDENING
(II) 70" MIN. LOCATED ON STREET LINE SHALL EXTEND TO MIN. / MAX. BASE HGT.
(c) SETBACK REGULATIONS
(1) 10' ON A WIDE STREET,15' ON A NARROW STREET
(4) SETBACKS ON STREET W/ ELEVATED TRAIN
(I) 15' FROM STREET LINE, 30' MIN OR 3 STORIES, NOT HIGHER THAN 65' OR 6 STORY
(d) MAXIMUM BUILDING HEIGHT
(2) 100' OR 10 STORIES
TABLE A: MINIMUM BASE HEIGHT: 40'
MAXIMUM BASE HEIGHT: 65'

RESIDENTIAL BULK REGULATIONS FOR COMMERCIAL DISTRICT
PER 35-23 BULK REGULATIONS FOR R7A SHALL BE USED
MAXIMUM DWELLING UNITS
DWELLING UNIT FACTOR PER 23-22: 680
84,500 (MAX FLR AREA)-56,142(COMMERCIAL. FLR. AREA)=28,358 / 680 = 41 MAX DU
PROPOSED DWELLING UNITS: 30

PARKING REQUIREMENTS
COMMERCIAL: PER 36-20 GENERAL RETAIL (PRC-B): NONE REQUIRED
RESIDENTIAL:
- PER 36-33 FOR C4-4L REGULATIONS OF R7-2 SHALL APPLY
- PER 25-23 FOR R7-2 PROVIDE PARKING FOR 50% OF DWELLING UNITS
- WAIVER PROVISIONS PER 36-362 FOR 15 SPACES
MAXIMUM DWELLINGS WITHOUT PARKING: 30 DWELLING X 50% = 15 SPACES WAIVED

PER TABLES OF ZR132-13, PLOT IS REQUIRED TO COMPLY WITH THE FOLLOWING (EC-4)

132-22(a) MANDATORY NON-RESIDENTIAL USES
132-22(c) OTHER PERMITTED USES
(1)RESIDENTIAL LOBBIES
132-24(c) RESIDENTIAL LOBBIES
-LESS THAN 25'-0" OF STREET FRONTAGE: PROVIDED 13'-8"
132-32 GROUND FLOOR TRANSPARENCY
-SEE TRANSPARENCY CALCULATION ON A-202.00
132-42 LOCATION OF PARKING SPACES
-NO PARKING SPACES REQUIRED
132-43 CURB CUTS
-NO CURB CUTS PROPOSED ON DESIGNATED COMMERCIAL STREET

BICYCLE PARKING ANALYSIS PER 36-711

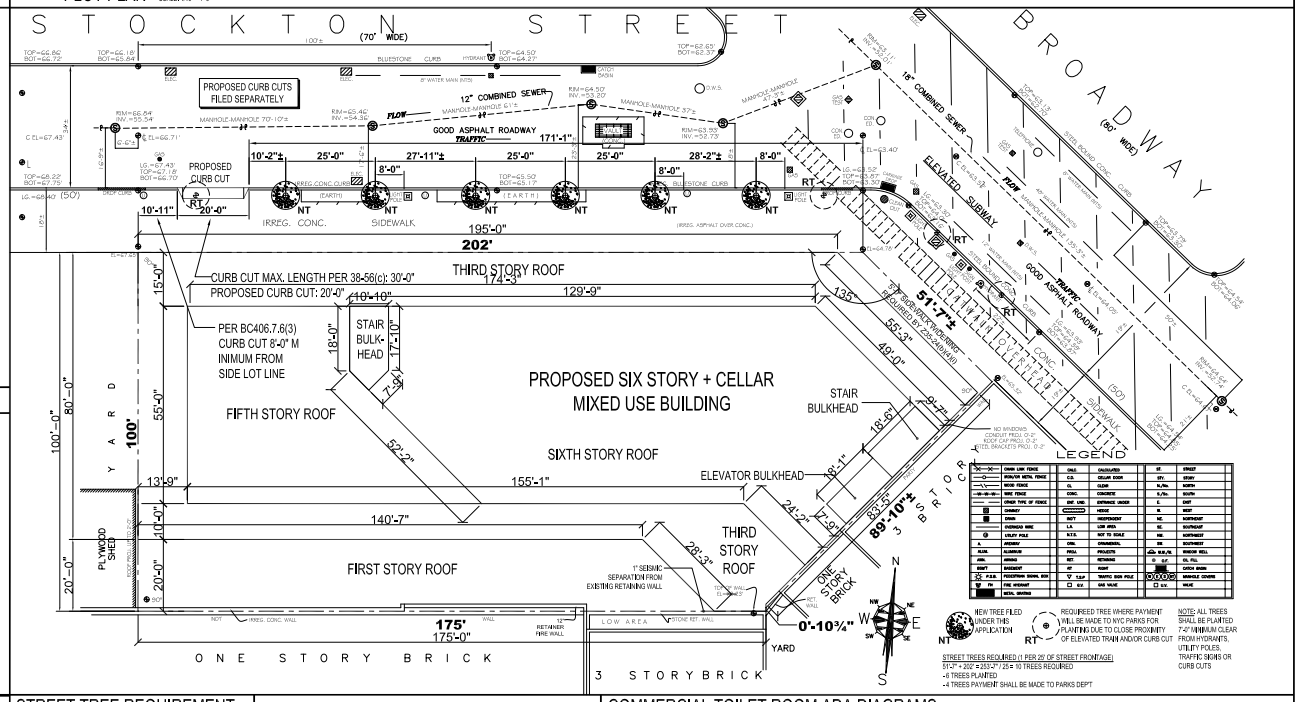
COMMERCIAL: (1 PER 10,000SF) 58,048 SF / 10,000 = 6 REQUIRED
RESIDENTIAL: (1 PER 2 DU) 29 DU / 2 = 15 REQUIRED
TOTAL: 6 + 15 = 21 REQUIRED TOTAL

DRAWING INDEX

1.A-001.00	SITE PLAN, ZONING DATA, BUILDING CODE DATA
2.A-002.00	FLOOR AREA DIAGRAMS, HEIGHT DIAGRAMS, LOT COVERAGE DIAGRAM
3.N-001.00	NOTES, REQUIRED INSPECTIONS
4.N-002.00	ADA NOTES & DIAGRAMS, FEMA FLOOD MAP
5.A-100.00	CELLAR CONSTRUCTION PLAN
6.A-101.00	FIRST FLOOR CONSTRUCTION PLAN
7.A-102.00	SECOND FLOOR CONSTRUCTION PLAN
8.A-103.00	THIRD FLOOR CONSTRUCTION PLAN
9.A-104.00	FOURTH FLOOR CONSTRUCTION PLAN
10.A-105.00	FIFTH FLOOR CONSTRUCTION PLAN
11.A-106.00	SIXTH FLOOR CONSTRUCTION PLAN
12.A-107.00	ROOF CONSTRUCTION PLAN
13.A-201.00	STOCKTON STREET EXTERIOR ELEVATION
14.A-202.00	BROADWAY EXTERIOR ELEVATION
15.A-301.00	SECTIONS
16.A-302.00	SECTIONS
17.A-401.00	STAIR DETAILS
18.A-402.00	STAIR DETAILS
19.A-501.00	DETAILS
20.EN-001.00	COMCHECK ENERGY ANALYSIS

PLOT PLAN

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



NEW TREE FILED UNDER THIS APPLICATION

REQUIRED TREE WHERE PAYMENT WILL BE MADE TO NYC PARKS FOR PLANTING DUE TO CLOSE PROXIMITY OF ELEVATED TRAIN AND/OR CURB CUT

STREET TREES REQUIRED (1 PER 25' OF STREET FRONTAGE)
51'-7" + 202' = 253'-7" / 25 = 10 TREES REQUIRED
- 6 TREES PLANTED
- 4 TREES PAYMENT SHALL BE MADE TO PARKS DEPT

NOTE: ALL TREES SHALL BE PLANTED 7'-0" MINIMUM CLEAR FROM HYDRANTS, UTILITY POLES, TRAFFIC SIGNS OR CURB CUTS

BUILDING CODE DATA

OCCUPANCY CLASSIFICATION: MERCANTILE GROUP M (BC 309)
SPRINKLER SYSTEM PROVIDED: YES
FIRE ALARM PROVIDED: YES
PROPOSED CONSTRUCTION CLASSIFICATION: IB (TABLE 503) 160 FEET HEIGHT MAX., UL STORIES, UL AREA
HEIGHT GOVERNS: PROPOSED HEIGHT 92 FEET < 160 FEET THUS OK
(TABLE 601 & 602) FIRE-RESISTANCE REQ'D FOR BLDG. ELEMENTS

STRUCTURAL FRAME:	2 HRS
BEARING WALLS:	2 HRS
NONBEARING WALLS:	0 HRS
FLOOR CONSTRUCTION:	2 HRS
ROOF CONSTRUCTION:	1 HR
EXTERIOR WALLS:	ON PROPERTY LINE: 2 HRS (<5')
	STREET FRONT: 0 HRS (>30')

STREET TREE REQUIREMENT

STREET TREES REQUIRED (1 PER 25' OF STREET FRONTAGE)
51'-7" + 202' = 253'-7" / 25 = 10 TREES REQUIRED
- 6 TREES PLANTED
- 4 TREES PAYMENT SHALL BE MADE TO PARKS DEP'T
NOTE: PAYMENT SHALL BE MADE TO NYC PARKS FOR PLANTING DUE TO HARDSHIPS SUCH CLOSE PROXIMITY TO ELEVATED TRAIN AND/OR EXISTING PUBLIC UTILITIES ON SIDEWALK

LOADING BERTH REQUIREMENT

REQUIRED OFF-STREET LOADING BERTHS (ZR36-62)
FIRST 25,000 SF FLOOR AREA - NONE
NEXT 15,000 SF (40,000) OF FLOOR AREA - 1
NEXT 60,000 SF (100,000) OF FLOOR AREA - 1 ADDITIONAL
TOTAL REQUIRED LOADING BERTHS: 2
SIZE OF OFF-STREET LOADING BERTHS (ZR36-681)

COMMERCIAL USE:	LENGTH	WIDTH	CLEARANCE
	33'	12'	14'

LEGEND

TWO-HOUR FIRE RATED PARTITION (UL DES U419)
-3 5/8" MT. STUDS 16" O.C.
-TWO LAYERS 5/8" SHEETROCK BRAND FIRECODE CORE GYPSUM WALLBOARD EACH SIDE OR EQUAL.
-ALL THROUGH PENETRATIONS TO BE FIRE STOPPED AS RQUIRED

NON-RATED PARTITION
-3 5/8" MT. STUDS 16" O.C.
-ONE LAYERS 5/8" GYPSUM WALLBOARD EACH SIDE.

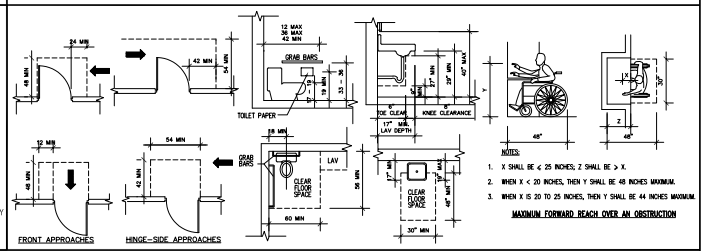
TWO-HOUR FIRE RATED CMU PARTITION
-8" WIDE CMU
-EXTERIOR WALLS TO RECEIVE STUCCO ON EXTERIOR SIDE

EXTERIOR STOREFRONT
- VISTAWALL FG-9000 INSULATED TEMPERED STOREFRONT SYSTEM
- FRAME TO BE CLEAR ANODYZED

CONCRETE FOUNDATION WALL
-SEE STRUCTRAL PLANS

30" x 48" AREA OF RESCUE PER 1007.8. EACH AREA OF RESCUE SHALL BE PROVIDED WITH A TWO-WAY EMERGENCY COMMUNICATION SYSTEM THAT COMPLIES WITH BC1007.6.3 AND POSTED INSTRUCTION THAT COMPLY WITH BC1007.6.4

COMMERCIAL TOILET ROOM ADA DIAGRAMS



NOTES:
1. X SHALL BE ≤ 25 INCHES; Z SHALL BE ≥ X.
2. WHEN X < 20 INCHES, THEN Y SHALL BE 48 INCHES MAXIMUM.
3. WHEN X IS 20 TO 25 INCHES, THEN Y SHALL BE 44 INCHES MAXIMUM.

MAXIMUM FORWARD REACH OVER AN OBSTRUCTION

Pinner Architecture PLLC
Architecture - Planning - Design
96 Cutler Road, Suite 475N
Great neck, NY 11021
phone: 516- 767 2660 fax: 516- 767 1782

SEAL

ISSUES

#	DATE	BY	FOR
1	4-13-12	PC	FIRST HUB REVIEW - DOC 1
2	2-12-14	PC	HUB REVIEW - DOC 1
3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

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4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVISIONS PER LATEST EXAM 12/01/14 FEMA MAP REQ, PAR REQ'ED STORAGE REQ'D TO FILE PARKING
6	12-16-14	PC	REVISIONS PER LATEST EXAM 12/01/14 CORRECT ENVIRONMENTAL CLOSURE, ADA PUSH PULL, APPROACH

CLIENT
BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT
NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

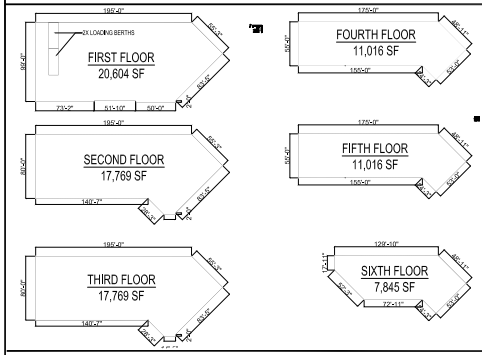
DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME
SITE PLAN, ZONING DATA, BUILDING CODE DATA

DRAWING NUMBER
A-001.00
1 OF 20

APPLICATION #: 320373822

FLOOR AREA DIAGRAMS



FLOOR AREA CHART	
FLOOR	GFA (SF)
FIRST	20,604
SECOND	17,769
THIRD	17,769
FOURTH	11,016
FIFTH	11,016
SIXTH	7,845
TOTAL	86,019
EXCLUSIONS	1,584
TOTAL FA	84,435

FLOOR AREA EXCLUSION

ZR12-10 FLOOR AREA EXCLUSION (7)

-FLOOR SPACE USED FOR ACCESSORY OFF-STREET LOADING BERTHS, UP TO 200 PERCENT OF THE AMOUNT REQUIRED BY THE APPLICABLE DISTRICT REGULATION

TWO LOADING BERTHS REQUIRED

PROVIDED ON FIRST FLOOR

REQUIRED SIZE OF BERTHS: 12' X 33' = 396 SF X 2 BERTHS = 792 X 200% = 1,584 SF EXCLUDED FROM FLOOR AREA

LOT COVERAGE

MAXIMUM LOT COVERAGE (23-145)

CORNER LOT: 80%

INTERIOR LOT: 65%

INTERIOR LOT PORTION

AREA: 11,081 SF

MAX. COVERAGE: 11,081 X 65% = 7,203 SF

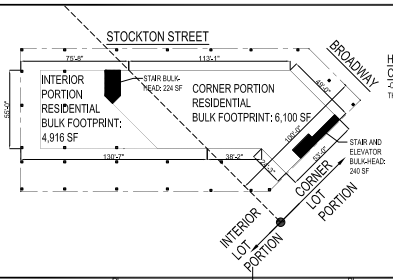
PROPOSED COVERAGE: 4,916 < 7,203 THUS OK

CORNER LOT PORTION

AREA: 10,044 SF

MAX. COVERAGE: 10,044 X 80% = 8,035 SF

PROPOSED COVERAGE: 6,100 < 8,035 THUS OK



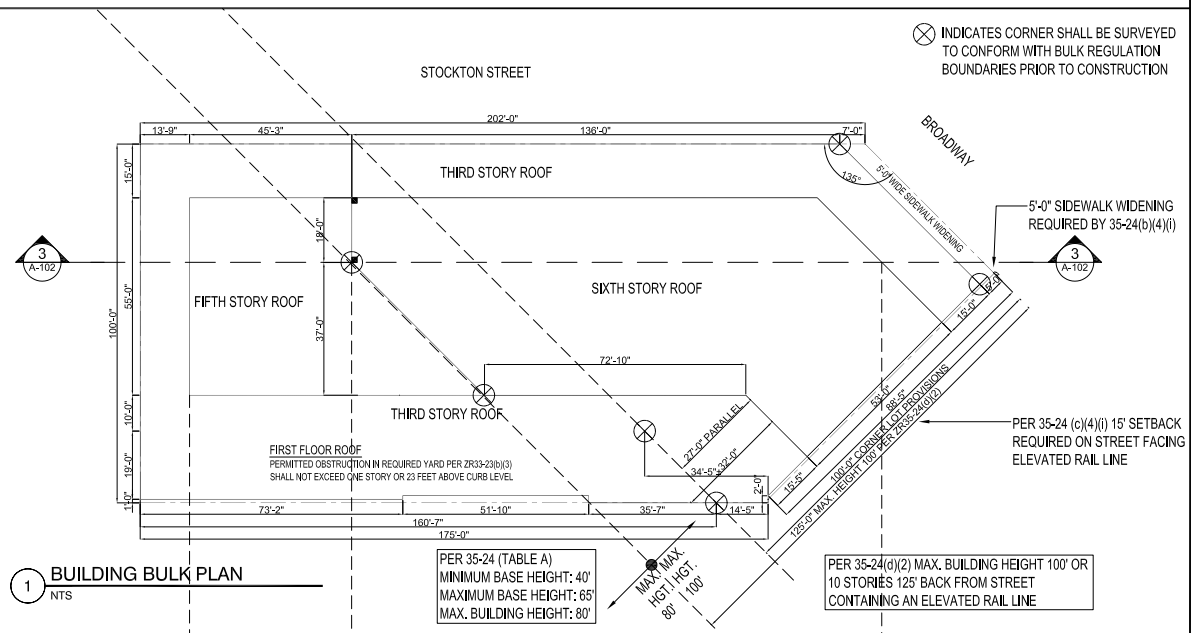
HEIGHT OBSTRUCTION AREA COVERAGE ZR33-42(f)(3)

-OBSTRUCTIONS SHALL NOT EXCEED 20% OF THE COVERAGE OF THE BUILDING

-BUILDING COVERAGE: 11,016 SF X 20% = 2,203 SF MAX COVERAGE

-AREA OF BULKHEADS: 464 < 2,203

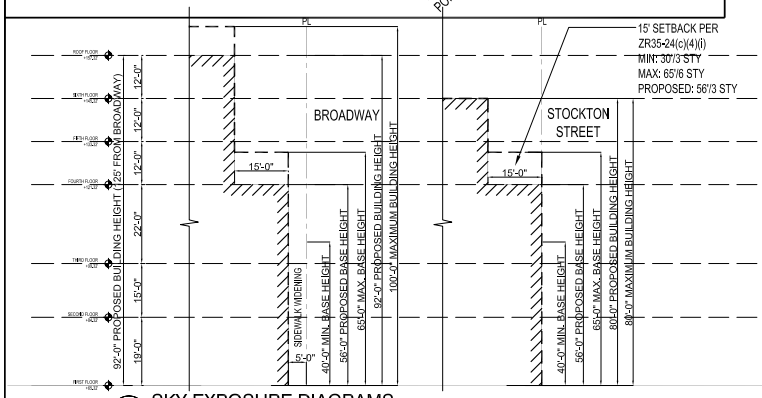
HEIGHT DIAGRAMS



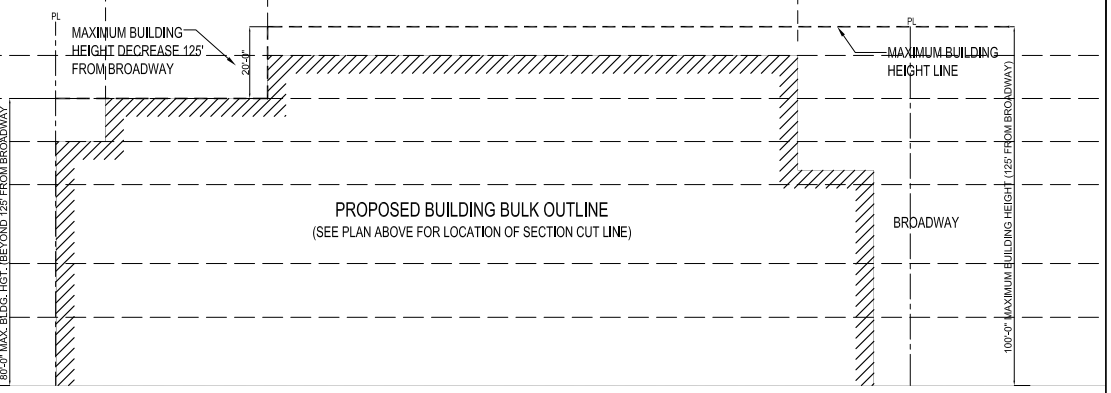
PER 35-24 (TABLE A)
MINIMUM BASE HEIGHT: 40'
MAXIMUM BASE HEIGHT: 65'
MAX. BUILDING HEIGHT: 80'

PER 35-24(d)(2) MAX. BUILDING HEIGHT 100' OR 10 STORIES 125' BACK FROM STREET CONTAINING AN ELEVATED RAIL LINE

1 BUILDING BULK PLAN
NTS



2 SKY EXPOSURE DIAGRAMS
NTS



3 BUILDING HEIGHT DIAGRAM
NTS

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Architecture - Planning - Design
98 Cutlerm Road, Suite 479N
Great neck, NY 11021
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6	12-16-14	PC	REVISIONS PER LAST EXAM 12/12/14 CORNER, SHORE ENCLOSURE, ADA PUSH PULL, APPROACH P

CLIENT

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PROJECT

NEW 6 STY MIXED BLDG
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BLOCK: 1584, LOT: 15

CONSULTANT

DATE: 1-10-12
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CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME

FLOOR AREA DIAGRAMS, HEIGHT DIAGRAMS, LOT COVERAGE DIAGRAM

DRAWING NUMBER

A-002.00

2 OF 20

APPLICATION #: 320373822

TRASH CHUTE/COMPACTOR INFORMATION

COMPACTOR: MODEL: # 100
POWER REQUIREMENTS: 220V, 3 PHASE, 30 AMP
CHUTE DIAMETER: 24"
ROUGH OPENING DIAMETER: 28"
NOTES
1. TRASH CHUTE ASSEMBLY CONTAINS TWO CONNECTIONS FOR FIRE SPRINKLER AT THIRD & FIRST FLOOR.
2. ACCESSED ON FLOORS 4, 5, 6 VIA 1.5 HOUR RATED HOPPER DOOR
MANUFACTURORINSTALLER INFORMATION
BIG APPLE COMPACTOR CO. INC.

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET
COMMON PATH PROPOSED: 11'-6" < 75'

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET
PRIMARY TRAVEL TOTAL: 11'-6" + 83'-6" + 82'-6" = 177'-6" < 200'
SECONDARY TRAVEL TOTAL: 11'-6" + 55' + 82'-6" = 149' < 200'

1013.4.1 AISLE WIDTH

MINIMUM CLEAR AISLE WIDTH SHALL BE DETERMINED BY SECTION 1005.1, BUT SHALL NOT BE LESS THAN 36 INCHES.

TABLE 1005.1 EGRESS WIDTH PER OCCUPANT SERVED (

36 INCHES / 0.2 INCHES PER OCCUPANT = 180 OCCUPANT CAPACITY

CELLAR EGRESS CALCULATIONS

GROSS AREA: 20,622 SF / 60 SF PER OCCUPANT = 344 OCCUPANTS

STAIR CAPACITY

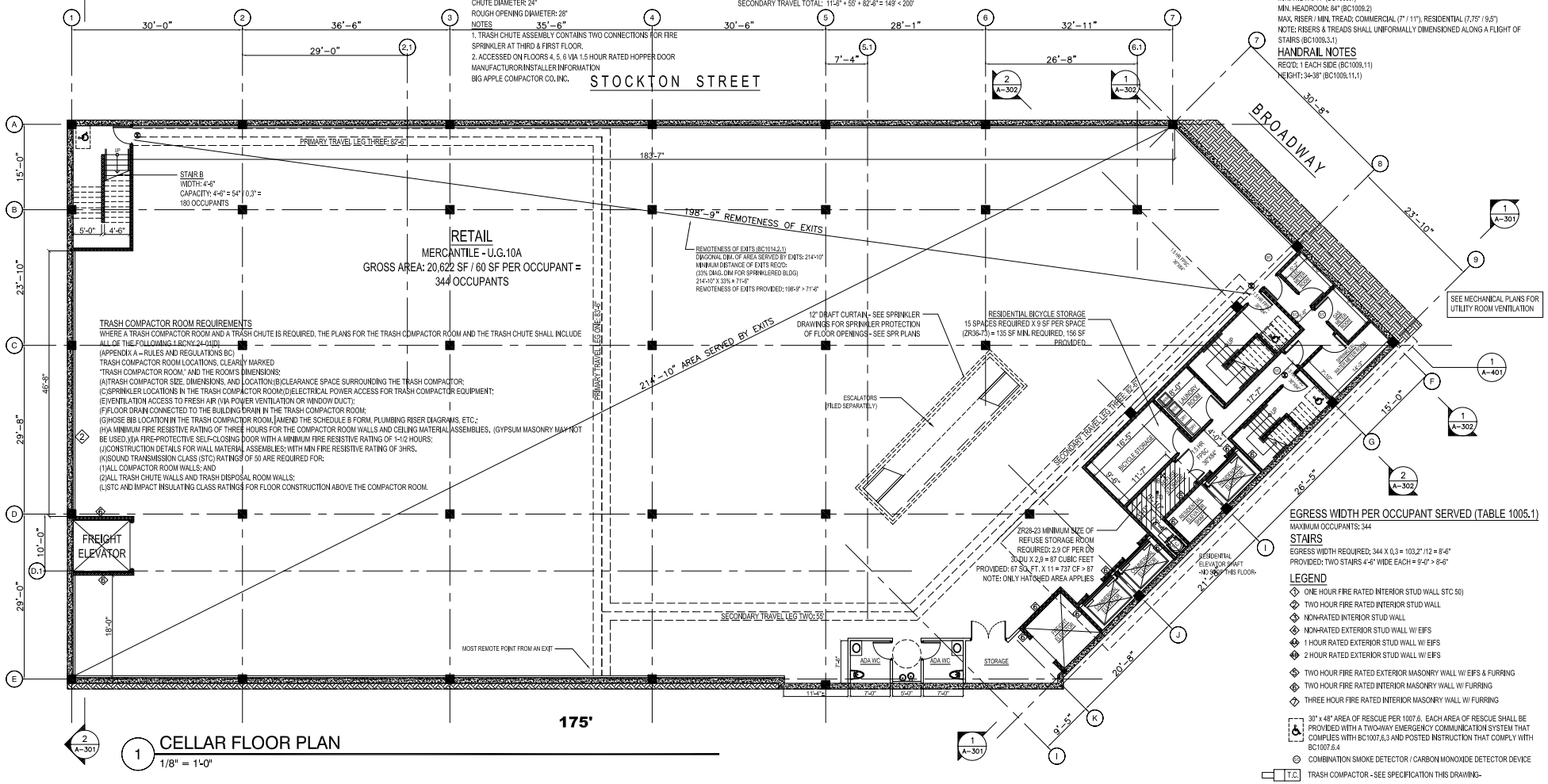
AGGREGATE STAIR WIDTH: 2X (4'-6") = 9'-0" / 0.3" PER OCC. = 360 OCC. > 344 THUS OK

STAIR PARAMETERS

MIN. WIDTH: 44" (BC1009.1)
MIN. HEADROOM: 84" (BC1009.2)
MAX. RISER / MIN. TREAD: COMMERCIAL (7" / 11"), RESIDENTIAL (7.75" / 9.5")
NOTE: RISERS & TREADS SHALL UNIFORMALLY DIMENSIONED ALONG A FLIGHT OF STAIRS (BC1009.3.1)

HANDRAIL NOTES

REQ'D; 1 EACH SIDE (BC1009.11)
HEIGHT: 34-38" (BC1009.11.1)



EGRESS WIDTH PER OCCUPANT SERVED (TABLE 1005.1)

MAXIMUM OCCUPANTS: 344

STAIRS

EGRESS WIDTH REQUIRED: 344 X 0.3 = 103.2" /12 = 8'-6"
PROVIDED: TWO STAIRS 4'-6" WIDE EACH = 9'-0" > 8'-6"

LEGEND

1. ONE HOUR FIRE RATED INTERIOR STUD WALL STC 50)
2. TWO HOUR FIRE RATED INTERIOR STUD WALL
3. NON-RATED INTERIOR STUD WALL
4. NON-RATED EXTERIOR STUD WALL W/ EIFS
4. 1 HOUR RATED EXTERIOR STUD WALL W/ EIFS
4. 2 HOUR RATED EXTERIOR STUD WALL W/ EIFS
5. TWO HOUR FIRE RATED EXTERIOR MASONRY WALL W/ EIFS & FURRING
6. TWO HOUR FIRE RATED INTERIOR MASONRY WALL W/ FURRING
7. THREE HOUR FIRE RATED INTERIOR MASONRY WALL W/ FURRING

30" x 48" AREA OF RESCUE PER 1007.6. EACH AREA OF RESCUE SHALL BE PROVIDED WITH A TWO-WAY EMERGENCY COMMUNICATION SYSTEM THAT COMPLIES WITH BC1007.6.3 AND POSTED INSTRUCTION THAT COMPLY WITH BC1007.6.4

COMBINATION SMOKE DETECTOR / CARBON MONOXIDE DETECTOR DEVICE

T.C. TRASH COMPACTOR - SEE SPECIFICATION THIS DRAWING-

1 CELLAR FLOOR PLAN

1/8" = 1'-0"

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Great neck, NY 11021
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6	12-16-14	PC	REVISE PER LAST EXAM 12/16/14 EGRESS SHOWS ENCLOSURE, ADA PUSH PULL, APPROACH

CLIENT

BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT

NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

DRAWING NAME

CELLAR CONSTRUCTION PLAN

DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NUMBER

A-100.00
5 OF 20

APPLICATION #: 320373822

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET
COMMON PATH PROPOSED: 46' < 75'

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET
PRIMARY TRAVEL TOTAL: 46' + 55' + 49'-6" = 150'-6" < 200'
SECONDARY TRAVEL TOTAL: 84'-6" + 51'-6" + 12' = 148' < 200'

LEGEND

EL.+XX.XX' SPOT ELEVATION INDICATING ACCESSIBLE BUILDING ENTRANCE

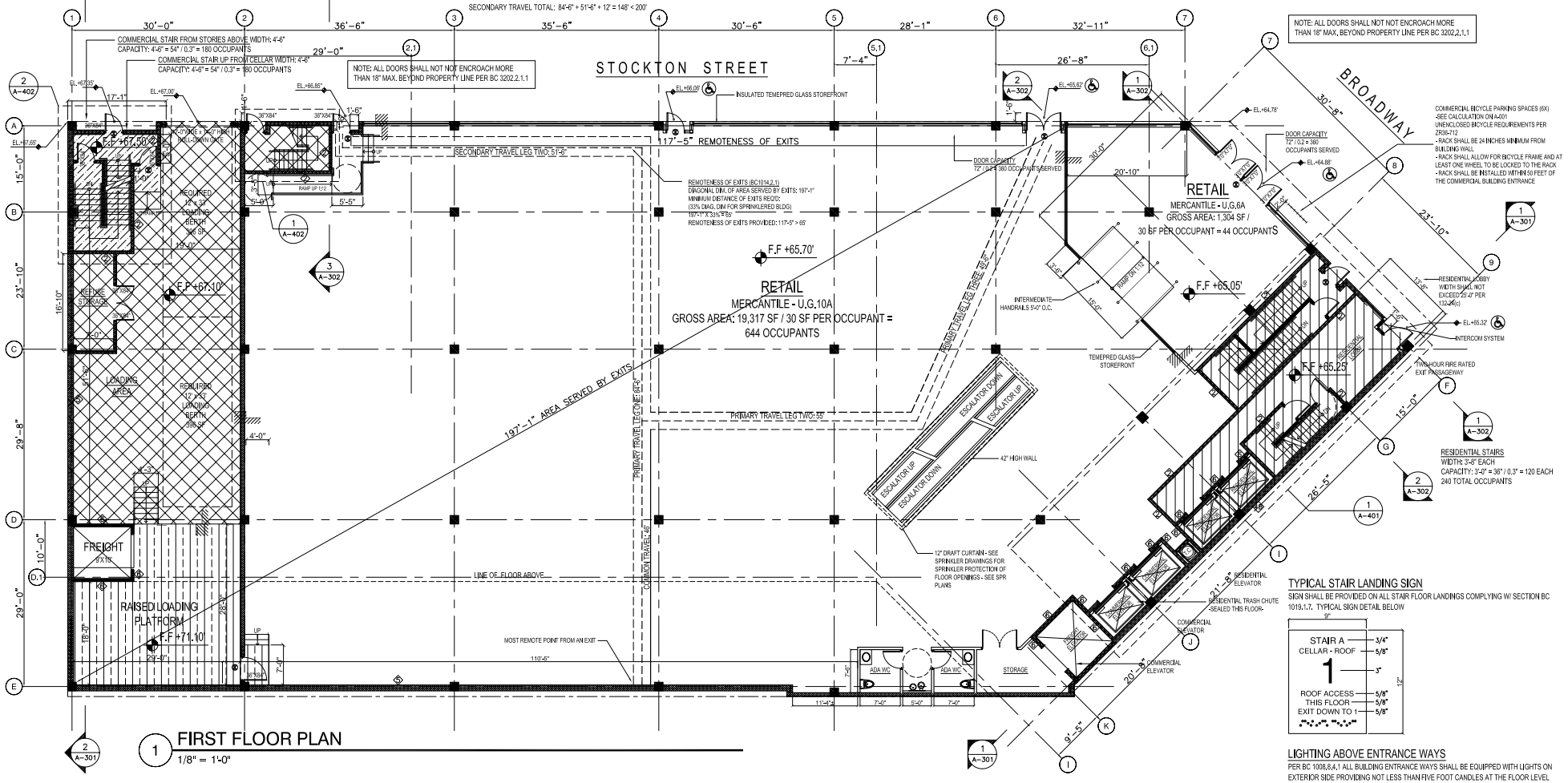
FIRST FLOOR EGRESS CALCULATIONS

GROSS AREA: 20,822 SF / 30 SF PER OCCUPANT = 687 OCCUPANTS

DOOR CAPACITY

AGGREGATE DOOR WIDTH: 7X (3'-0") = 21'-0" / 0.2" PER OCC. = 1,260 OCC. > 687 THUS OK

NOTE: ALL DOORS SHALL NOT NOT ENCROACH MORE THAN 18" MAX. BEYOND PROPERTY LINE PER BC 3202.2.1.1



1 FIRST FLOOR PLAN

1/8" = 1'-0"

TYPICAL STAIR LANDING SIGN

SIGN SHALL BE PROVIDED ON ALL STAIR FLOOR LANDINGS COMPLYING W/ SECTION BC 1019.1.7. TYPICAL SIGN DETAIL BELOW

LIGHTING ABOVE ENTRANCE WAYS

PER BC 1008.8.4.1 ALL BUILDING ENTRANCE WAYS SHALL BE EQUIPPED WITH LIGHTS ON EXTERIOR SIDE PROVIDING NOT LESS THAN FIVE FOOT CANDLES AT THE FLOOR LEVEL

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DRAWING NAME

FIRST FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-101.00
6 OF 20

APPLICATION #: 320373822

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET
COMMON PATH PROPOSED: 49-6" < 75'

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

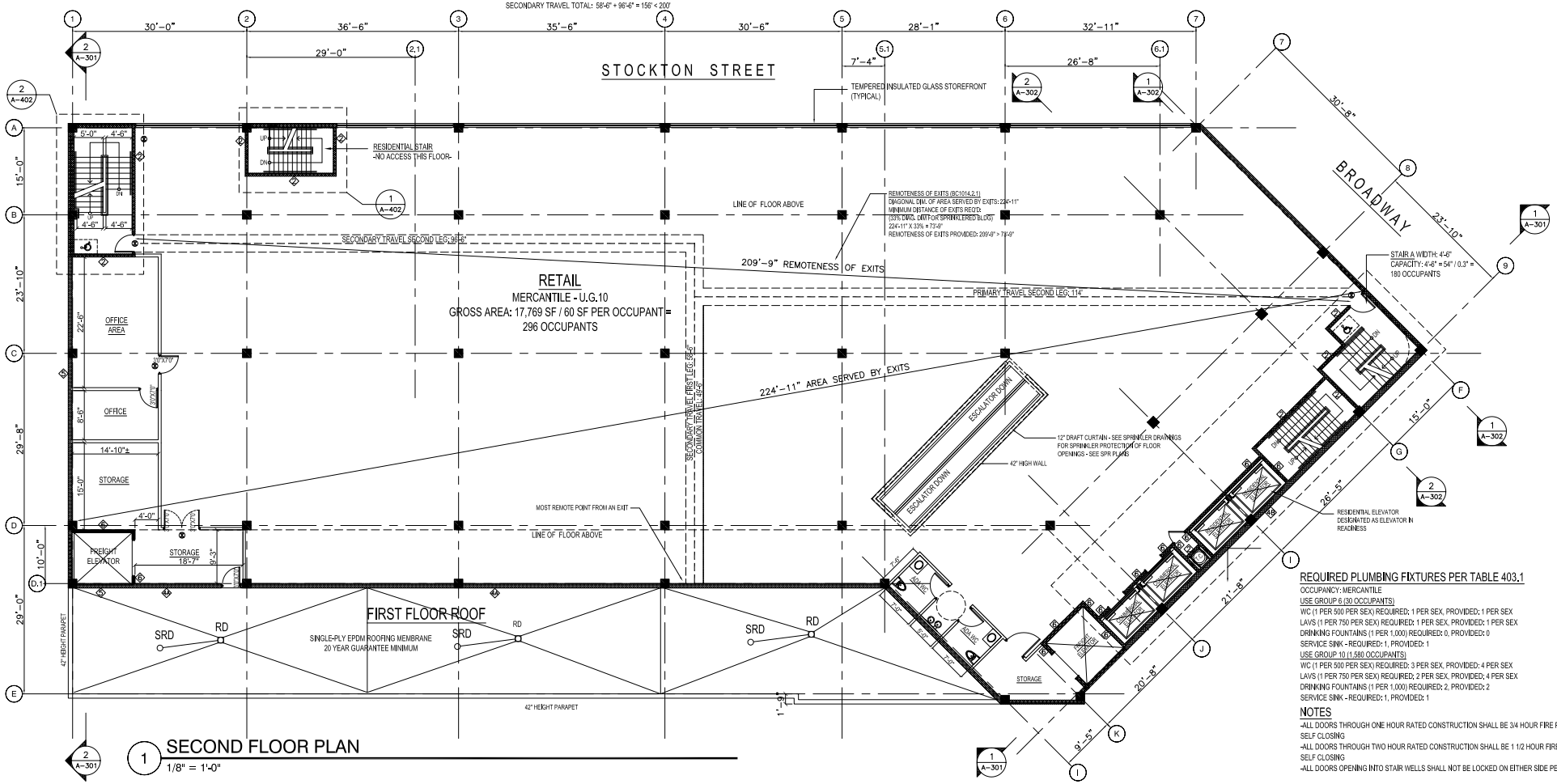
MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET
PRIMARY TRAVEL TOTAL: 49'-6" + 114' = 163'-6" < 200'
SECONDARY TRAVEL TOTAL: 58'-6" + 96'-6" = 156' < 200'

SECOND FLOOR EGRESS CALCULATIONS

GROSS AREA: 17,769 SF / 60 SF PER OCCUPANT = 296 OCCUPANTS

STAIR CAPACITY

AGGREGATE STAIR WIDTH: 2X (4'-6") = 9'-0" / 0.3" PER OCC. = 360 OCC. > 296 THUS OK



1 SECOND FLOOR PLAN
1/8" = 1'-0"

REQUIRED PLUMBING FIXTURES PER TABLE 403.1

OCCUPANCY: MERCANTILE
USE GROUP 6 (30 OCCUPANTS)
WC (1 PER 500 PER SEX) REQUIRED: 1 PER SEX, PROVIDED: 1 PER SEX
LAVS (1 PER 750 PER SEX) REQUIRED: 1 PER SEX, PROVIDED: 1 PER SEX
DRINKING FOUNTAINS (1 PER 1,000) REQUIRED: 0, PROVIDED: 0
SERVICE SINK - REQUIRED: 1, PROVIDED: 1
USE GROUP 10 (1,580 OCCUPANTS)
WC (1 PER 500 PER SEX) REQUIRED: 3 PER SEX, PROVIDED: 4 PER SEX
LAVS (1 PER 750 PER SEX) REQUIRED: 2 PER SEX, PROVIDED: 4 PER SEX
DRINKING FOUNTAINS (1 PER 1,000) REQUIRED: 2, PROVIDED: 2
SERVICE SINK - REQUIRED: 1, PROVIDED: 1

NOTES

-ALL DOORS THROUGH ONE HOUR RATED CONSTRUCTION SHALL BE 3/4 HOUR FIRE PROOF SELF CLOSING
-ALL DOORS THROUGH TWO HOUR RATED CONSTRUCTION SHALL BE 1 1/2 HOUR FIRE PROOF SELF CLOSING
-ALL DOORS OPENING INTO STAIR WELLS SHALL NOT BE LOCKED ON EITHER SIDE PER 403.12

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6	12-16-14	PC	REVS. PER LAST EXAM 12/16/14 EGRESS. CHANGE ENCLOSURE, ADA PUSH PULL, APPROACH

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DRAWING NAME

SECOND FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-102.00
7 OF 20

APPLICATION #: 320373822

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET

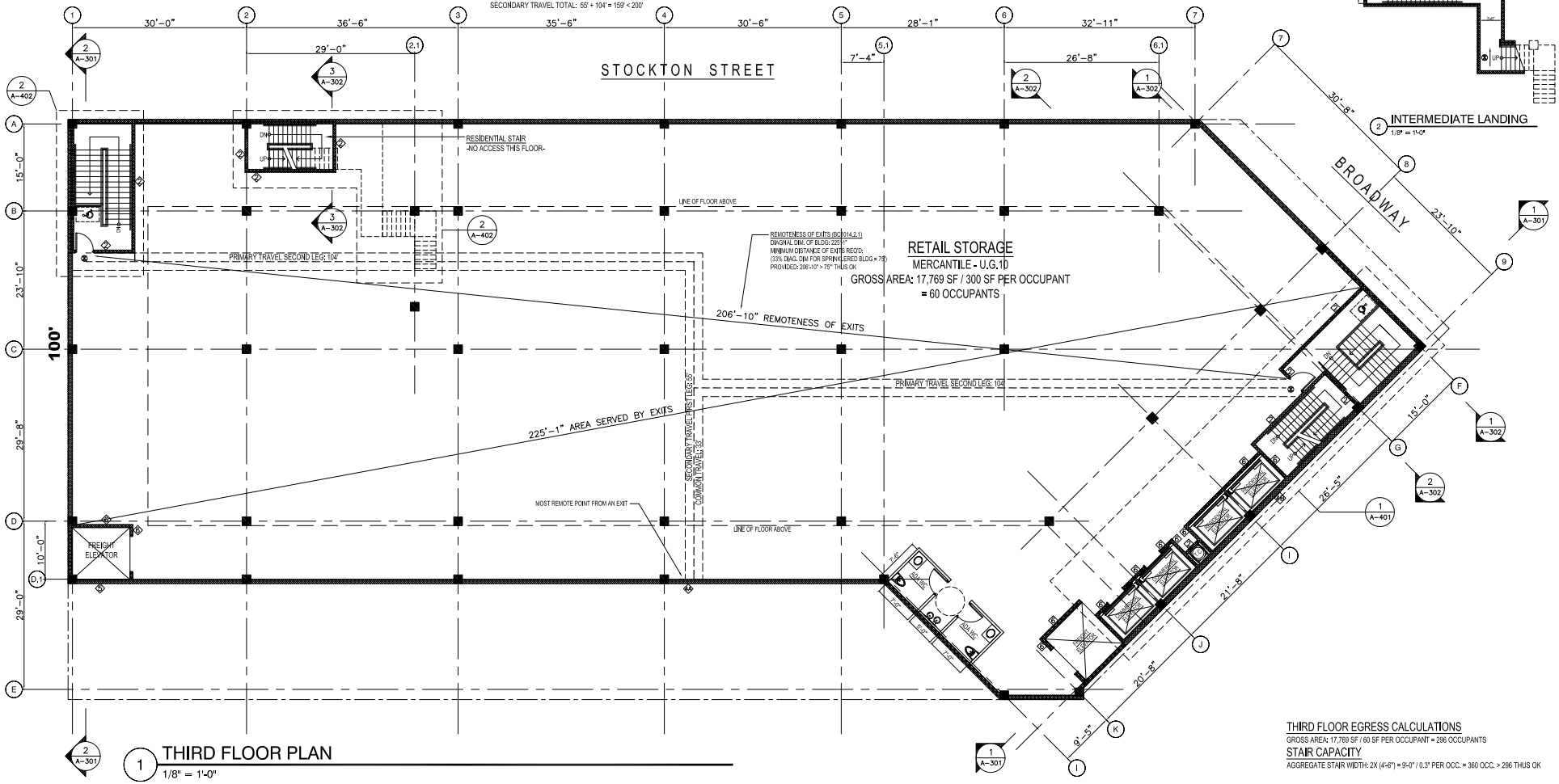
COMMON PATH PROPOSED: 33' < 75'

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET

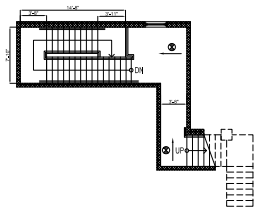
PRIMARY TRAVEL TOTAL: 33' + 104' = 137' < 200'

SECONDARY TRAVEL TOTAL: 55' + 104' = 159' < 200'



1 THIRD FLOOR PLAN

1/8" = 1'-0"



2 INTERMEDIATE LANDING

1/8" = 1'-0"

THIRD FLOOR EGRESS CALCULATIONS

GROSS AREA: 17,769 SF / 60 SF PER OCCUPANT = 296 OCCUPANTS

STAIR CAPACITY

AGGREGATE STAIR WIDTH: 2X (4'-6") = 9'-0" / 0.3" PER OCC. = 360 OCC. > 296 THUS OK

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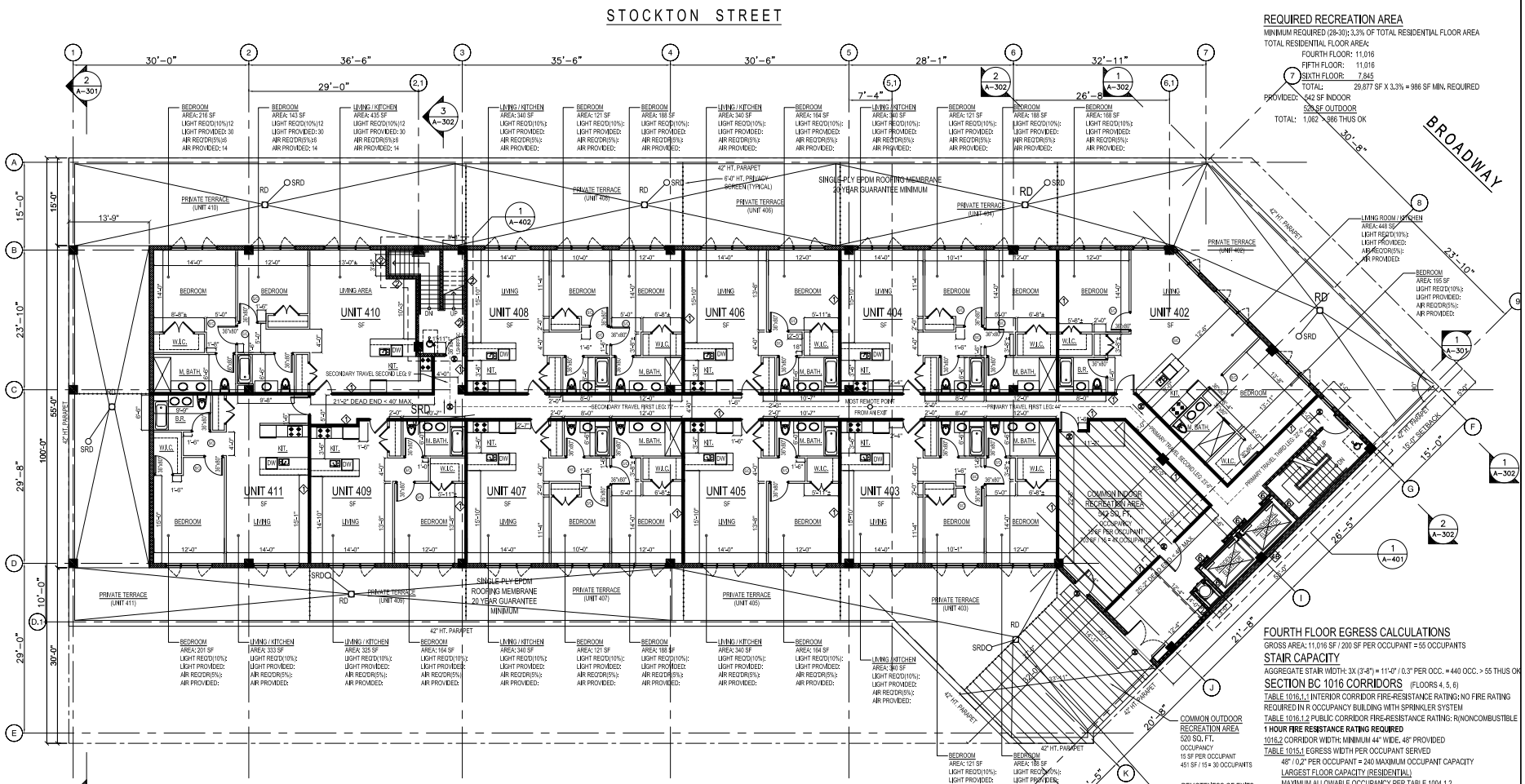
THIRD FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-103.00

8 OF 20

APPLICATION #: 320373822



REQUIRED RECREATION AREA

MINIMUM REQUIRED (28-30): 3.3% OF TOTAL RESIDENTIAL FLOOR AREA

TOTAL RESIDENTIAL FLOOR AREA:

FOURTH FLOOR:	11,016
FIFTH FLOOR:	11,016
SIXTH FLOOR:	7,845
TOTAL:	29,877 SF X 3.3% = 986 SF MIN. REQUIRED

PROVIDED: 542 SF INDOOR
520 SF OUTDOOR
TOTAL: 1,062 > 986 THUS OK

FOURTH FLOOR EGRESS CALCULATIONS

GROSS AREA: 11,016 SF / 200 SF PER OCCUPANT = 55 OCCUPANTS

STAIR CAPACITY

AGGREGATE STAIR WIDTH: 3X (3'-8") = 11'-0" / 0.3" PER OCC. = 440 OCC. > 55 THUS OK

SECTION BC 1016 CORRIDORS (FLOORS 4, 5, 6)

TABLE 1016.1.1 INTERIOR CORRIDOR FIRE-RESISTANCE RATING: NO FIRE RATING REQUIRED IN R OCCUPANCY BUILDING WITH SPRINKLER SYSTEM

TABLE 1016.1.2 PUBLIC CORRIDOR FIRE-RESISTANCE RATING: R(NONCOMBUSTIBLE

1 HOUR FIRE RESISTANCE RATING REQUIRED

1016.2 CORRIDOR WIDTH: MINIMUM 44" WIDE, 48" PROVIDED

TABLE 1015.1 EGRESS WIDTH PER OCCUPANT SERVED

48" / 0.2" PER OCCUPANT = 240 MAXIMUM OCCUPANT CAPACITY

LARGEST FLOOR CAPACITY (RESIDENTIAL)

MAXIMUM ALLOWABLE OCCUPANCY PER TABLE 1004.1.2

11,016 / 200 SF PER OCC. = 55 OCCUPANTS < 240

1016.3 DEAD END CORRIDORS

EXCEPTION 4 - IN OCCUPANCIES R2, DEAD END IN A CORRIDOR SHALL NOT EXCEED 40'. SEE PLANS FOR COMPLIANT DEAD END CORRIDORS LOCATIONS

1 FOURTH FLOOR PLAN

1/8" = 1'-0"

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SEAL

ISSUES

#	DATE	BY	FOR
1	4-13-12	PC	FIRST HUB REVIEW - DOC 1
2	2-12-14	PC	HUB REVIEW - DOC 1
3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

REVISIONS

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3	4-16-14	PC	INCLUS. HOUSING, 7 STY - DOC 1
4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVS. PER LAST EXAM 12/3/14 FDNY RMP REQ. FIN. REFUSE STORAGE PER NYC ZR 28-12
6	12-16-14	PC	REVS. PER LAST EXAM 12/3/14 EGRESS, SMOKE ENCLOSURE, ADA PUSH PULL, APPROACH

CLIENT

BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT

NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME

FOURTH FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-104.00

9 OF 20

APPLICATION #: 320373822

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET
COMMON PATH PROPOSED: NONE

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET
PRIMARY TRAVEL TOTAL: 44' + 23'-6" + 22'-6" = 70' < 200'
SECONDARY TRAVEL TOTAL: 72' + 9' = 81' < 200'

NOTES

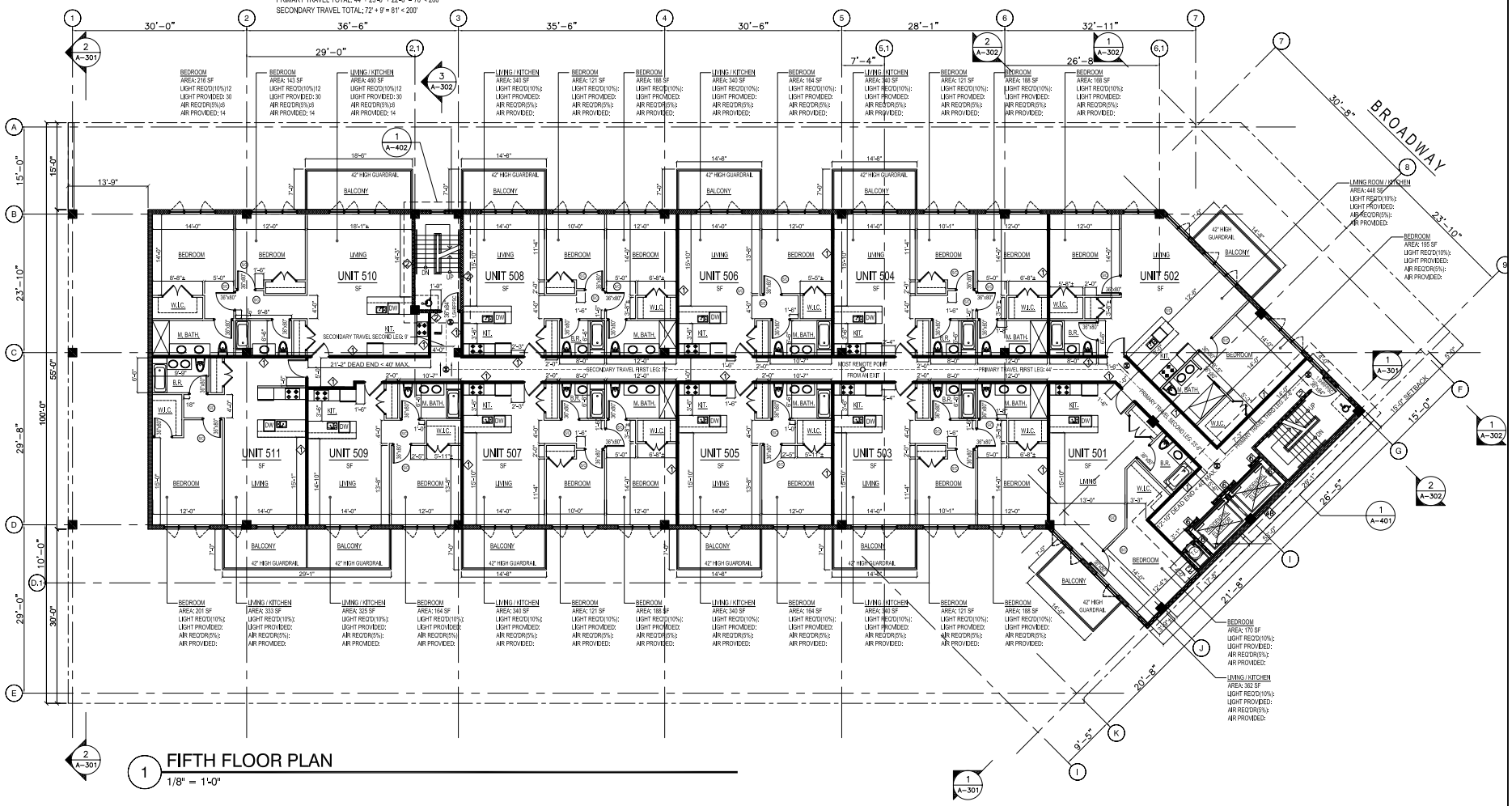
1. APARTMENT ENTRY DOORS SHALL BE 36"x84" 3/4 HOUR FPSC TYPE

FIFTH FLOOR EGRESS CALCULATIONS

GROSS AREA: 11,016 SF / 200 SF PER OCCUPANT = 55 OCCUPANTS

STAIR CAPACITY

AGGREGATE STAIR WIDTH: 3X (3'-8") = 11'-0" / 0.3" PER OCC. = 440 OCC. >55 THUS OK



1 FIFTH FLOOR PLAN

1/8" = 1'-0"

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ISSUES			
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3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

REVISIONS			
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3	4-16-14	PC	INCLUS. HOUSING, 7 STY - DOC 1
4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVS. PER LAST EXAM 12/3/14 PERM IMP. REG. PM. REFUSE STORAGE PER HOUSE PARKING
6	12-16-14	PC	REVS. PER LAST EXAM 12/31/14 CLOSED ENCLOSURE, ADA PUSH PULL, APPROVED F

CLIENT

BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT

NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME

FIFTH FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-105.00

APPLICATION #: 320373822

1013.3 COMMON PATH OF EGRESS TRAVEL

COMMON PATH OF EGRESS TRAVEL SHALL NOT EXCEED 75 FEET

COMMON PATH PROPOSED: NONE

TABLE 1015.1 EXIT ACCESS TRAVEL DISTANCE

MAXIMUM TRAVEL FOR M OCCUPANCY WITH SPRINKLER SYSTEM: 200 FEET

PRIMARY TRAVEL TOTAL: 44' + 23'-6" + 22'-6" = 70' < 200'

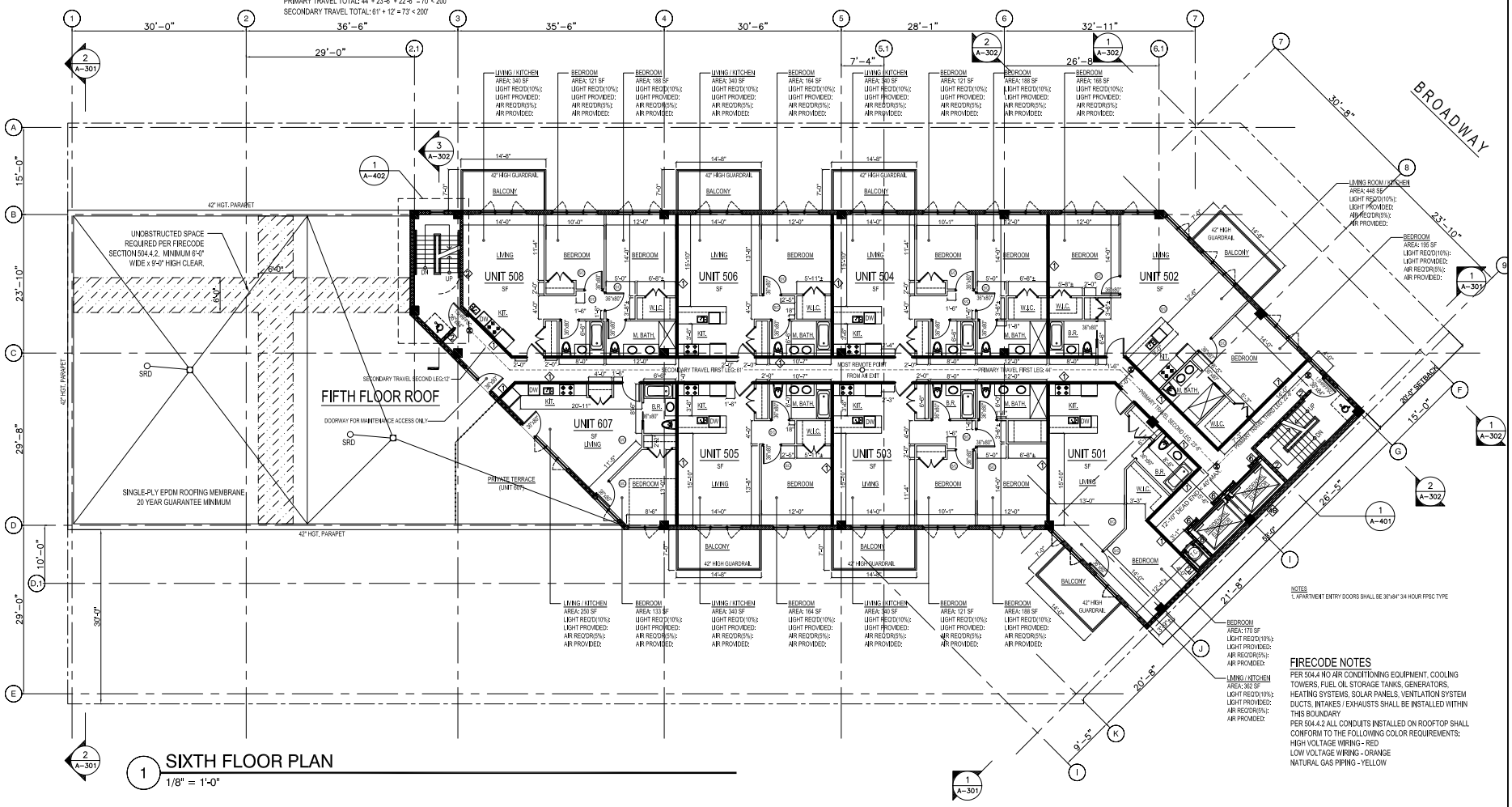
SECONDARY TRAVEL TOTAL: 61' + 12' = 73' < 200'

SIXTH FLOOR EGRESS CALCULATIONS

GROSS AREA: 7,845 SF / 200 SF PER OCCUPANT = 39 OCCUPANTS

STAIR CAPACITY

AGGREGATE STAIR WIDTH: 2X (3'-8") = 7'-4" / 0.3" PER OCC. = 293 OCC. > 39 THUS OK



NOTES
1. APARTMENT ENTRY DOORS SHALL BE 36"x84" 3/4 HOUR FPSC TYPE

FIRECODE NOTES

PER 504.4 NO AIR CONDITIONING EQUIPMENT, COOLING TOWERS, FUEL OIL STORAGE TANKS, GENERATORS, HEATING SYSTEMS, SOLAR PANELS, VENTILATION SYSTEM DUCTS, INTAKES / EXHAUSTS SHALL BE INSTALLED WITHIN THIS BOUNDARY

PER 504.4.2 ALL CONDUITS INSTALLED ON ROOFTOP SHALL CONFORM TO THE FOLLOWING COLOR REQUIREMENTS:

HIGH VOLTAGE WIRING - RED

LOW VOLTAGE WIRING - ORANGE

NATURAL GAS PIPING - YELLOW

1 SIXTH FLOOR PLAN

1/8" = 1'-0"

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ISSUES

#	DATE	BY	FOR
1	4-13-12	PC	FIRST HUB REVIEW - DOC 1
2	2-12-14	PC	HUB REVIEW - DOC 1
3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

REVISIONS

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3	4-16-14	PC	INCLUS. HOUSING, 7 STY - DOC 1
4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVISIONS PER LATEST EXAM 12/01/14 PERMIT REF. REG. PM. REFUSE STORAGE PER TITLE PARKING
6	12-16-14	PC	REVISIONS PER LATEST EXAM 12/15/14 DORMER, DWORE ENCLOSURE, ADA PUSH PULL, APPENDIX F

CLIENT

BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT

NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME

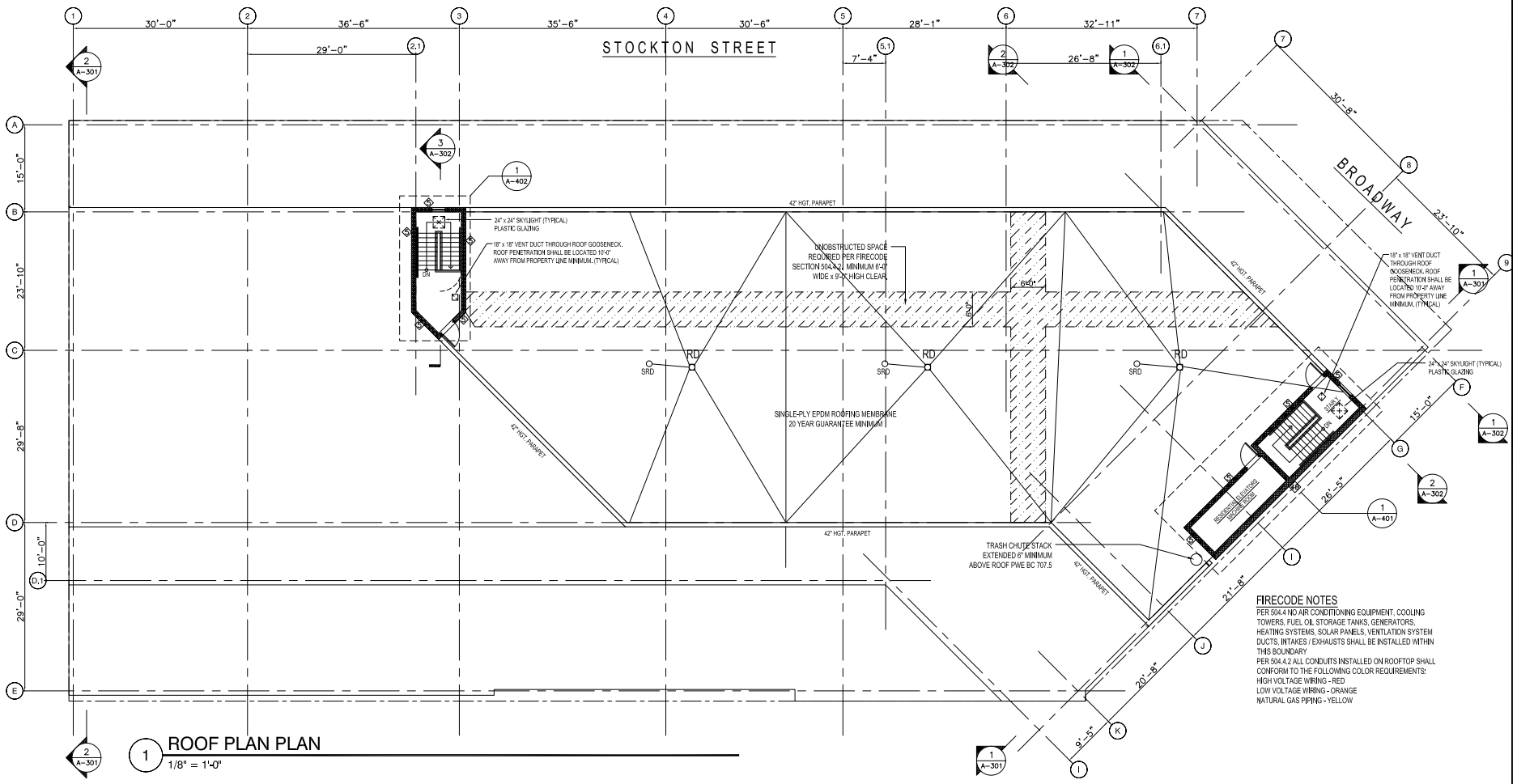
SIXTH FLOOR
CONSTRUCTION PLAN

DRAWING NUMBER

A-106.00

11 OF 20

APPLICATION #: 320373822



FIRECODE NOTES

PER 504.4 NO AIR CONDITIONING EQUIPMENT, COOLING TOWERS, FUEL OIL STORAGE TANKS, GENERATORS, HEATING SYSTEMS, SOLAR PANELS, VENTILATION SYSTEM DUCTS, INTAKES / EXHAUSTS SHALL BE INSTALLED WITHIN THIS BOUNDARY

PER 504.4.2 ALL CONDUITS INSTALLED ON ROOFTOP SHALL CONFORM TO THE FOLLOWING COLOR REQUIREMENTS:
HIGH VOLTAGE WIRING - RED
LOW VOLTAGE WIRING - ORANGE
NATURAL GAS PIPING - YELLOW

1 ROOF PLAN PLAN

1/8" = 1'-0"

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ISSUES

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3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

REVISIONS

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4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVS. PER LAST EXAM 12/01/14 PERM. IMP. REG. PM. REFUSE STORAGE PM. VEHICLE PARKING
6	12-16-14	PC	REVS. PER LAST EXAM 12/15/14 CORRECT. SMOKE ENCLOSURE, ADA PUSH PULL, APPROACH P

CLIENT

BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT

NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

CONSULTANT

DATE: 1-16-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME

ROOF CONSTRUCTION PLAN

DRAWING NUMBER

A-107.00

12 OF 20

APPLICATION #: 320373822

1 STOCKTON STREET ELEVATION
1/8" = 1'-0"

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1	4-13-12	PC	FIRST HUB REVIEW - DOC 1
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3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

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4	9-22-14	PC	REMOVE INCLUS. HOUSING, 6 STY - DOC 1
5	12-4-14	PC	REVS. PER LAST EXAM 12/3/14 FDNY INSP. REQ. INC REFUSE STORAGE PER NYC ZONING
6	12-16-14	PC	REVS. PER LAST EXAM 12/15/14 DOB DOB. ENCRE ENCLOSURE, ADA PUSH PULL, APPROACH

CLIENT
BROADWAY STOCKTON LLC
1628 CHURCH AVENUE
BROOKLYN, NY 11226

PROJECT
NEW 6 STY MIXED BLDG
912 BROADWAY
BROOKLYN, NY 11206
BLOCK: 1584, LOT: 15

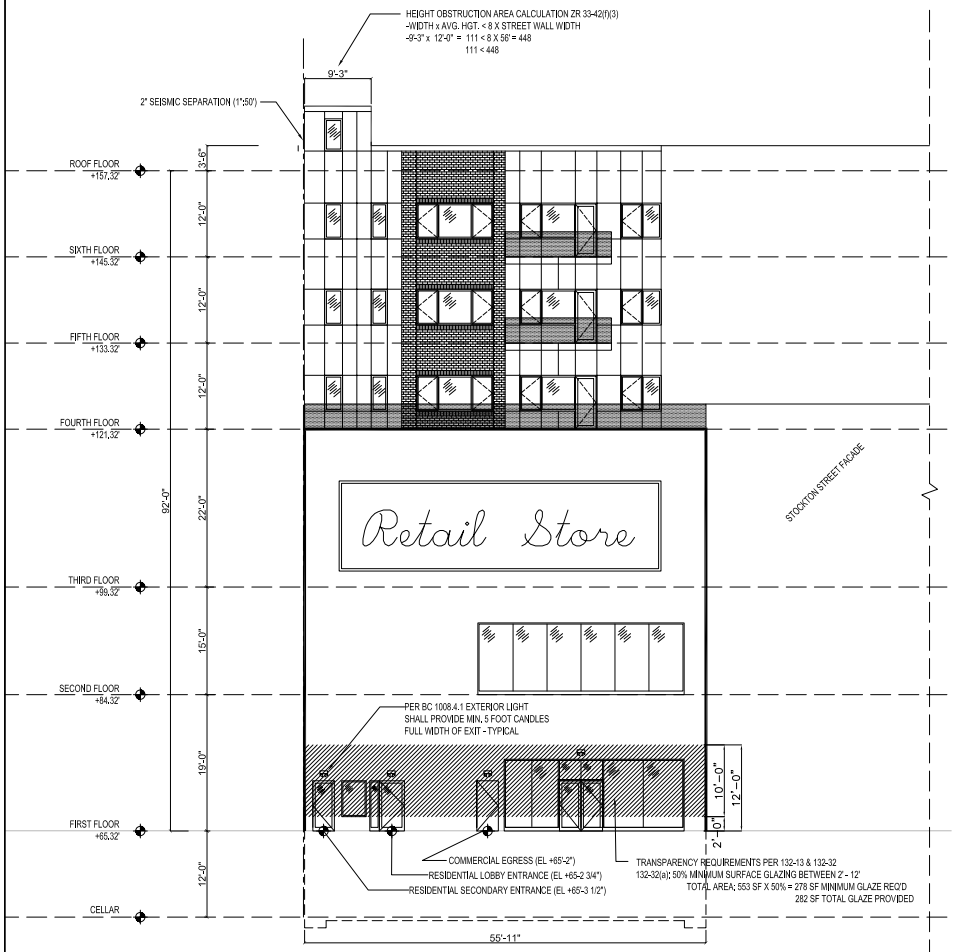
CONSULTANT

DATE: 1-10-12
SCALE: AS NOTED
JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME
STOCKTON STREET
EXTERIOR ELEVATION

DRAWING NUMBER
A-201.00
13 OF 20

APPLICATION #: 320373822



1 BROADWAY ELEVATION
1/8" = 1'-0"

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3	4-25-14	PC	INCLUS. HOUSING, 7 STY - DOC 1 HUB PLAN EXAM UPLOAD

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CLIENT
BROADWAY STOCKTON LLC
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CONSULTANT

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JOB #: 2.09
DWG BY: PC
CAD FILE: Drawings\2.09 - 912 Broadway - 4 New Bldgs

DRAWING NAME
BROADWAY EXTERIOR ELEVATION

DRAWING NUMBER
A-202.00
14 OF 20

APPLICATION #: 320373822

APPENDIX 2

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Broadway Stockton, LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, Broadway Stockton, LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Sarah Pong, 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
DeKalb Library
Address: 790 Bushwick Avenue, Brooklyn, NY 11221
Telephone Number: (718) 455-3898
Hours of Operation:

Mon	10:00 AM - 6:00 PM
Tue	10:00 AM - 8:00 PM
Wed	1:00 PM - 8:00 PM
Thu	10:00 AM - 6:00 PM
Fri	10:00 AM - 6:00 PM
Sat	10:00 AM - 5:00 PM
Sun	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 will be potential impacts of nuisance odors and dust during the disturbance of historic fill soils at the Site. This work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure including a Construction Health and Safety Plan and a Community Air Monitoring Plan are required components of the remedial program. Implementation of these plans will be under the direct oversight of the New York City Department of Environmental Remediation (NYCOER).

These plans will specify the following worker and community health and safety activities during remedial activity at the Site:

- On-Site air monitoring for worker protection,
- Perimeter air monitoring for community protection.

The Health and Safety Plan and the Community Air Monitoring Plan prepared as part of the Remedial Action Work Plan will be available for public review at the document repository.

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 Broadway Stockton, LLC. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones: Public notice and public comment activities occur at several steps during a typical NYC VCP project. 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: Broadway Stockton, LLC 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: Broadway Stockton, LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

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

There will be no plantings or trees located on this Site.

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 Broadway Stockton, LLC 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 Broadway Stockton, LLC. 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.

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.

APPENDIX 5

CONSTRUCTION HEALTH AND SAFETY PLAN

Health and Safety Plan

Site Location:

374 Stockton Street/910-912 Broadway
Brooklyn, New York 11206

NYC VCP Project Number 16CVCP049K
OER Project Number 15EHAN355K

Prepared For:

Broadway Stockton, LLC
98 1628 Church Avenue, Suite 475N
Brooklyn, New York 11226

Date:

January 2016

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1 Introduction

This Health and Safety Plan (HASP) describes the procedures to be followed in order to reduce employee exposure to potential health and safety hazards that may be present during excavation and solid waste transportation and disposal activities being performed as part of the redevelopment of the subject project Site, located at the intersection of Stockton Street and Broadway in Brooklyn, New York, herein referred to as the *Site*. This redevelopment project will involve the excavation of soil/fill and the construction of a building. Emergency response procedures necessary to respond to project-related hazards are described in this document.

All activities performed under this HASP are targeted to comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Part 1910.120. This document is not, nor does it purport to be, a complete description of all safety and health requirements applicable to work performed at the site. Rather, the HASP is a general overview of the compliance policies and work practices applicable to the primary tasks and hazards associated with the excavation and soil removal activities at the Site, as well as a recitation of minimum safety and health compliance obligations for contractors, subcontractors and workers at the site. All subcontractors of any tier operating at the worksite are obligated to implement and maintain comprehensive safety and health plans for their own employees and to ensure that their employees comply with all applicable safety and health requirements. All subcontractors operating at the worksite should refer to the applicable specific OSHA Standards for detailed requirements.

1.1 Purpose

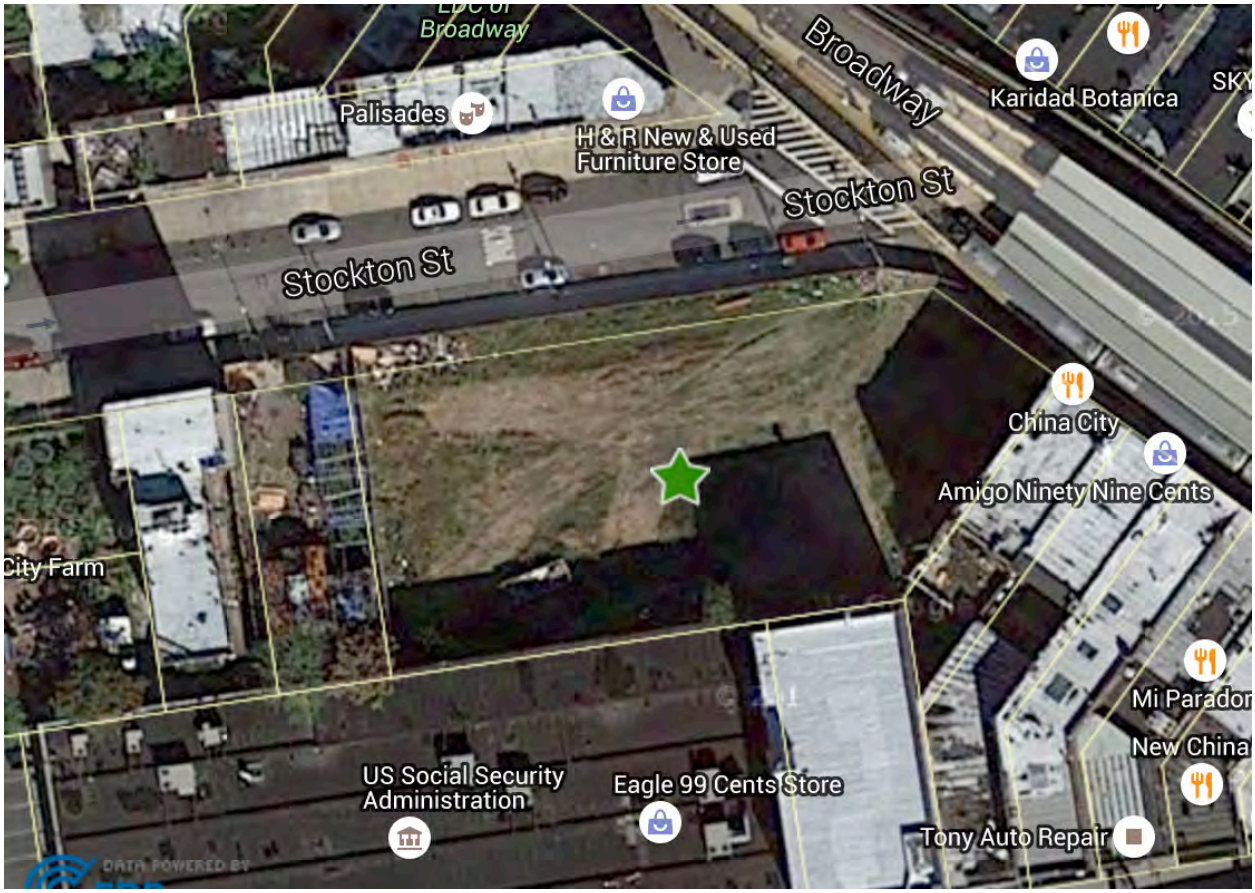
The purpose of this HASP is to provide field personnel with an understanding of the potential chemical and physical hazards that exist or may arise while portions of the project are being performed. To this end, this HASP also presents information on the progression of the project and specific details regarding the transportation and disposal of wastes excavated from the site. In that the solid waste is comprised of historic fill with background concentrations or organic and inorganic contaminants, the excavation activities will be collectively referred to in this document as “Remedial Activities”. The specific health and safety activities that will apply to the Remedial Activities are subject to the HASP. Activities associated with the transportation and disposal of waste generated from the site will be collectively referred to in this document as ‘Transport and Disposal Activities”.

The primary objective for the project is to ensure the well being of all field personnel and the community surrounding this site during Transport and Disposal Activities. In order to accomplish this, project staff and approved subcontractors of any tier performing such work shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to the field to perform Transport and Disposal Activities associated with this project shall read this HASP and sign the Agreement and Acknowledgment Statement (Appendix F) to certify that they have read, understood, and agree to abide by its provisions. A copy of this HASP supplement will be available to anyone that requests it. Other personnel (e.g. government officials, administrators, inspectors, engineers, etc.) that will have limited exposure Transport and Disposal Activities will be instructed on how to reduce the probability of exposure to site contaminants, but will not be required read the HASP.

1.2 Site Description

The site is currently under redevelopment as a mixed-use property with a single structure and is located at the southwest corner of the intersection of Broadway and Stockton Street in Brooklyn New York (see Figure 1, Site Location Map). The site previously held a theater that was torn down circa 2000 and currently contains no existing structures.

FIGURE 1 – SITE LOCATION MAP



1.3 Recognized Environmental Conditions

Previously performed investigations of the site's soil quality revealed that semivolatile organic compounds (SVOCs) and inorganic metals were present at concentration in excess of the New York State Department of Environmental Conservation (NYSDEC) Recommended Soil Cleanup Objectives (RSCOs). The nature and extent of the detected contaminants is typical to urban/historic fill materials in New York City that typically were created from mixing soil with coal ash, cinders, slag and crushed brick, tiles and glass.

While metals and SVOCs were detected in the soil samples collected, their extent has not been delineated and no definitive source for the compounds has been designated. In addition, various volatile organic

compounds were detected in the soil vapor samples collected from the Site, though the source of those compounds has not been defined either. Groundwater was not encountered during previous environmental investigations at the Site, and is not expected to be encountered during excavation activities. Given the dense nature of various layers and lenses of soil and fill observed throughout the Site during investigation, it is possible that perched water could be encountered during excavation, however, that water was not previously sampled and is not anticipated to pose a threat to human health provided that the proper personal protective equipment is utilized to limit direct exposure.

All MSDS sheets will be available at the site in the event they are needed for referenced or for an emergency.

Based upon the analytical data obtained from the previous investigations, it was determined that all of the soil/fill materials excavated from the site be managed as non-hazardous solid waste in accordance with New York State Environmental Conservation Law (6 NYCRR Part 371).

2 Application of Health and Safety Plan Supplement

The procedures of this HASP supplement apply as guidance for any person that will enter the boundaries of the site, or a portion of the site that will be involved in Transport and Disposal Activities.

The primary exposure routes for site contaminants to affect personnel involved in work on-Site are through inhalation, ingestion and/or dermal contact. Accordingly, exposure-based determinations used for this document will be consistent with guidelines provided within Material Safety Data Sheets for each product (see Section 10.1 of this document). It should be noted that there have been no detections of benzene in any of the samples analyzed from the site.

Inorganic metals exposure determinations used for this document will be consistent with guidelines provided within MSDS of each substance in its static compound/elemental state. The MSDS for each substance is included within this document. Also included within this document are MSDS sheets for other inorganic substances typically found in construction fill (arsenic and mercury). All MSDS sheets will be conspicuously posted at the site in the event they are needed for reference or for an emergency.

2.1 Transport and Disposal Activities Personnel

Transport and Disposal Activities personnel will include the transport vehicle driver, the transportation coordinator and the off-site disposal facility personnel.

3 Key Personnel / Identification of Health & Safety Personnel

3.1 Key Personnel

A list of the pertinent personnel authorized to supervise site health and safety operations on behalf of the client is presented in the table below.

Title	Name	Telephone Number
Project Manager	Tony Ambrosino	718-366-6528
Project Administrator	TBD	TBD
Health and Safety Officer	TBD	TBD
Site Health and Safety Officer	TBD	TBD
Transportation Coordinator *Metric Earth Services, LLC*	Sean O'Keefe	637-428-1684 (c)

3.2 Organizational Responsibility

3.2.1 Project Manager

The Project Manager (PM) has the overall responsibilities for the health and safety of site personnel. THE PM will also ensure that adequate resources are provided to the field health and safety staff to carry out their responsibilities as described below. The PM will ensure that all activities are conducted in accordance with the HASPs, and will have the authority to suspend field activities if employees are in danger of injury or exposure to harmful agents. The PM's responsibilities include:

- Assurance that appropriate health and safety equipment and PPE are available for project personnel.
- Assurance that all personnel have received the appropriate training, and required medical examination before engaging in work activities.
- Designation of a Site Health and Safety Officer (SHSO) who will assist in enforcing compliance with the HASPs.

3.2.2 Site Health and Safety Officer

The SHSO will be responsible for directing and coordinating all health and safety monitoring activities and ensuring that proper personal protective equipment (PPE) is utilized by field personnel. The SHSO will conduct periodic safety briefings and ensure that the filed personnel company with the HASPs. The SHSO reports to the PM to provide summaries and progress of field operations. The SHSO has stop-work authorization that will be executed upon a

determination of an imminent safety hazard, emergency situation, and/or other potentially dangerous situations. Authorization to proceed with work will be issued by the PM after such action. The SHSO shall initiate and execute all contact with support facilities and personnel when this action is appropriate.

The SHSO may direct the site health and safety efforts through an assistant Health and Safety Officer approved by the PM. The assistant will be responsible for implementation of the HASP and may direct or participate in activities, as appropriate, when this does not interfere with the SHSO responsibilities. Other responsibilities of the SHSO include:

- Ensure that all field personnel and visitors in the field comply with the requirements of the HASPs.
- Maintain a log of personnel on-site each day. A copy of these logs will be sent to the PM. Originals will be kept in the project file.
- Coordinate periodic safety briefings and notify the PM of any changes in work conditions or tasks which may require changes to the HASPs.
- Manage health and safety equipment, including monitoring instruments and PPE, and oversee documentation procedures.
- Maintain a health and safety log book in which daily site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original logbooks will become part or the exposure records file and will be maintained by the PM.
- Delegate, if necessary and/or appropriate, some of these responsibilities to other on-site qualified employees.

3.2.3 Transportation Coordinator

The transportation coordinator will be responsible for all transportation related activities. This will include ordering trucks as advised by the PM and the PA. Additionally, it will be the Transportation Coordinators responsibility to insure that the truck does not allow for the release of soil/fill to off-site receptors. This includes tracking material off-site on wheels or releasing residues from the transport vehicle body. The Transportation Coordinator is also responsible for the following:

- Compiling a list of cell phone numbers of the drivers. Exchanging his cell phone number so that he can be contact in the event of a vehicle accident.

- Ensuring that drivers do not exit their vehicles during loading.
- Obtaining copies of executed manifests and weight tickets from each disposal facility.
- Reading and signing an acknowledgement form indicating that he has read and understands all aspects of the HASP.

4 Task / Operation Health and Safety Risk Analysis

The field tasks covered by the HASP will include material excavation with hydraulic equipment and hand tools, the manual sorting of materials, the transporting and loading of materials onto trucks for off-site transport, and if necessary, soil/fill sampling. Additionally, standard job task hazards that are inherent to a construction project will exist.

4.1 Operational Safety Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to earth moving equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Excavation Standard, set forth at 29 C.F.R. § 1910 Subpart P as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

4.1.1 Heavy Machinery / Equipment

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of transport vehicles and machinery to avoid physical injury to themselves or others. Drivers of the transport vehicles will remain within the truck cab at all times while on-site.

4.1.2 Damage Prevention

Damage of underground facilities must be prevented by calling all relevant utilities for a mark-out. The underground facilities should be marked in the area where the excavating is occurring with the appropriate paint, flags and/or stakes according to the Underground Facility Protection Act. The color code requirements are presented in the graphic below.

4.1.3 Vehicular Traffic

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, supplemental traffic safety equipment use can be exercised when warranted by specific task. Supplemental equipment can be items such as cones, flags, barricades, and/or caution tape. Drivers of waste transportation vehicles will only exit vehicles in designated areas within the Support Zone. During this time, drivers will only be allowed to inspect the placement of waste loads and cover their trailers.

4.2 Noise Hazards

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to noise hazards. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Occupational Noise Exposure Standard, set forth at 29 C.F.R. § 1910 part 1926.52, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

Hearing protection shall be provided to the employees where sound pressure levels exceed 85 dB. Hearing protection shall be worn where sound pressure levels in areas and/or on equipment exceeds 90 dB. Typical heavy excavation operations have been monitored with a sound level meter and indicate that hearing protection is required for all personnel while engaged in this action.

4.3 Site Security

Trailers are not expected to be on-site during the term of the project. However, if trailers are to remain on site overnight, they will be fully chocked. Lights, barricades, protective devices, warnings, and precautions sufficient to prevent injury to persons and damage to property shall be provided and maintained.

Visitors to the site shall be escorted by the Health and Safety Officer, the Project Manager and/or the Field Operations Leader.

5 Personnel Training

5.1 Pre-assignment and OSHA Training

The Transportation Coordinator will be the only staff involved in Transportation and Disposal Activities that will have 40-hour OSHA training. Vehicle drivers will be required to stay within their vehicles during all loading activities. As such, the only requirement for the drivers will have to read this HASP.

Drivers will be responsible for contacting the Transportation Coordinator in the event of a vehicle accident while loaded or unloaded.

6 Personal Protective Equipment

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to personal protective equipment. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Personal Protective Equipment Standard, set forth at 29 C.F.R. § 1910 Subpart I as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered on-site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of all on-site workers. No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices.

Site-specific chemicals of concern include semi-volatile organic compounds. These chemicals are of moderate to low hazard. Therefore, level D personal protective equipment will be required at all times when on site. The following is a breakdown of the types of protective clothing and

equipment to be used during the site activities. The YUA HASP should be used for all final determinations with respect to on-site PPE.

6.1 Levels of Protection

The Site Safety Officer will determine whether a level of protection should be upgraded or downgraded. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes (see Section 7.1.3 for additional information on PPE upgrades). Modified Level D PPE will be the minimum requirement at all times during Transportation and Disposal Activities.

6.1.1 Level D Personal Protective Equipment

All initial site access and activities will be done in Level D attire. Level D protection is sufficient under conditions where no contaminants are present or those activities that do not pose a potential threat of unexpected inhalation of or contact with hazardous levels of any substances. Typical Level D activities may include sediment, logging and groundwater sampling, and as surficial site surveys.

- Hard hat (complaint with ANSI-Z89.1)
- Safety glasses (as appropriate)
- Steel toe and shank boots
- Fluorescent/reflective safety vest
- Hearing protection (as appropriate)

6.1.2 Modified Level D Personal Protective Equipment

- Hard hat
- Safety glasses
- Steel toe and shank boots
- Fluorescent vest
- Nitrile "N-Dex" inner gloves
- Latex outer boots (chemical resistant)
- Polyethylene coated Tyvek suit
- Hearing protection (as appropriate)

6.1.3 Level C Personal Protective Equipment

Level C protection, as described in this plan, will be available at a minimum for those activities that involve surface and subsurface soil (strata disturbance such as well installation, and all subsurface media sampling activities such as split-spoon sampling and borings). Level C protection equipment should be readily available at all times. Consistent with OSHA training, prior to donning Level C, oxygen percent must be continuously monitored.

• Buddy system required at all times
• Full or partial face respirator with NIOSH approved OV/AG/HEPA combination cartridges (MSAGMC-H)
• Saranex coated Tyvek Suit
• Inner Nitrile "N-Dex" gloves
• Outer Nitrile (NBR) gloves
• Steel toe and shank boots
• Outer boots (chemical resistant)
• Hard hat
• Hearing protection (as appropriate)

6.1.4 Level B Personal Protective Equipment

Some activities may require Level B protection. In atmospheres potentially containing toluene and xylenes, the protective ensemble should include chemical resistant clothing since the two compounds have skin absorption potential. Governmental Health and Safety representatives must be on site upon start-up of <u>any</u> project requiring level B protection. This should be understood to include subcontractors conducting Level B activity.

• Buddy system required at all times
• Supplied air respirator or SCBA
• Saranex coated Tyvek Suit
• Inner Nitrile "N-Dex" gloves
• Outer Nitrile (NBR) gloves
• Steel toe and shank boots
• Outer boots (chemical resistant)
• Hard hat
• Hearing protection (as appropriate)

6.2 Personal Use Factors and Equipment Change Out Schedule

Prohibitive or precautionary measures should be taken as necessary to prevent workers from jeopardizing safety during equipment use.

If necessary, all respiratory protective equipment used will be approved by NIOSH/MSHA. Respirator cartridges will be changed once per eight-hour shift at a minimum. This can be accomplished at the end of the workday during respirator decontamination. Employees working within the excavation front should change the cartridge of their respirators once every four hours. If odor breakthrough is detected while wearing the respirator or if breathing becomes difficult, change cartridges immediately and notify the site Health and Safety Officer. A filter change out schedule is provided below.

Remedial Worker	Work Area	Filter Type	Replacement Rate
Site Screener	EZ – At Excavation Front	MSA GMC-H	Every 4 Hours
Laborer	EZ – At Excavation Front	MSA GMC-H	Every 2 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Equipment Operator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours
Administrator	EZ	MSA GMC-H	Every 4 Hours
	SZ, CRZ	MSA GMC-H	Every 8 Hours

When utilizing protective garments such as Tyvek suits, gloves, and booties, all seams between protective items will be sealed with duct tape.

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling in, or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers.

Eating, smoking, drinking, and/or the application of cosmetics in the immediate work area is prohibited. Ingestion of contaminants or absorption of contaminants into the skin may occur.

The use of contact lenses on the job site is strongly advised against. Contact lenses may trap contaminants and/or particulate between the lens and eye, causing irritation. However, when glasses are not available, contact lenses are preferred over faulty vision. When contact lenses are worn, safety glasses and/or goggles must be worn at all times while on the job site. Wearing contact lenses with a respirator in a contaminated atmosphere is prohibited under 29 CFR ss1910.134 (e)(5)(iii).

7 Site Management and Planning

7.1 Material Transport

Permitted trucks exiting the site containing non-hazardous contaminated fill/soil will be given a waste transport charter to act as a transportation manifest. Each section of the transportation manifest must be filled out by the appropriate party prior to the transportation of any material from the Site. If the receiving facility does not provide a signed and dated certified weight ticket for attachment to the manifest, then a representative of the receiving facility must complete the weight information directly on the manifest. Tare weights may be established upfront and used throughout the term of the project for the same truck.

7.1.1.1 Truck Entrance and Egress

Truck entrance and egress will be made via paved roadways at areas designated along Broadway or Stockton Street or at an alternate access/egress point designated by the PM.

7.1.1.2 Transportation Route

Once a suitable & appropriate disposal facility, or facilities, has been chosen, a transportation route will be created & included with this Health & Safety Plan.

7.2 Material Disposal/Beneficial Reuse

All permits for the selected disposal facilities will be issued to the generator for review and approval.

8 General Safety and Health Provisions

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to general safety and health provisions. Rather, contractors, subcontractors and workers at the site must refer to OSHA's General Safety and Health Provision Standard, set forth at 29 C.F.R. § 1926 subpart C as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

8.1 Safety Practices / Standing Orders

The following are important safety precautions that will be enforced during work activities.

- 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.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garments are removed.
- No excessive facial hair that 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 the wearer obtains a proper seal.

- Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles; kneel on the ground; lean, sit, or place equipment on drums, containers, vehicles, or the ground.
- Medicine and alcohol can potentate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.
- Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
- Work areas for various operational activities should be established.
- 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.
- Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.
- Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
- All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
- Noise mufflers or earplugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Officer. Disposable, form-fitting plugs are preferred.
- Cartridges for air-purifying respirators in use will be changed daily at a minimum.

8.2 Buddy System

Site personnel will employ the buddy system when working under certain circumstances, such as enclosed spacing. Under the buddy system, each site worker is responsible for monitoring the well-being of another worker. No one will work alone when the buddy system is implemented. At no time will fewer than two employees be present at the site if activities are underway.

8.3 Site Communications Plan

Mobile telephone and/or two-way radios will be used to communicate between the work parties on the site. The following standard hand signals will be used in case of failure of radio communication:

- Hands on top of head = Need assistance
- Thumbs up = OK, I am alright, I understand
- Thumbs down = No, negative

Personnel in the Contaminated Zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication will require the team leader to evaluate whether personnel should leave the zone.

8.4 Retention of Records

The following records will be maintained on-site and in corporate records for no less than three years.

- Fit test results
- OSHA Training Certification
- Medical Questionnaire and/or Medical Clearance
- Medical Data Sheets
- Accident Report Forms

9 Decontamination Plan

9.1 General

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

In general, decontamination involves scrubbing with a detergent water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. 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 detergent and water and scrubbed with a brush. In addition to being contaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized or replaced before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks.

The Site Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of any respirator equipment that may be used on-site.

The decontamination zone layout and procedures should match the prescribed levels of personal protection.

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the point of operations designated as the EZ must follow these minimum procedures. The decontamination process shall take place within the contaminant reduction zone.

9.2 Minimum Decontamination Procedure

Personnel leaving the point of operations should remove or change outer gloves. At a minimum, boots shall be cleaned of all accumulated soil/fill. Outer boots must be properly washed where gross contamination is evident or disposed of. If Tyvek suits are being utilized, they should be removed or changed. Personnel should remove the Tyvek suits so that the inner clothing does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer Nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between uses with towelettes or other sanitary methods. Potable water, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations.

The Site Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Safety Officer's observations.

9.3 Standard Decontamination Procedure

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

9.3.1 Level B

Segregated equipment drop	Deposit equipment (tools, sampling devices, notes, monitoring instruments, radios, etc.) used on the site onto plastic drop cloths.
Boot covers and glove wash	Outer boots and outer gloves should be scrubbed with a decontamination solution of detergent and water or replaced.
Rinse off boot covers and gloves	Decontamination solution should be rinsed off boot covers and gloves using generous amounts of water. Repeat as many times as necessary.
Tape removal	Remove tape from around boots and gloves and place into container with plastic liner.
Boot cover removal	Remove disposable boot covers and place into container with plastic liner.

Outer glove removal	Remove outer gloves and deposit in container with plastic liner.
Suit / safety boot wash	Completely wash splash suit, SCBA, gloves, and safety boots. Care should be exercised that no water is allowed into the SCBA regulator. It is suggested that the SCBA regulator be wrapped in plastic.
Suit / safety boot rinse	Thoroughly rinse off all decontamination solution from protective clothing.
Tank or canister changes	This is the last step in the decontamination procedure for those workers wishing to change air tanks and return to the EZ. The worker's air tank or cartridge is exchanged, new outer glove and boot covers are donned, and joints taped.
Removal of safety boots	Remove safety boots and deposit in container with a plastic liner.
SCBA backpack removal	Without removing the face piece, the SCBA backpack should be removed and placed on a table. The face piece should then be disconnected from the remaining SCBA unit and then proceed to the next station.
Splash suit removal	With care, remove the splash suit. The exterior of the splash suit should not come in contact with any inner layers of clothing.
Inner glove wash	The inner gloves should be washed with a mild decontamination solution (detergent / water).
Inner glove rinse	Generously rinse the inner gloves with water.
Face piece removal	Without touching the face with gloves, remove the face piece. The face piece should be deposited into a container that has a plastic liner.
Inner glove removal	Remove the inner glove and deposit into a container that has a plastic liner.
Field wash	Wash hands and face thoroughly. If highly toxic, skin corrosive, or skin absorbent materials are known or suspected to be present, a shower should be taken.

9.3.2 Level C and Level D

The decontamination procedure for Level C and Level D will be satisfied with the Minimum procedures outlined in section 8.2.

9.4 Heavy Equipment and Handling Equipment Decontamination

Equipment traversing the site and exiting the site will be subjected to a decontamination protocol. At a minimum the protocol will consist of an inspection of the truck fenders, tires and mud flaps for accumulated soil/fill, and removal of all accumulations using hand tools (brush, broom and scrapers). If deemed necessary by the Health and Safety Officer, this inspection will be performed over a thirty by fifteen foot area that has been filled with ¾ inch crushed recycled concrete aggregate to facilitate the removal of soil/fill accumulations from the tires, and to immobilize soil/fill removed from the truck body. Additionally, all trucks hauling waste will be required to be covered prior to exiting the site.

At the conclusion of the use of each piece of excavation equipment on the site, it will be decontaminated with an Alconox / water solution followed by a clean water rinse within the Contaminant Reduction Zone. The rinsate will be allowed to charge into the site ground.

10 Emergency Response / Contingency Plan

10.1 Pre-Emergency Planning

In order to properly prepare for emergencies, Material Safety Data Sheets (MSDS) will be maintained on-site for the type of contaminants to which workers may be exposed. Based upon the results of previous investigations, these contaminants consist of a mixture of organic compounds consistent with those found within diesel and/or heating oil. The MSDS for both products are presented on the following pages.

In the event a suspected or known hazardous substance or substance container is encountered during site activities, a contingency plan will be triggered (see Section 11.3).

10.1.1 Diesel Material Safety Data Sheet - MSDS

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1. GENERAL INFORMATION

DIESEL ENGINE OIL; HEATING OIL; FUEL OIL

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2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: BASE OIL AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:

Substance Name	Approx. Wt%
CALCIUM ALKYLENE PHENATE SULFIDE CARBONATE (OVERBASED) (122384-87-6)	1-5
CALCIUM LONG-CHAIN ALKARYL SULFONATES (LOW OVERBASED) (156619-82-8)	1-5

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3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Clear Dark Amber Liquid. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. For further health effects/toxicological data, see Section 11.

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4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area. (See Section 16 - Injection Injury)
INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a
mechanical device or mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

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5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): 204(400) (ASTM D-92).
Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

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6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.
ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

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7. HANDLING AND STORAGE

HANDLING: No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained,

properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:
When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist)
- ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA
Permissible Exposure Limit (PEL)
VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.
RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.
EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Clear Dark Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 391(735)
MELTING POINT C(F): NA
FLASH POINT C(F): 204(400) (ASTM D-92)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: NE
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.89
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: > 100.0
VISCOSITY AT 100 C, cSt: > 10.0
POUR POINT C(F): -12(10)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

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11. TOXICOLOGICAL DATA

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--ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components.
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).

---REPRODUCTIVE TOXICOLOGY (SUMMARY)---

No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.

---CHRONIC TOXICOLOGY (SUMMARY)---

Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydro treated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of

mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.

---SENSITIZATION (SUMMARY)---

Not expected to be sensitizing based on tests of this product, components, or similar products.

---OTHER TOXICOLOGY DATA---

Used gasoline engine oils have shown evidence of skin carcinogenic activity in laboratory tests when no effort was made to wash the oil off between applications. Used oil from diesel engines did not produce this effect.

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12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: This product is expected to be inherently biodegradable. Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal. Available

ectoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product. When released into the environment, adsorption to sediment and soil will be the predominant behavior.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

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14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.
STATIC ACCUMULATOR (50 picosiemens or less): YES

Disclaimer:

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10.1.2 Lead Material Safety Data Sheet – MSDS

SECTION 1. GENERAL INFORMATION

FREE ELMENTAL LEAD; LEAD SALTS

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient	Approximate Percent by Weight	C.A.S. Number	Occupational Exposure Limits (OELs)		LD_{50}/LC_{50} Species and Route
Lead	99+%	7439-92-1	OSHA PEL	0.05mg/m^3	No Data
			ACGIH TLV	0.05mg/m^3	
			NIOSH REL	<0.10mg/m^3	

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH - National Institute for Occupational Safety and Health. OEL – Occupational Exposure Limit, PEL – Permissible Exposure Limit, TLV – Threshold Limit Value, REL – Recommended Exposure Limit.

Trade Names and Synonyms: Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A bluish-white to silvery-grey heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire hazard and moderate explosion hazard, however. When heated in air highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of lead dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage (e.g., fatigue, headaches, tremors, hypertension), gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead is classified as an A3 Carcinogen by the ACGIH and as a 2B Carcinogen by IARC. (see Toxicological Information, Section 11)

Potential Environmental Effects: Lead metal has low bioavailability but its compounds can be hazardous in the environment at low concentrations. They can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both the aquatic and terrestrial environments. (see Ecological Information, Section 12)

EU Risk Phrase(s): R61 - May cause harm to unborn child; R62 - Possible risk of impaired fertility; R20/22 - Harmful by inhalation and if swallowed; R33 - Danger of cumulative effects.

SECTION 4. FIRST AID MEASURES

Eye Contact: Flush with warm, running water, including under the eyelids, to remove dust particle(s). If irritation persists seek medical attention.

Skin Contact: *Dust:* Remove contaminated clothing and wash affected area with soap and warm water. Launder contaminated clothing before reuse. Seek medical attention if irritation develops or persists. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: Remove victim from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Medical oxygen may be administered, if available, where breathing is difficult. Seek immediate medical attention.

Ingestion: If victim is conscious and can swallow, dilute stomach contents with 2-4 cupfuls of water or milk. Do not induce vomiting. Seek medical attention and bring a copy of this MSDS. Never give anything by mouth to an unconscious person.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or incandescents. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: If possible, move material from fire area and cool material exposed to flame. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see Section 8) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

Environmental Precautions: Lead metal has limited bioavailability but its compounds can pose a severe threat to the aquatic and terrestrial environments. Contamination of water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a dry, covered area away from incompatible materials, strong acids and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture

could expand explosively and spatter molten metal out of the bath. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. No special packaging materials are required.

EU Safety Phrase(s): S53 - Avoid exposure - obtain special instructions before use; S45 – In case of accident, or if you feel unwell, seek medical advice immediately (show label where possible).

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations. Remove contaminated clothing promptly and discard or launder before reuse. Inform laundry personnel of contaminants' hazards.

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, grinding, burning, and use of powders.

Respirators: Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white or silvery-grey metal	**Odour:** None	**Physical State:** Solid	**pH:** Not Applicable
Vapour Pressure: 1.3 mm Hg at 970°C (negligible @ 20°C)	**Vapour Density:** Not Applicable	**Boiling Point/Range:** 1,740°C	**Freezing/Melting Point/Range:** 328°C
Specific Gravity: 11.34	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Odour Threshold:** None
Solubility: Insoluble in water			

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable under normal temperatures and pressures. Fresh cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead reacts vigorously with strong oxidizers, such as hydrogen peroxide and chlorine trifluoride, and active metals, such as sodium and potassium. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels above the exposure limits of lead dust or

fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

Acute:
Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposure of this magnitude is rare. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also be expected to occur.

Chronic:
Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agency for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure in pregnant women. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans) by the ACGIH and as a Group 2B Carcinogen (possibly carcinogenic to humans) by IARC. The NTP, OSHA and the EU do not currently list lead as a human carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

While lead metal is insoluble, its processing or extended exposure in the aquatic and terrestrial environments may lead to the release of lead in bioavailable forms. Lead compounds are not particularly mobile in the aquatic environment but can be toxic to organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are factors which regulate the degree of toxicity. In soil, lead is generally not very mobile or bioavailable as it can become strongly sorbed on soil particles, increasingly so over time, to a degree dependent on soil properties. Lead bioaccumulates in plants and animals in both the terrestrial and aquatic environments.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME .....Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION .....Not Applicable
TRANSPORT CANADA AND U.S. DOT PIN .....Not Applicable
MARINE POLLUTANT.....No
IMO CLASSIFICATION.....Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.
Ingredient Listed on TSCA Inventory.....Yes

Hazardous Under Hazard Communication Standard.....Yes

CERCLA Section 103 Hazardous Substances .....Lead RQ: 10 lbs. (4.54 kg.)*
*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance.....No

Disclaimer:

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10.1.3 Arsenic Material Safety Data Sheet – MSDS – Also for Barium

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I. GENERAL INFORMATION

Trade Name: Arsenic Formula: As
Chemical Family: Metallic element CAS #: 7440-38-2

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2. HAZARDOUS INGREDIENTS

Hazardous Components % OSHA/PEL ACGIH/TLV Sec. 313
Arsenic 0-100 10 ug/m^3 0.01 mg/m^3 Yes

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3. PHYSICAL DATA

Boiling Point: 613 ^oC (Sublimes) Melting Point: 817 ^oC
Vapor Density (Air=1): N/A Vapor Pressure: 1mm @ 372 ^oC
Solubility in H_2O: Insoluble % Volatiles: 0
Appearance and Odor: Steel-grey brittle solid, no odor. Specific gravity (H_2O=1): 5.72gm/cc

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4. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A Autoignition Temp: N/A
Flammability: Lower: N/A Upper: N/A

Extinguishing Media: Do not use water. Use carbon dioxide, dry chemical extinguishing agents, dry sand, dry ground dolomite.
Special Firefighting Procedures: Use NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing if involved in fire.

Unusual Fire and Explosion Hazard: Slight explosion hazard in the form of a dust when exposed to flame. Moderate fire hazard in the form of dust when exposed to heat or flame or by chemical reaction.

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5. HEALTH HAZARD INFORMATION

Effects of Exposure:

Acute arsenic poisoning (from ingestion) results in marked irritation of the stomach and intestines with nausea, vomiting and diarrhea. In severe cases the vomitus and stools are bloody and the patient goes into collapse and shock with weak, rapid pulse, cold sweats, coma and death. Chronic arsenic poisoning, whether through ingestion or inhalation, may manifest itself in many different ways. There may be disturbances of the digestive system such as loss of appetite, cramps, nausea, constipation or diarrhea. Liver damage may occur, resulting in jaundice. Disturbances of the blood, kidneys and nervous system are not infrequent. Arsenic can cause a variety of skin abnormalities including itching, pigmentation and even cancerous changes. A characteristic of arsenic poisoning is the great variety of symptoms that can be produced. A recognized carcinogen of the skin, lungs, liver. An experimental carcinogen of the mouth, esophagus, larynx, bladder and para nasal sinus. (Sax, Dangerous Properties of Industrial Materials)

Acute Effects:

Inhalation: Causes irritation of mucous membranes and respiratory tract, metallic taste, pharyngitis, bloody nose, perforation of the nasal septum.
Ingestion: May cause vomiting, diarrhea and nausea.
Skin: Causes moderate irritation, skin sensitization.
Eye: Causes moderate irritation.

Chronic Effects:

Inhalation: May cause cancer (skin and lung).
Ingestion: May cause cancer (skin and lung).
Skin: Can cause eczematous dermatitis, pigmentation, hyperkeratosis.
Eye: None known

Other Health Hazards: There is evidence that arsenic may cross the placental barrier. Arsenic is a neurotoxin. Poisoning may affect the heart, GI system, kidneys and liver.

Routes of Entry: Inhalation, ingestion.
Medical Conditions Generally Aggravated by Exposure: No data
Carcinogenicity: NTP: Yes IARC: Yes OSHA: Yes

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: No specific information available, one should obtain medical attention.
INGESTION: No data available but one should obtain medical attention.
SKIN: Remove contaminated clothing, flood skin with large amounts of water. If irritation persists seek medical attention.
EYE: Immediately flush eyes, including under eyelids, with large amounts of water for at least 15 minutes. Call a physician.

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6. REACTIVITY DATA

Stability: Stable

Conditions to Avoid: Incompatibles, exposure to air.

Incompatibility (Materials to Avoid): Acids, acid fumes, oxidizing agents, halogens, heat, palladium, zinc, platinum, nitrogen trichloride, silver nitrate, acetylenes, chlorosylamine, chromium (VI) oxide, sodium peroxide, dirubidium acetylide.

Hazardous Decomposition Products: At temperatures above the melting point, metal oxide fumes may be evolved. Under reducing conditions (i.e. any strong acid or base plus an active metal) or in the presence of nascent hydrogen, highly toxic arsine gas may be evolved.
Hazardous Polymerization: Will not occur.

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7. SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Any method which keeps dust to a minimum is acceptable. Vacuuming is preferred for dust. Use approved respiratory protection if possibility of dust/fume exposure exists. Do not use compressed air for cleaning.

Waste Disposal Method: Dispose of in accordance with all State, Federal and Local regulations.

---

8. SPECIAL PROTECTION INFORMATION

Respiratory Protection: Where airborne exposures may exceed OSHA/ACGIH permissible air concentrations, the minimum respiratory protection recommended is a negative pressure air purifying respirator with cartridges that are NIOSH/MSHA approved against dust, fumes and mists having a TWA less than 0.05 mg/m^3.

Ventilation: Glove bag or box preferred.

Protective Gloves: Rubber
Eye/Face Protection: ANSI approved safety goggles with a full face shield.

Other Protective Equipment: Full protective clothing, lab coat and apron, flame and chemical resistant coveralls, is recommended for exposures that exceed permissible air concentrations. All contaminated clothing should be removed before leaving plant premises.

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9. SPECIAL PRECAUTIONS

Precautions to Be Taken in Handling and Storage: Use of approved respirators is required for applications where adequate ventilation cannot be provided. Activities which generate dust or fume should be avoided. When melted, the temperature should be kept as low as possible. Keep container tightly closed. Store in a cool, dry, well-ventilated area. Wash thoroughly after use.

Work Practices: Avoid inhalation or ingestion. Practice good housekeeping and personal hygiene procedures. No tobacco or food in the work area. Wash thoroughly before eating or smoking. Shower and change clothes at end of work shift. Do not wear contaminated clothing home. Do not blow dust off clothing with compressed air. Maintain eyewash capable of sustained flushing, safety drench shower and hygienic facilities for washing.

Danger: Poison, causes skin and lung cancer.

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damage resulting from handling or from contact with the above product.

10.1.4 Mercury Material Safety Data Sheet – MSDS

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1. GENERAL INFORMATION

Synonyms: Quicksilver; hydrargyrum; Liquid Silver
CAS No.: 7439-97-6
Molecular Weight: 200.59
Chemical Formula: Hg

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No	Percent	Hazardous
Mercury	7439-97-6	90 - 100%	Yes

---

3. HAZARDS IDENTIFICATION

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Mercury vapor is highly toxic via this route. Causes severe respiratory tract damage. Symptoms include sore throat, coughing, pain, tightness in chest, breathing difficulties, shortness of breath, headache, muscle weakness, anorexia, gastrointestinal disturbance, ringing in the ear, liver changes, fever, bronchitis and pneumonitis. Can be absorbed through inhalation with symptoms similar to ingestion.
Ingestion:
May cause burning of the mouth and pharynx, abdominal pain, vomiting, corrosive ulceration,

bloody diarrhea. May be followed by a rapid and weak pulse, shallow breathing, paleness, exhaustion, tremors and collapse. Delayed death may occur from renal failure. Gastrointenstinal uptake of mercury is less than 5% but its ability to penetrate tissues presents some hazard. Initial symptoms may be thirst, possible abdominal discomfort.

Skin Contact:

Causes irritation and burns to skin. Symptoms include redness and pain. May cause skin allergy and sensitization. Can be absorbed through the skin with symptoms to parallel ingestion.

Eye Contact:

Causes irritation and burns to eyes. Symptoms include redness, pain, blurred vision; may cause serious and permanent eye damage.

Chronic Exposure:

Chronic exposure through any route can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. A suspected reproductive hazard; may damage the developing fetus and decrease fertility in males and females.

Aggravation of Pre-existing Conditions:

Persons with nervous disorders, or impaired kidney or respiratory function, or a history of allergies or a known sensitization to mercury may be more susceptible to the effects of the substance.

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4. FIRST AID MEASURES

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. FIRE FIGHTING MEASURES

Fire:

Not considered to be a fire hazard.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode. Undergoes hazardous reactions in the presence of heat and sparks or ignition. Smoke may contain toxic mercury or mercuric oxide. Smoke may contain toxic mercury or mercuric oxide.

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6. ACCIDENTAL RELEASE MEASURES

Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapor.

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate misting. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Do not flush to sewer. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. HANDLING AND STORAGE

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Do not use or store on porous work surfaces (wood, unsealed concrete, etc.). Follow strict hygiene practices. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTIVE EQUIPMENT

Airborne Exposure Limits:
- OSHA Acceptable Ceiling Concentration:
mercury and mercury compounds: 0.1 mg/m3 (TWA), skin
- ACGIH Threshold Limit Value (TLV):
inorganic and metallic mercury, as Hg: 0.025 mg/m3 (TWA) skin, A4 Not classifiable as a human carcinogen.
- ACGIH Biological Exposure Indices:
total inorganic mercury in urine (preshift): 35 ug/g creatinine;
total inorganic mercury in blood (end of shift): 15 ug/l.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face respirator

with a mercury vapor or chlorine gas cartridge may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with a mercury vapor or chlorine gas cartridge may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:
Silver-white, heavy, mobile, liquid metal.

Odor:
Odorless.

Solubility:
Insoluble in water.

Density:
13.55

pH:
No information found.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
356.7C (675F)

Melting Point:
-38.87C (-38F)

Vapor Density (Air=1):
7.0

Vapor Pressure (mm Hg):
0.0018 @ 25C (77F)

Evaporation Rate (BuAc=1):
4

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10. STABILITY AND REACTIVITY

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
At high temperatures, vaporizes to form extremely toxic fumes.

Hazardous Polymerization:

Will not occur.
Incompatibilities:
Acetylenes, ammonia, ethylene oxide, chlorine dioxide, azides, metal oxides, methyl silane, lithium, rubidium, oxygen, strong oxidants, metal carbonyls.
Conditions to Avoid:
Heat, flames, ignition sources, metal surfaces and incompatibles.

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11. TOXICOLOGICAL INFORMATION

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
All forms of mercury can cross the placenta to the fetus, but most of what is known has been learned from experimental animals. See Chronic Health Hazards.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

---NTP Carcinogen---

Ingredient	Known	Anticipated	IARC Category
Mercury (7439-97-6)	No	No	3

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12. ECOLOGICAL INFORMATION

Environmental Fate:
This material has an experimentally-determined bioconcentration factor (BCF) of greater than 100. This material is expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

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13. DISPOSAL CONSIDERATIONS

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. TRANSPORTATION INFORMATION

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

International (Water, I.M.O.)

Proper Shipping Name: MERCURY
Hazard Class: 8
UN/NA: UN2809
Packing Group: III
Information reported for product/size: 1LB

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15. OTHER INFORMATION

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE KIDNEYS AND CENTRAL NERVOUS SYSTEM. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.

Disclaimer: Follows next page

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10.2 Emergency Contact Information

In the event of an accident or emergency situation, emergency procedures will be executed. Said procedures can and will be executed by the first person to observe an accident or emergency situation. The PM and SHSO will be notified about the situation immediately after emergency procedures are implemented.

10.2.1 Emergency Contacts and Map to Hospital

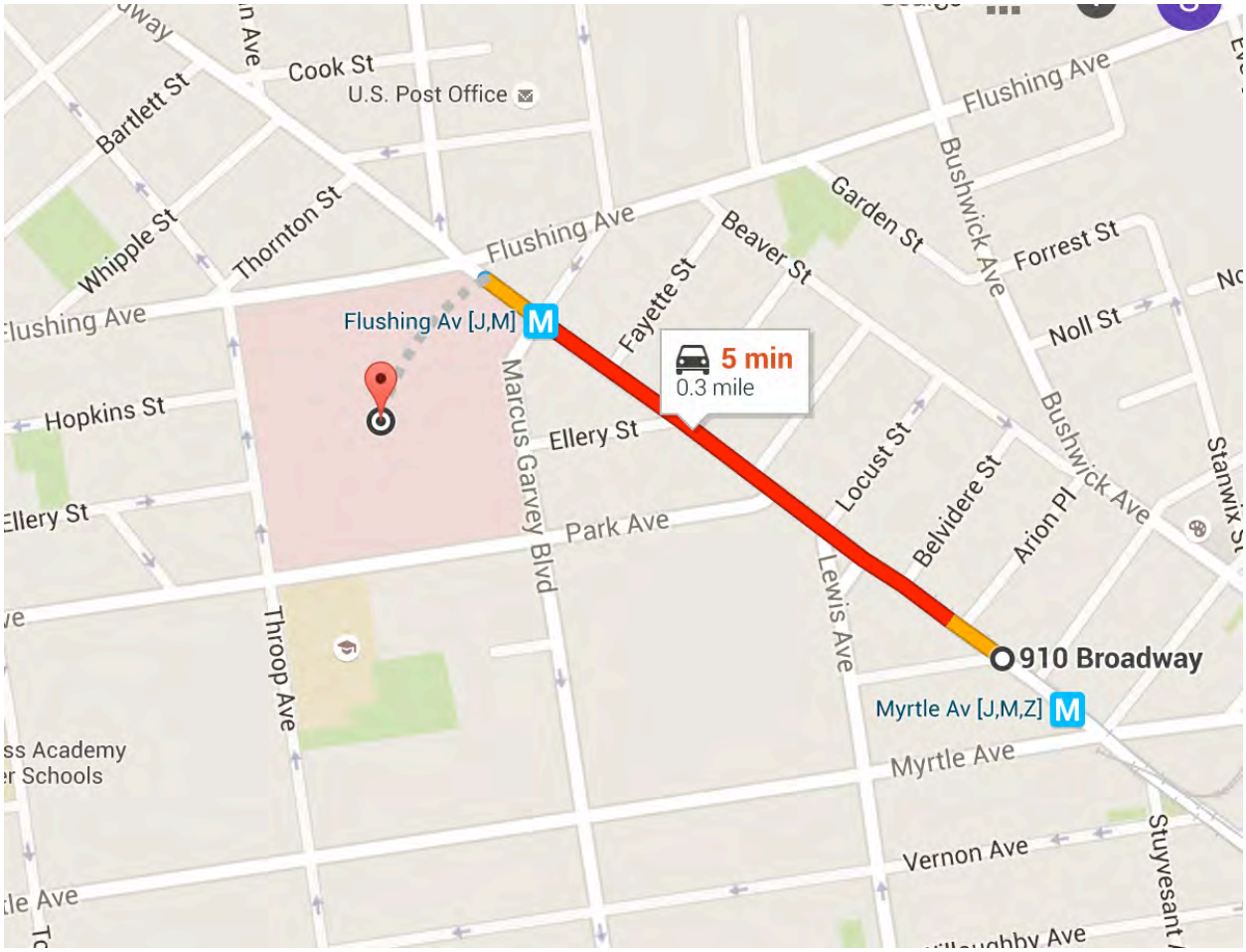
Emergency:	911	
Hospital:	718-963-8000	Woodhull Medical Center - ER
Police:	911	NYPD
Fire Department:	911	NYFD
Chemtrec:	800-424-9300	
Poison Control Center:	800-336-6997	
National Response Center:	800-424-8802	
US EPA (24-hour hotline):	800-424-9346	
New York State Department of Environmental Conservation	800-457-73682	Spill Hotline
Ambulance	911	
Below Ground Utilities	800-922-4455	“Call before you dig”
New York State Department of Health	518-474-2121	
National Pesticide Information	800-845-6733	

Directions to Nearest Hospital From Project Site- Woodhull Medical Center, 760 Broadway, Brooklyn, New York.

Summary: 0.4 miles (5 minutes)

Instruction	For
Depart 910/912 Broadway, Brooklyn, NY 11206	0 miles
Turn left & head northwest on Broadway toward Arion Place	0.3 mi
Turn left onto Marcus Garvey Boulevard	253 ft
Turn right into hospital entrance	
Arrive Woodhull Medical Center	

Figure 2 - Driving Directions To Woodhull Medical Center



10.2.2 Utility Emergencies / Initiating Subsurface Investigation Work

Where necessary, utility mark outs will be called in via the one call center. These markings are good for a period of 30–days.

10.3 Contingency / Evacuation Plan

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to emergency procedures. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Employee Emergency Action Plan Standard, set forth at 29 C.F.R. § 1926 Part 1926.35, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

If an unknown substance or substance container is encountered during site activities, the following contingency plan will be triggered as follows.

1. The Site Health and Safety Officer, Project Manager and Field Operations Leader will be notified and an Exclusion Zone (the aerial extent of which will be determined by the above safety staff) will be established.
2. All staff will be evacuated from the Exclusion Zone.
3. Air monitoring will be conducted down-wind of the Exclusion Zone.
4. The NYSDEC, as well as any other Government regulatory agency whose need may be prompted by the particular situation, will be notified.
5. Upon arrival of the NYSDEC or Government regulatory agency representative(s), site control will transfer to the appropriate Government personnel.

It may be possible that a situation could develop site emergency could necessitate the evacuation of all personnel from the site. If such a situation develops, an audible alarm shall be given for site evacuation (consisting of an air horn). Personnel shall evacuate the site in a calm and controlled fashion and regroup at a predetermined location. The route of evacuation will be dependent on wind direction, severity, type of incident, etc. The site must not be re-entered until back-up help, monitoring equipment, and/or personal protective equipment are on hand and the appropriate regulatory agencies have been notified.

10.4 Emergency Medical Treatment Procedures

This Section is not, nor does it purport to be, a comprehensive recitation of safety and health requirements applicable to medical treatment and first aid. Rather, contractors, subcontractors and workers at the site must refer to OSHA's Medical Services and First Aid Standard, set forth at 29 C.F.R. § 1926.50, as well as all supporting OSHA Compliance Directives and Letters of Interpretation, for complete information on safety and health compliance obligations.

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. The safety supervisor will complete an accident report for all incidents.

Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel.

10.4.1 Standard Procedures for Injury

1. Notify the Site Safety Officer, Project Manager, and the Port Authority Police of all accidents, incidents, and near emergency situations.
2. If the injury is minor, trained personnel should proceed to administer appropriate first aid.
3. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital. Refer to the map in section 11.2.1.
4. When transporting an injured person to a hospital, bring this Health and Safety Plan with the attached MSDS to assist medical personnel with diagnosis and treatment.

10.4.2 Chemical Overexposure

In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Different routes of exposure and their respective first aid/poison management procedures are outlined below.

Ingestion	Do not induce vomiting unless prompted by a health professional. Transport person to nearest hospital immediately.
Inhalation / Confined Space	Do not enter a confined space to rescue someone who has been overcome unless properly equipped and a standby person present.
Inhalation / Other	Move the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical

	assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.
Skin Contact / Non-Caustic Contaminant (Petroleum, Gasoline, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.
Skin Contact / Corrosive Contaminant (Acids, Hydrogen Peroxide, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin with water. Transport person to a medical facility if necessary.
Eyes	Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

10.4.3 First Aid for Injuries Incurred During Field Work

A first aid kit and emergency eyewash will be available on-site. Field crews, when performing field operations, will carry portable first aid kits that include emergency eye wash stations.

10.4.4 First Aid Equipment List

The first aid kit(s) kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1-inch and 2-inch
- Gauze compress bandages, 4-inch
- Gauze pads, 2-inch
- Adhesive tape, 1-inch
- Bandage, 1-inch
- Butterfly bandages
- Triangular bandages, 40-inch
- Ampoules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing

- Portable emergency eye wash
- Emergency oxygen supply
- Alcohol
- Hydrogen peroxide
- Clinical grade thermometer
- Tourniquet

10.4.5 Other Emergency Equipment

One portable fire extinguisher with a rating (ratio) of 20 pound A/B/C and one portable fire extinguisher with a rating of 2A will be conspicuously and centrally located between the restricted and non-restricted zones. In addition, similar extinguishers of the same size and class will be located in the site office trailer so that maximum travel distance to the nearest unit shall not exceed 50 feet. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. Field personnel will be trained in fire extinguisher use before field operations begin.

An emergency at any part of the site, such as fire or chemical release, might require that some appropriately trained site workers direct traffic on or near the site.
The following safety equipment to be used for traffic should be kept readily available on site in the field office:

- reflective/fluorescent vests
- flares
- traffic cones (and flags, or the equivalent, as needed)
- hazard tape (barricades as needed)
- working flashlights

10.5 Record of Injuries Incurred On-Site

10.5.1 Occupational Injuries and Illnesses Form (OSHA 300)

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 300. The site safety supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

10.5.2 Employer's First Report of Injury

The site safety supervisor for all accidents involving work injury at the site will complete this form (Appendix A). Follow-up procedures will include investigation of each accident or near-miss by the safety supervisor to assure that no similar accidents occur in the future.

Appendix 6

Manufacturer Specifications for Vapor Barrier

910-912 Broadway
Brooklyn, New York

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

RAVEN INDUSTRIES

Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.

Under-Slab Vapor/Gas Retarder

Product	Part #
VaporBlock Plus 20	VBP20

APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

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VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

PROPERTIES	TEST METHOD	VAPORBLOCK PLUS 20 IMPERIAL	VAPORBLOCK PLUS 20 METRIC
Appearance		White/Gold	
Thickness, Nominal		20 mil	0.51 mm
Weight		102 lbs/MSF	498 g/m²
Classification	ASTM E 1745	CLASS A, B & C	
Tensile Strength lbf/in (N/cm) average MD & TD (new material)	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
Impact Resistance	ASTM D 1709	2600 g	
Maximum Use Temperature		180° F	82° C
Minimum Use Temperature		-70° F	-57° C
Permeance (new material)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0098 Perms grains/(ft²·hr·in·Hg)	0.0064 Perms g/(24hr·m²·mm Hg)
(after conditioning) Perms (same measurement as above permeance)	ASTM E 154 Section 8, E96 Section 11, E96 Section 12, E96 Section 13, E96	0.0079 0.0079 0.0097 0.0113	0.0052 0.0052 0.0064 0.0074
WVTR	ASTM E 96 Procedure B	0.0040 grains/hr-ft²	0.0028 gm/hr-m²
Radon Diffusion Coeffiecient	K124/02/95	< 1.1 x 10^{-13} m²/s	
Methane Permeance	ASTM D 1434	< 1.7 x 10^{-10} m²/d• atm 0.32 GTR (Gas Transmission Rate) ml/m²•D•ATM	

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed.
Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.RavenEFD.com

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Appendix 7

Specifications for Active Sub-Slab Depressurization System

1. Proposed locations of depressurization system riser pipes to be verified by architect.

2. Prepare subsoil as specified by project geotechnical or structural engineer, or in accordance with ACI 302.1R-04 Section 4.1. Place, level, and compact gravel bed consisting of clean 3/4-inch pea gravel, or an equivalent approved by the design engineer. Gravel to be no more than 1-inch in diameter, with no sharp aggregate. Level gravel bed to elevation of bottom of PVC piping to be installed.

3. 3-inch diameter schedule 80 slotted PVC screen shall be installed 6 inch beneath the building slab. Backfill and compact over supported screen with clean 3/4-inch pea gravel. Total depth of compacted gravel surrounding piping shall be minimum 12-inches thick. PVC screens shall be connected to 4-inch diameter schedule 80 PVC solid pipe and steel risers. Vapor effluent sampling ports shall be installed on the risers. The risers shall raise at least 3-feet above the roof. Rain caps shall be installed on the roof at the end of the risers.

4. PVC piping to be new, clean slotted screen and solid pipe. 20-foot lengths of pipe shall be used to the extent practicable. Screen to be 40-slot (0.040 inch wide slots). Steel riser pipe and fittings for the vertical stack to be primed and painted with weather resistant paint. A minimum of two unions shall be installed on the stack pipe to provide for future modification.

5. Plumbing, priming, gluing, painting, fastening, and supporting PVC and steel pipes, screens, risers, and fittings to be conducted in accordance with existing project plans and specifications, industry standards, and manufacturer's instructions, unless otherwise approved by the project engineer. The installation shall comply with all federal, state, and local codes.

6. Contractor shall store materials in a clean and dry area, and shall protect materials from damage during handling and installation.

7. Install one in-line centrifugal fan unit, Radon Away 4-inch Mitigation Fan (RP-145), or an equivalent approved by the design engineer, on each stack pipe. These fan units consume about 41-72 watts of power, and are capable of inducing 2.1 inches of water vacuum, while moving 166 cubic feet per minute (CFM) of air.

8. Install one in-line pressure gauge or manometer on each stack pipe. The gauge or manometer must have a clearly marked line or lines showing minimum acceptable vacuum levels. Where appropriate, in addition to a manometer or gauge, a visible and/or audible alarm should be considered, indicating loss of system vacuum or power. In all cases, clear instructions, with the name and phone number of a person to be contacted in such event, should be visible at the extraction points.