

606 WEST 57TH STREET

NEW YORK, NEW YORK

Remedial Action Work Plan

NYC VCP Number: 15CVCP026M

OER Project Number: 14EHAN423M

CEQR Number: 13DCP080M

Prepared for:

TFC West 57 GC LLC
387 Park Avenue South
New York, New York 10016
212-672-1000

Prepared by:

AKRF Engineering, P.C.
440 Park Avenue South
New York, New York 10016
646-388-9525

OCTOBER 2014

REMEDIAL ACTION WORK PLAN

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 SITE BACKGROUND.....	9
1.1 Site Location and Current Usage	9
1.2 Proposed Redevelopment Plan	9
1.3 Description of Surrounding Property	10
1.4 Remedial Investigation	10
1.4.1 Summary of Environmental Findings.....	11
2.0 REMEDIAL ACTION OBJECTIVES	13
2.1 Groundwater	13
2.2 Soil	13
2.3 Soil Vapor	13
3.0 REMEDIAL ALTERNATIVES ANALYSIS	14
3.1 Threshold Criteria	15
3.1.1 Protection of Public Health and the Environment	15
3.2 Balancing Criteria	16
3.2.1 Compliance with Standards, Criteria and Guidance (SCGs).....	16
3.2.2 Short-term Effectiveness and Impacts	16
3.2.3 Long-term Effectiveness and Permanence	17
3.2.4 Reduction of Toxicity, Mobility, or Volume of Contaminated Material	18
3.2.5 Implementability.....	18
3.2.6 Cost Effectiveness	19
3.2.7 Community Acceptance	20
3.2.8 Land Use.....	20
3.2.9 Sustainability of the Remedial Action.....	20
4.0 REMEDIAL ACTION	22
4.1 Summary of Preferred Remedial Action.....	22
4.2 Soil Cleanup Objectives and Soil/Fill Management.....	24

4.2.1	Estimated Soil/Fill Removal Quantities	24
4.2.2	Endpoint Sampling	24
4.2.3	Quality Assurance/Quality Control	25
4.2.4	Import and Reuse of Soils	27
4.3	Engineering Controls	27
4.3.1	Composite Cover System	27
4.3.2	Vapor Barrier	28
4.4	Institutional Controls	29
4.5	Site Management Plan	29
4.6	Qualitative Human Health Exposure Assessment	30
4.6.1	Known and Potential Sources	30
4.6.2	Nature, Extent, Fate and Transport of Contaminants	31
4.6.3	Potential Routes of Exposure	32
4.6.4	Evaluation for Human Health Exposure.....	32
4.6.5	Receptor Populations	33
4.6.6	Overall Human Health Exposure Assessment.....	33
5.0	REMEDIAL ACTION MANAGEMENT.....	35
5.1	Project Organization and Oversight.....	35
5.2	Site Security	35
5.3	Work Hours.....	35
5.4	Construction Health and Safety Plan	35
5.5	Community Air Monitoring Plan.....	36
5.5.1	VOC Monitoring, Response Levels, and Actions	36
5.5.2	Particulate Monitoring, Response Levels, and Actions.....	37
5.6	Agency Approvals	37
5.7	Site Preparation.....	38
5.7.1	Pre-Construction Meeting.....	38
5.7.2	Mobilization.....	38
5.7.3	Utility Marker Layouts, Easement Layouts.....	38
5.7.4	Dewatering.....	38
5.7.5	Equipment and Material Staging	38

5.7.6	Stabilized Construction Entrance	39
5.7.7	Truck Inspection Station.....	39
5.7.8	Extreme Storm Preparedness and Response Contingency Plan	39
5.7.9	Storm Preparedness	39
5.7.10	Storm Response	39
5.7.11	Storm Response Reporting	40
5.8	Traffic Control	41
5.9	Demobilization.....	41
5.10	Reporting and Record Keeping.....	41
5.10.1	Daily Reports.....	41
5.10.2	Record Keeping and Photo-Documentation	42
5.11	Complaint Management.....	42
5.12	Deviations from the Remedial Action Work Plan	42
6.0	REMEDIAL ACTION REPORT	43
6.1	Remedial Action Report Certification	44
7.0	SCHEDULE	45

FIGURES

- Figure 1 - Site Location Map
- Figure 2 - Site Plan
- Figure 3 - Planned Development
- Figure 4 - Proposed Excavation Plan
- Figure 5 - Existing Land Use
- Figure 6 - Endpoint Sample Locations

APPENDICES

- Appendix A - Proposed Development Plans
- Appendix B - Citizen Participation Plan
- Appendix C - Sustainability Statement
- Appendix D - Soil/Materials Management Plan
- Appendix E - Specifications for Waterproofing/Vapor Barrier
- Appendix F - Construction Health and Safety Plan

LIST OF ACRONYMS

Acronym	Definition
AGV	Air Guideline Value
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
ECs/ICs	Engineering and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
ESA	Environmental Site Assessment
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NAVD88	North American Vertical Datum of 1988
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation

Acronym	Definition
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
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PE	Professional Engineer
PID	Photo Ionization Detector
QA/QC	Quality assurance/quality control
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RIR	Remedial Investigation Report
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
TCA	Trichloroethane

Acronym	Definition
TCE	Trichloroethene
USGS	United States Geological Survey
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound

CERTIFICATION

I, Michelle Lapin, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 606 West 57th Street, New York, NY (NYC VCP Site Number 15CVCP026M and NYCOER Project Number 14EHAN423M).

I, Marc Godick, LEP, am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for 606 West 57th Street, New York, NY (NYC VCP Site Number 15CVCP026M and NYCOER Project Number 14EHAN423M).

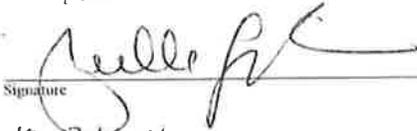
I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Michelle Lapin

Name

073934-1

NYS PE License Number



Signature

10-21-14

Date



Marc S. Godick, LEP

QEP Name



QEP Signature

10/21/14

Date

EXECUTIVE SUMMARY

TFC West 57 GC LLC has enrolled in the New York City Voluntary Brownfield Cleanup Program (NYC VCP) to investigate and remediate an 83,260-square foot site located at 606 West 57th Street in the Borough of Manhattan, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 606 West 57th Street, New York, New York and is identified as Block 1104, Lot 31 on the New York City Tax Map. Note that Lots 31, 40, 44, and 55 were merged into Lot 31 in July 2014 in preparation for redevelopment. The Site is approximately 83,260 square feet and is bounded by West 57th Street to the north, West 56th Street and a New York City Sanitation garage to the south, Eleventh Avenue and commercial buildings to the east, and the New York City Sanitation garage to the west. The Site is in the process of being vacated; however, recent land use consisted of automotive sales, service, and parking. Former Lots 31 and 40 were used as Lexus and Acura automotive dealerships with low-rise structures for sales and service and open areas for vehicle handling, pickup, and short-term storage. Former Lot 44 contained a four-story parking garage and former Lot 55 contained a one-story auto repair shop.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of demolition of existing buildings and construction of a new mixed-use building with full build-out, covering the entirety of the Site lot. Planned development consists of a tiered building varying in height from 2 to 42 stories with one to two full basement levels. The building will contain up to 1,028 residential apartments, ground floor retail uses comprising up to about 39,270 gross square feet, and 400 below-grade parking spaces. Twenty percent of residential units will be affordable housing. The total gross building floor area is 1,195,313 square feet.

Development plans consist of the anticipated excavation generally to elevation 0 to -12 feet (which is below the water table) with numerous pile caps throughout the Site extending to elevations -7 to -16.5 feet [North American Vertical Datum of 1988 (NAVD88)]. The excavation plan extends into bedrock on portions of the Site. Accounting for Site topography and elevation changes, the depth of the bottom of the pile caps will vary from approximately 14 to 30 feet below sidewalk grade. It is anticipated that there will be three deeper elevator pits in the central portion of the Site extending to elevation -18 feet to elevation -22 feet (NAVD88 datum). The excavation for Site development is anticipated to consist of about 75,000 cubic yards of soil and rock.

The current zoning designation is C4-7 commercial use. The proposed use is consistent with existing zoning for the property. The remedial action contemplated under this RAWP is part of the proposed redevelopment plan.

Summary of Environmental Findings

1. Elevation of the Site ranges from 12.5 feet on the western side to 25.5 feet on the eastern side (NAVD88 datum).
2. Groundwater flow is generally from east to west beneath the Site.
3. Depth to bedrock ranges from approximately 10 feet below sidewalk grade on the eastern side of the Site to 70 feet below sidewalk grade on the western side of the Site.
4. The stratigraphy of the Site, from the surface down, consists of fill, varying from 5 to 20 feet below grade, underlain by 10 to 35 feet of apparently native sandy soil with varying amounts of silt, clay and gravel, underlain by bedrock.
5. Soil/fill samples results were compared to NYSDEC Unrestricted Use Soil Cleanup Objectives (USCO) and Restricted Residential Soil Cleanup Objectives (RRSCO) as listed in 6 NYCRR Part 375-6.8(a,b) and CP-51. The results of soil/fill analyses showed seven volatile organic compounds (VOCs) were detected at a concentration exceeding the USCOs, as follows: 1,2,4-trimethylbenzene (maximum of 79,000 parts per billion (ppb)); 1,3,5-trimethylbenzene (max. of 24,000 ppb); benzene (maximum of 130 ppb); n-butylbenzene (maximum of 14,000 ppb); ethylbenzene (maximum of 9,100 ppb); n-propylbenzene (maximum of 6,000 ppb); and xylene (maximum of 9,400 ppb). Acetone was also detected in 10 soil samples at concentrations greater than the USCO (maximum of 150 ppb). 1,2,4-trimethylbenzene was the only detected VOC concentration which also exceeded RRSCO in one soil sample. PCE (maximum of 58 ppb) was detected in seven of 35 samples at low-level concentrations below its USCO. TCE, TCA, and carbon tetrachloride were not detected. Seven semivolatile organic compounds (SVOCs) including benzo(a)pyrene (maximum of 15,000 ppb), benzo(a)anthracene (maximum of 19,000 ppb), benzo(b)fluoranthene (maximum of 16,000 ppb), benzo(k)fluoranthene (maximum of 6,700 ppb), chrysene (maximum of 19,000 ppb), indeno(1,2,3-cd)pyrene (maximum of 12,000 ppb), and naphthalene (maximum of 35,000 ppb) were detected at concentrations exceeding their respective RRSCOs. Several metals exceeded RRSCOs and included arsenic in 4 of 35 samples (maximum of 41.5 parts per million (ppm)), barium (maximum of 3,020 ppm), cadmium (maximum of 18.5 ppm), copper (maximum of 1,550 ppm), lead in 13 of 35 samples (maximum of 11,800 ppm), mercury in 14 of 35 samples (maximum of 54.2 ppm), and zinc (maximum of 14,000 ppm). Several pesticides and PCBs were identified slightly exceeding USCOs, but none exceeded RRSCOs.
6. Results from twenty groundwater samples were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). The groundwater results showed the following VOCs exceeding their Class GA Standards: 1,2,4-trimethylbenzene (maximum of 7.4 ppb), benzene (maximum of 12 ppb), isopropylbenzene (maximum of 8.7 ppb), m/p xylene (maximum of 14 ppb), naphthalene (maximum of 1,100 ppb), n-propylbenzene (maximum of 16 ppb), o-xylene (maximum of 10 ppb), sec-butylbenzene (maximum of 7.1 ppb), and toluene (maximum of 14 ppb). The chlorinated VOCs PCE, TCE, TCA, and carbon tetrachloride were not detected in any of the groundwater samples collected. Several SVOCs were detected above their respective Class GA Standards and included: acenaphthene (maximum of 110 ppb), naphthalene (maximum of 550 ppb), fluorene (maximum of 57 ppb), phenanthrene (maximum 61 ppb), phenol (maximum 1.1 ppb),

benzo(a)pyrene (maximum of 1.1 ppb), benzo(a)anthracene (maximum of 3.3 ppb), benzo(b)fluoranthene (maximum of 1.2 ppb), benzo(k)fluoranthene (maximum of 0.63 ppb), chrysene (maximum of 2.7 ppb), indeno(1,2,3-cd)pyrene (maximum of 0.65 ppb), and bis(2-ethylhexyl)phthalate (maximum of 7.4 ppb). Several metals were identified exceeding their Class GA Standards including arsenic (maximum of 33 ppb), manganese, sodium, and selenium. No PCBs or pesticides were detected above Class GA Standards.

7. Soil vapor results 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 samples collected during the RI showed low levels of petroleum related and low levels of chlorinated VOCs in all soil vapor samples. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, cyclohexane, heptane, hexane, and 2,2,4-trimethylpentane] were detected at concentrations up to 193 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). All compounds were detected at low levels except for acetone (maximum of $1850 \mu\text{g}/\text{m}^3$). The following chlorinated VOCs were detected in soil vapor: tetrachloroethene (PCE) at a maximum concentration of $30.5 \mu\text{g}/\text{m}^3$, trichloroethene (TCE) in one soil vapor sample at $2.18 \mu\text{g}/\text{m}^3$, carbon tetrachloride in one soil vapor sample at $1.69 \mu\text{g}/\text{m}^3$, and 1,1,1-trichloroethane (TCA) in one soil vapor sample at $32.5 \mu\text{g}/\text{m}^3$. No VOC concentrations were above the monitoring or mitigation level ranges established within the NYSDOH soil vapor guidance matrix. One PCE concentration slightly exceeded the NYSDOH Air Guideline Value (AGV) for indoor air of $30 \mu\text{g}/\text{m}^3$.

Summary of the Remedy

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic compounds.
3. Establishment of Site-Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency of one composite sample per 800 to 1,000 (approximate) cubic yards of material to be excavated. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to the start of the remedial action.

5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding SCOs. Excavation for development purposes would take place to a depth of approximately 14 to 30 feet below sidewalk grade (accounting for Site topography and elevation changes) and would be below the water table across the entirety of the Site. A small area for elevator pits will be excavated to greater depths. Approximately 112,000 tons of soil and rock will be excavated and removed from this Site.
7. Installation of a dewatering system for construction purposes which will include groundwater cutoff elements at the perimeter of the Site, to include interlocking sheet piling, tangent piles, and concrete retention piers.
8. Dewatering will be performed via well points or excavated sumps for pumping as needed. Dewatering discharge will include appropriate approvals obtained from New York City Department of Environmental Protection (NYCDEP) for discharges to the combined sewer system, and if needed from NYSDEC. Pre-treatment of groundwater will be performed as needed for the permitted discharge.
9. Removal of underground storage tanks (if encountered during excavation) and closure of petroleum spills, if encountered, in compliance with applicable local, State and Federal laws and regulations. Any spill management, if required, will be conducted under the New York State Department of Environmental Conservation (NYSDEC) Spill program authority.
10. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).
11. Management of excavated materials including temporarily stockpiling and segregating to prevent co-mingling of contaminated material and non-contaminated materials.
12. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
13. Collection and analysis of endpoint samples to determine the performance of the remedy with respect to attainment of Site Specific SCOs.
14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
15. Installation of a waterproofing/vapor barrier system beneath the building slab and outside foundation sidewalls below grade. The barrier will consist of Grace Preprufe® 300R (46 mils) and 160R (32 mils), or an OER-approved equivalent. Grace Bituthene liquid membrane (or an OER-approved equivalent) will be applied to double formed walls and to seal holes in the membrane and around penetrations.
16. Construction and maintenance of an engineered composite cover consisting of a minimum 20-inch thick concrete building slab to prevent human exposure to residual soil/fill remaining under the Site.
17. Implementation of stormwater pollution prevention measures in compliance with applicable laws and regulations.

18. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
19. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
20. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
21. The property will continue to be registered with an E-Designation by the NYC Department of Buildings. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER approval.

COMMUNITY PROTECTION STATEMENT

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

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

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

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

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

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

Site Safety Coordinator. This project has a designated Site safety coordinator to implement the environmental Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator [also known as the environmental Site Safety Officer (SSO)] is Robert Panczer and can be reached at 484-547-5664.

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 NYC noise control standards. If you observe problems in these areas, please contact AKRF’s Project Manager Kate Brunner at 646-388-9525 or NYC Office of Environmental Remediation Project Manager Katherine Glass at 212-676-4925.

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 (DOB) construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to the DOB construction code requirements or according to specific variances issued by DOB.

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

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the environmental consultant’s Project Manager Kate Brunner at 646-388-9525, the construction Project Manager at 212-984-1743, the NYC Office of Environmental Remediation Project Manager Katherine Glass at 212-676-4925, or call 311 and mention that 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 DOB 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 of contaminated material will be kept covered overnight with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles above sidewalk grade will be protected with silt fences. Hay bales will be used, as needed to protect stormwater catch basins and other discharge points.

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

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

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

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

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

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at The New York Public Library – Columbus Library and online via the NYCOER VCP website.

Long-Term Site Management. To provide long-term protection 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. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

TFC West 57 GC LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 606 West 57th Street in the Clinton neighborhood in the Borough of Manhattan, New York, 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, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 Site Location and Current Usage

The Site is located at 606 West 57th Street, New York, New York and is identified as Block 1104, Lot 31 on the New York City Tax Map. Note that Lots 31, 40, 44, and 55 were merged into Lot 31 in July 2014 in preparation for redevelopment. Figure 1 shows the Site location. The Site is approximately 83,260 square feet and is bounded by West 57th Street to the north, West 56th Street and a New York City Sanitation garage to the south, Eleventh Avenue and commercial buildings to the east, and the New York City Sanitation garage to the west. A map of the Site boundary is shown on Figure 2. The Site is in the process of being vacated; however, recent land use consisted of automotive sales, service, and parking. Former Lots 31 and 40 were used as Lexus and Acura automotive dealerships with low-rise structures for sales and service and open areas for vehicle handling, pickup, and short-term storage. Former Lot 44 contained a four-story parking garage and Former Lot 55 contained a one-story auto repair shop.

1.2 Proposed Redevelopment Plan

The proposed future use of the Site will consist of demolition of existing buildings and construction of a new mixed-use building with full build-out, with the building and associated concrete covering the entirety of the Site lot. Planned development consists of a tiered building varying in height from 2 to 42 stories with one to two full basement levels. The building will contain up to 1,028 residential apartments, ground floor retail uses comprising up to 39,400 gross square feet, and 400 below-grade parking spaces. Twenty percent of residential units will be affordable housing. The total gross building floor area is 1,195,313 square feet. A figure of the planned development is provided in Figure 3.

Development plans consist of the anticipated excavation generally to elevation 0 to -12 feet (which is below the water table) with numerous pile caps throughout the Site extending to elevations -7 to -16.5 feet [North American Vertical Datum of 1988 (NAVD88)]. The excavation plan extends into bedrock on portions of the Site. Accounting for Site topography and elevation changes, the depth of the bottom of the pile caps will vary from approximately 14 to 30 feet below sidewalk grade. It is anticipated

that there will be three deeper elevator pits in the central portion of the Site extending to elevation -18 feet to elevation -22 feet (NAVD88 datum). The excavation for Site development is anticipated to consist of about 75,000 cubic yards of soil and rock. The location and generalized maximum depths of the excavation to bottom of pile cap for the foundation are shown in Figure 4.

A current topographic survey and layout of the proposed Site development, including specifics for foundation depths and support of excavation depths, are presented in Appendix A. The current zoning designation is C4-7 commercial use. The proposed use is consistent with existing zoning for the property.

The remedial action contemplated under this RAWP is part of the proposed redevelopment plan. A two-level sub grade parking garage will be constructed and operated per codes and requirements of the New York City Department of Buildings. An air exchange system with a carbon monoxide sensor will be installed in the parking garage to provide ventilation of the parking area.

1.3 Description of Surrounding Property

The Site is bordered to the north by West 57th Street with a construction Site, residential properties, and a Con Edison facility further north. East-adjacent properties are used for commercial purposes with Eleventh Avenue bordering a portion of the eastern property boundary. A New York City Department of Sanitation facility is located to the west and south of the Site. The Site is partially bordered to the south by West 56th Street, beyond which are automobile dealership and service facilities. Figure 5 shows the general surrounding land usage.

1.4 Remedial Investigation

A remedial investigation was performed and the results are documented in a companion document called *Remedial Investigation Report, 606 West 57th Street*, dated September 2014 (RIR). The following activities were performed as part of the remedial investigation and spill investigation and remediation:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e., structures, buildings, etc.);
2. Installed 28 soil borings across the entire project Site (excluding spill investigation samples of subsequently remediated/removed soil), and collected thirty-nine soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Collected four post-excavation endpoint soil samples from each sidewall of the area of spill remediation to evaluate soil quality;
4. Installed five temporary and four permanent groundwater monitoring wells throughout the Site and collected 20 groundwater samples for chemical analysis to evaluate groundwater quality; and
5. Installed seven soil vapor probes and collected seven soil vapor samples and one ambient air sample for chemical analysis.

1.4.1 Summary of Environmental Findings

The RIR included the following findings:

1. Elevation of the Site ranges from 12.5 feet on the western side to 25.5 feet on the eastern side (NAVD88 datum).
2. Groundwater flow is generally from east to west beneath the Site.
3. Depth to bedrock ranges from approximately 10 feet below sidewalk grade on the eastern side of the Site to 70 feet below sidewalk grade on the western side of the Site.
4. The stratigraphy of the Site, from the surface down, consists of fill, varying from 5 to 20 feet below grade, underlain by 10 to 35 feet of apparently native sandy soil with varying amounts of silt and gravel, underlain by bedrock.
5. Soil/fill samples results were compared to NYSDEC Unrestricted Use Soil Cleanup Objectives (USCO) and Restricted Residential Soil Cleanup Objectives (RRSCO) as listed in 6 NYCRR Part 375-6.8(a,b) and CP-51. The results of soil/fill analyses showed seven volatile organic compounds (VOCs) were detected at a concentration exceeding the USCOs, as follows: 1,2,4-trimethylbenzene (maximum of 79,000 parts per billion (ppb)); 1,3,5-trimethylbenzene (max. of 24,000 ppb); benzene (maximum of 130 ppb); n-butylbenzene (maximum of 14,000 ppb); ethylbenzene (maximum of 9,100 ppb); n-propylbenzene (maximum of 6,000 ppb); and xylene (maximum of 9,400 ppb). Acetone was also detected in 10 soil samples at concentrations greater than the USCO (maximum of 150 ppb). 1,2,4-trimethylbenzene was the only detected VOC concentration which also exceeded RRSCO in one soil sample. PCE (maximum of 58 ppb) was detected in seven of 35 samples at low-level concentrations below its USCO. TCE, TCA, and carbon tetrachloride were not detected. Seven semivolatile organic compounds (SVOCs) including benzo(a)pyrene (maximum of 15,000 ppb), benzo(a)anthracene (maximum of 19,000 ppb), benzo(b)fluoranthene (maximum of 16,000 ppb), benzo(k)fluoranthene (maximum of 6,700 ppb), chrysene (maximum of 19,000 ppb), indeno(1,2,3-cd)pyrene (maximum of 12,000 ppb), and naphthalene (maximum of 35,000 ppb) were detected at concentrations exceeding their respective RRSCOs. Several metals exceeded RRSCOs and included arsenic in 4 of 35 samples (maximum of 41.5 parts per million (ppm)), barium (maximum of 3,020 ppm), cadmium (maximum of 18.5 ppm), copper (maximum of 1,550 ppm), lead in 13 of 35 samples (maximum of 11,800 ppm), mercury in 14 of 35 samples (maximum of 54.2 ppm), and zinc (maximum of 14,000 ppm). Several pesticides and PCBs were identified slightly exceeding USCOs, but none exceeded RRSCOs.
6. Results from twenty groundwater samples were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). The groundwater results showed the following VOCs exceeding their Class GA Standards: 1,2,4-trimethylbenzene (maximum of 7.4 ppb), benzene (maximum of 12 ppb), isopropylbenzene (maximum of 8.7 ppb), m/p xylene (maximum of 14 ppb), naphthalene (maximum of 1,100 ppb), n-propylbenzene (maximum of 16 ppb), o-xylene (maximum of 10 ppb), sec-butylbenzene (maximum of 7.1 ppb), and toluene

- (maximum of 14 ppb) . The chlorinated VOCs PCE, TCE, TCA, and carbon tetrachloride were not detected in any of the groundwater samples collected. Several SVOCs were detected above their respective Class GA Standards and included: acenaphthene (maximum of 110 ppb), naphthalene (maximum of 550 ppb), fluorene (maximum of 57 ppb), phenanthrene (maximum 61 ppb), phenol (maximum 1.1 ppb), benzo(a)pyrene (maximum of 1.1 ppb), benzo(a)anthracene (maximum of 3.3 ppb), benzo(b)fluoranthene (maximum of 1.2 ppb), benzo(k)fluoranthene (maximum of 0.63 ppb), chrysene (maximum of 2.7 ppb), indeno(1,2,3-cd)pyrene (maximum of 0.65 ppb), and bis(2-ethylhexyl)phthalate (maximum of 7.4 ppb). Several metals were identified exceeding their Class GA Standards including arsenic (maximum of 33 ppb), manganese, sodium, and selenium. No PCBs or pesticides were detected above Class GA Standards.
7. Soil vapor results 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 samples collected during the RI showed low levels of petroleum related and low levels of chlorinated VOCs in all soil vapor samples. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, cyclohexane, heptane, hexane, and 2,2,4-trimethylpentane] were detected at concentrations up to 193 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). All compounds were detected at low levels except for acetone (maximum of $1850 \mu\text{g}/\text{m}^3$). The following chlorinated VOCs were detected in soil vapor: tetrachloroethene (PCE) at a maximum concentration of $30.5 \mu\text{g}/\text{m}^3$, trichloroethene (TCE) in one soil vapor sample at $2.18 \mu\text{g}/\text{m}^3$, carbon tetrachloride in one soil vapor sample at $1.69 \mu\text{g}/\text{m}^3$, and 1,1,1-trichloroethane (TCA) in one soil vapor sample at $32.5 \mu\text{g}/\text{m}^3$. No VOC concentrations were above the monitoring or mitigation level ranges established within the NYSDOH soil vapor guidance matrix. One PCE concentration slightly exceeded the NYSDOH Air Guideline Value (AGV) for indoor air of $30 \mu\text{g}/\text{m}^3$. For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of hazardous waste is possible for soil excavated from this Site. Prior to excavation, additional soil sampling will be performed for waste characterization purposes in accordance with disposal facility requirements.

2.0 REMEDIAL ACTION OBJECTIVES

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

2.1 Groundwater

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

2.2 Soil

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

2.3 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 remedial action objectives (RAOs) for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

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

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

- **Alternative 1 involves:**
 - Selection of NYSDEC 6NYCRR Part 375 Section 6.8 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 all Track 1 Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. Based on the results of the remedial investigation, it is expected that this alternative would require excavation of all overburden soil to the top of bedrock. Excavation to bedrock would extend to depths of approximately 20 to 65 feet below sidewalk grade and up to 50 feet below the water table (varying depths accounting for Site topography, bedrock topography, and elevation changes). Although portions of the planned development excavation will encounter bedrock, significant overexcavation and backfilling with clean fill would be necessary under this scenario to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs;
 - No engineering or institutional controls are required for a Track 1 cleanup, but a waterproofing system would be installed along the foundation walls and beneath the building slab. This waterproofing system would also serve as a vapor barrier that would mitigate potential vapors from off-site properties; and

- Placement of a final cover over the entire Site as part of new construction.
- **Alternative 2 involves:**
 - Establishment of Track 4 Site-Specific SCOs;
 - Removal of all soil/fill exceeding Track 4 Site-Specific SCOs to the extent practicable and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. Excavation for development purposes would take place to a depth of approximately 14 to 30 feet below sidewalk grade (accounting for Site topography and elevation changes) and would be below the water table across the entirety of the Site. Excavation and soil removal will be conducted at greater depths in select areas of the Site to accommodate elevator pits;
 - Placement of a final cover over the entire Site to eliminate exposure to remaining soil/fill;
 - Placement of a waterproofing system/vapor barrier along the foundation walls and beneath the building slab to prevent potential vapors from off-site properties entering the new building;
 - Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive sites uses, such as farming or vegetable gardening, to eliminate future exposure pathways;
 - Establishment of an approved Site Management Plan to ensure long-term management of these engineering and institutional controls including the performance of periodic inspections and certification that the controls are performing as they were intended; and
 - The property will continue to be registered with an E-Designation at the NYC Department of Buildings.

3.1 Threshold Criteria

3.1.1 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 the historic fill and contaminated soil within the development area at the Site, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater.

Alternative 2 would achieve comparable overall protection of human health and the environment since soil to a minimum depth of approximately 14 feet will be removed for purposes of new development and remaining soil/fill on-Site would

meet Track 4 Site-Specific SCOs to the extent practicable. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into groundwater. Further protection to residual contamination would be attained by placement of engineering controls, including a composite cover system and waterproofing/vapor barrier. As part of construction, the waterproofing system would also serve as a means to protect future occupants from potential exposure to residual contaminants. Implementing institutional controls including continuation of the E-Designation and a Site Management Plan would ensure that the composite cover system remains intact and protective.

For both Alternatives, potential exposure to contaminated soil and groundwater during construction would be minimized by implementing an approved Soil and Materials Management Plan and an environmental Construction Health and Safety Plan (CHASP), which includes a Community Air Monitoring Plan (CAMP).

3.2 Balancing Criteria

3.2.1 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 to Track 1 Unrestricted Use SCOs and Groundwater Protection Standards. Compliance with SCGs for soil vapor would also be achieved by installation of a vapor barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls, and a concrete building slab would be constructed over the entirety of the Site as part of new construction.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of fill/soil to meet Track 4 Site Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installation of a vapor barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls, and a concrete building slab would be constructed over the entirety of the Site. A Site Management Plan would ensure that these controls remained protective for the long term.

Health and safety measures contained in the CHASP and CAMP that comply with the applicable SCGs would 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 would protect on-Site workers and the surrounding community from exposure to Site-related contaminants.

3.2.2 Short-term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met.

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

Both Alternatives 1 and 2 have similar short-term effectiveness during their respective implementations, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short term impacts would be significantly higher for Alternative 1 as excavation of significantly greater amounts of historical fill material would be anticipated both below the excavation depth of the proposed building (varying approximately 14 to 30 feet below grade) and elsewhere on-Site. However, focused attention to means and methods during the remedial action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risk to the community associated with both remedial alternatives is increased truck traffic. Up to approximately 3,750, 20-yard capacity truck trips would be necessary to transport fill and soil excavated during Site development under Alternative 2, whereas under Alternative 1, assuming nominal average depth to bedrock 10 feet beneath base of planned excavation, about 5,300 truck trips would be required.

Both remedial alternatives would also employ appropriate measures to prevent short-term impacts through the use of a CHASP (with CAMP) and a Soil/Materials Management Plan during all on-Site soil disturbance activities, and would effectively mitigate the release of significant contaminants into the environment by properly handling and disposing of soil/fill encountered during the development. 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 (site-specific CHASP) would be protected from on-Site contaminants through the use of the appropriate personal protective equipment.

3.2.3 Long-term Effectiveness and Permanence

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

Alternative 1 would achieve long-term effectiveness and permanence by permanently removing all contaminated soil/ fill material.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination, installing a composite cover system across the Site, installing a vapor barrier, maintaining use restrictions, establishing a Site Management Plan to ensure long-term management of Institutional Controls (ICs) and Engineering Controls (ECs), and leaving the E-Designation in place 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 use restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

Both alternatives would result in removal of soil contamination exceeding the SCOs providing an effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which would eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination would also be eliminated as part of the remedy.

3.2.4 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 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by meeting Track 1 Unrestricted Use SCOs.

Alternative 2 would permanently eliminate the toxicity, mobility, and volumes of contaminants by removing most of the contaminated soil/fill (an estimated total of 75,000 cubic yards of soil, fill and rock are anticipated to be removed) are present on the Site. Any remaining soil/fill beneath the new building would meet Track 4 Site-Specific SCOs to the extent practicable and would be handled as residual contamination addressed via the composite site cover, vapor barrier, and implementation of the SMP. Alternative 1 would eliminate a greater total mass of contaminants on Site due to the additional excavation that would be required under this alternative.

3.2.5 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 proposed remedial action under both alternatives is feasible and implementable and uses reliable methods and standard construction technologies. Standard construction equipment utilized for the overall earthwork would be used. The techniques, materials and equipment to implement the work are readily available and have been proven effective in remediating and/or mitigating the contaminants associated with the Site. Personnel with OSHA-required training would complete all activities that include excavation and handling of petroleum-contaminated or other soils with contamination beyond that associated with typical historical fill material.

The reliability of Alternative 2 is higher than that for Alternative 1 and Alternative 2 would have less likelihood of difficulties associated with the activities proposed.

3.2.6 Cost Effectiveness

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

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

Although Alternative 1 would eliminate potential costs for investigation or remediation by future landowners or lessees, it would not be cost effective to remove all historic fill and other contaminated soil that exceeds the Unrestricted Use Track 1 SCOs during redevelopment due to the need to maintain structural stability of a deep excavation adjacent to existing sidewalks, streets and structures with the increased depth. Alternative 1 would also require additional measures for groundwater control and dewatering to achieve additional depth of excavation extending up to 50 feet below the water table. Initial costs associated with Alternative 1 would thus be significantly higher than Alternative 2. Long-term costs are anticipated to be significantly higher for Alternative 1 than Alternative 2, even when including costs associated with implementation of a Site Management Plan as part of Alternative 2. In both cases, appropriate public health and environmental protections are achieved.

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

3.2.7 Community Acceptance

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

Based on the overall goals of the remedial program and the proposed Site development, no adverse community opinion is anticipated during the project. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. Any public comments related to environmental remediation will be considered by OER and TFC West 57 GC LLC prior to the approval and execution of the remedial plan. The Citizen Participation Plan for the project is provided in Appendix B.

3.2.8 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 remedial alternatives are appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed redevelopment of the Site is compatible with the existing zoning designation and is consistent with recent development patterns. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs (with residual contamination addressed by Engineering Controls and Institutional Controls), both of which are appropriate for its planned restricted residential use. The Site is surrounded by commercial and residential uses. The proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the Site achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such land into productive reuse. Both alternatives are equally protective of natural resources and cultural resources.

3.2.9 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.

The remedial plan would take into consideration the shortest trucking routes during off-site disposal of fill/soil, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. To the extent practicable, energy saving and energy efficient building materials, appliances, and equipment will be utilized to complete the development. A sustainability statement is provided in Appendix C.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic compounds.
3. Establishment of Site-Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency of one composite sample per 800 to 1,000 (approximate) cubic yards of material to be excavated. A Waste Characterization Report documenting sample procedures, location, analytical results shall be submitted to NYCOER prior to the start of the remedial action.
5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding SCOs. Excavation for development purposes would take place to a depth of approximately 14 to 30 feet below sidewalk grade (accounting for Site topography and elevation changes) and would be below the water table across the entirety of the Site. Three deeper elevator pits will be excavated to greater depths. Approximately 112,000 tons of soil and rock will be excavated and removed from this Site.
7. Installation of a dewatering system for construction purposes which will include groundwater cutoff elements at the perimeter of the Site, to include interlocking sheet piling, tangent piles, and concrete retention piers.
8. Dewatering will be performed via well points or excavated sumps for pumping as needed. Dewatering discharge will include appropriate approvals obtained from New York City Department of Environmental Protection (NYCDEP) for discharges to the combined sewer system, and if needed from NYSDEC. Pre-treatment of groundwater will be performed as needed for the permitted discharge.
9. Removal of underground storage tanks (if encountered during excavation) and closure of petroleum spills, if encountered, in compliance with applicable local, State and

- Federal laws and regulations. Any spill management, if required, will be conducted under the New York State Department of Environmental Conservation (NYSDEC) Spill program authority.
10. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).
 11. Management of excavated materials including temporarily stockpiling and segregating to prevent co-mingling of contaminated material and non-contaminated materials.
 12. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
 13. Collection and analysis of endpoint samples to determine the performance of the remedy with respect to attainment of Site Specific SCOs.
 14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
 15. Installation of a waterproofing/vapor barrier system beneath the building slab and outside foundation sidewalls below grade. The barrier will consist of Grace Preprufe® 300R (46 mils) and 160R (32 mils), or an OER-approved equivalent. Grace Bituthene liquid membrane (or an OER-approved equivalent) will be applied to double formed walls and to seal holes in the membrane and around penetrations.
 16. Construction and maintenance of an engineered composite cover consisting of a minimum 20-inch thick concrete building slab to prevent human exposure to residual soil/fill remaining under the Site.
 17. Implementation of stormwater pollution prevention measures in compliance with applicable laws and regulations.
 18. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
 19. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
 20. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
 21. The property will continue to be registered with an E-Designation by the NYC Department of Buildings. 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 SCOs for this Site are listed in the 6NYCRR Part 375, Table 6.8(b) Restricted Residential Use SCOs as amended by the following Site-Specific SCOs:

<u>Contaminant</u>	<u>Track 4 SCOs</u>
Total SVOCs	250 ppm
Arsenic	24 ppm
Barium	700 ppm
Lead	1,200 ppm
Mercury	2.5 ppm

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

4.2.1 Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill and rock expected to be excavated and disposed off-Site is 75,000 cubic yards. Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

4.2.2 Endpoint Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Fifteen confirmation samples will be collected from the base of the excavation at the locations shown on Figure 6 using the following procedures:

1. For sampling of volatile organics (for sample EP-14 and if additional VOC contamination identified), 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.
2. 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.

Post-remediation endpoint 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 will be grab samples biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all confirmation and end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the RAR. The RAR will provide a data table and map summary of all confirmation and endpoint sample results and will include all data including non-detects and applicable standards and/or guidance values. Endpoint samples will be confirmation samples and will be analyzed for compounds and elements of concern. Soil analyses will only include the trigger compounds established on the Track 4 SCO list using the following analytical methods:

- Volatile organic compounds by EPA Method 8260 (for sample EP-14 and if additional VOC contamination identified);
- Semi-volatile organic compounds (base-neutral fraction only) by EPA Method 8270; and/or
- RCRA list metals by EPA Method 6010/7471.

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.

4.2.3 Quality Assurance/Quality Control

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

One duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters.

Samples will be collected in accordance with the following procedures:

- Record sample observations (e.g., evidence of contamination, PID readings, soil classification) in a field log book.
- Collect an aliquot of soil or groundwater using a dedicated and disposable plastic sample spoon or sample bailer and place in laboratory-supplied sample jars.
- Seal and label the sample jars as described below and place in a chilled cooler.

Decontamination Procedures

To avoid contamination and cross-contamination of samples, only dedicated or disposable sampling equipment may be used to collect these samples. All non-disposable equipment involved in field sampling must be decontaminated before

being brought to the sampling location, and must be properly decontaminated after use.

Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric or alpha-alpha code. For endpoint soil samples, the alpha prefix will be “EP” followed by numbers as indicated on Figure 6.

For stockpiled soil, if samples are necessary, the alpha prefix will be “SP” and the numbers following the alpha prefix will correspond to excavated stockpiles, beginning with “1, 2, 3...etc.” For example, the first sample collected from the first stockpile will be labeled “SP-1-1” and the first sample collected from the second stockpile will be labeled “SP-2-1.”

Sample Labeling and Shipping

All sample containers will be labeled with the following information:

- Site identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler’s initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. Soil samples will be shipped to the laboratory at a frequency that will not result in an exceedance of applicable holding times for sample methods. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment by placing each sample jar in a sealable plastic bag, then wrapping each bag in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a chain-of-custody seal to ensure that the coolers remain sealed during delivery.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on chain-of-custody forms. The chain-of-custody forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in

sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

Documentation

A sample log book will be maintained. The following information, as a minimum will be recorded to the log

- Sample identification number
- Sample location
- Field observations
- Sample type
- Analyses
- Date/time of collection
- Collector's name
- Sample procedures and equipment utilized
- Date sent to laboratory/name of laboratory
- Copies of site drawings indicating stockpile numbers and locations

4.2.4 Import and Reuse of Soils

Import of soils onto the property and reuse of soils already on-Site will be performed in conformance with the Soil/Materials Management Plan in Appendix D. The current redevelopment plans include importing gravel for a subbase layer beneath the waterproofing. Assuming 6 inches of gravel across the entire footprint of the building, up to 1,500 cubic yards of gravel may be imported. In addition, smaller volumes of gravel or recycled concrete aggregate will be brought to the Site for construction of a stabilized construction entrance or roads/ramps during construction. Reuse of on-Site soil may be considered on a limited basis; however, large quantities of reuse are not currently anticipated.

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:

- Composite cover system
- Waterproofing/vapor barrier system

4.3.1 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 composed of a concrete building slab of at least 20-inch thickness with large portions of the

site up to 24 inches and 26 inches thick. The concrete building slab will be underlain by a vapor barrier as discussed in Section 4.3.2.

Foundation Drawings FO-010 to FO-027 in Appendix A show the typical design for each slab variation on this Site. The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

4.3.2 Vapor Barrier

Migration of soil vapor will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will be installed beneath the new building slabs and outside of below-grade foundation sidewalls. The barrier will consist of Grace Preprufe[®] 300R (46 mils) and 160R (32 mils), or an OER-approved equivalent. Grace Bituthene liquid membrane (or an OER-approved equivalent) will be applied to double formed walls and to seal holes in the membrane and around penetrations. The vapor barrier would mitigate subsurface vapors from entering the building and also serve as additional waterproofing. The barrier will be installed in accordance with the manufacturer's specifications, including those for sealing penetrations. Proof of installation will be included in the Professional Engineer (P.E.)-certified Remedial Action Report discussed in Section 6.0. The waterproofing/vapor barrier design details are shown on Drawings FO-010 to FO-027 in Appendix A and specifications are provided in Appendix E.

At a minimum, field quality control of the integrity of the vapor barrier installation will include:

- The sealing of all penetrations per the manufacturer's specifications to ensure a single membrane layer;
- Notifying the manufacturer or third-party certifying inspector of the waterproofing installation in sufficient time to allow for inspection of substrates and membranes; and
- Sufficient site visits by the membrane manufacturer or third-party certifying inspector to provide certification of proper installation.

The vapor barrier specifications and a letter from the manufacturer certifying the Grace product's resistance to contaminants are provided in Appendix E. Appendix E also includes a technical letter from Grace noting that test studies indicate that the vapor barrier material is resistant to the site contaminant types and concentrations. The sub-slab vapor barrier would be further protected from direct contact with contaminants in groundwater by the installation of a subbase layer of gravel beneath it.

The vapor barrier system is a permanent engineering control for the Site. The Remedial Action Report will include photographs of the installation process, PE/RA certified letter (on company letterhead) from the contractor responsible for installation oversight and field inspections, and a copy of the manufacturer's certificate of warranty.

4.4 Institutional Controls

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

Institutional Controls for this remedial action are:

- The property will continue to be registered with an E-Designation at the NYC Department of Buildings. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP.
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determined by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials.
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use.
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP.
- The Site will be used for residential use and will not be used for a higher level of use without prior approval by OER.

4.5 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP.

The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. 606 West 57 LLC is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

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

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

4.6 Qualitative Human Health Exposure Assessment

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

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

4.6.1 Known and Potential Sources

A Phase I Environmental Site Assessment (ESA), a Remedial Investigation, and petroleum spill investigation and remediation have been performed at the Site to identify the following Areas of Concern (AOCs):

- Suspect and observed on-Site petroleum and solvent usage, including the presence of ASTs, USTs, drums, hydraulic lifts, hydraulic elevators, and an oil/water separator;
- Past and present Site uses including automotive repair,
- In addition to the identified aboveground and underground storage tanks, petroleum products and solvents were stored throughout the Site in drums and other containers. Some oil staining was visible on the concrete floors of the buildings; and

- Electrical panels, hydraulic fluid containers, abandoned hydraulic lifts, hydraulic elevators, and a transformer, which might contain polychlorinated biphenyls (PCBs).

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

Soil

- VOCs: 1,2,4-trimethylbenzene exceeded the Restricted Residential Use SCO;
- SVOCs: including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded Restricted Residential SCOs; and
- Metals including arsenic, barium, cadmium, copper, lead, mercury, and zinc exceeding Restricted Residential Use SCOs.

Groundwater

- VOCs: 1,2,4-trimethylbenzene, benzene, isopropylbenzene, m/p xylene, naphthalene, n-propylbenzene, o-xylene, sec-butylbenzene, and toluene exceeded the NYSDEC Class GA Groundwater Quality Standards;
- SVOCs: Several PAH-related SVOCs exceeded their Class GA Groundwater Quality Standards, and
- Metals: arsenic, manganese, sodium, and selenium exceeded the NYSDEC Class GA Groundwater Quality Standards.

Soil Vapor

- The chlorinated VOC PCE was detected in one soil vapor sample with a concentration slightly above the NYSDOH Air Guideline Value (AGV) for indoor air.
- VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, cyclohexane, heptane, hexane, and 2,2,4-trimethylpentane] were also detected.

4.6.2 Nature, Extent, Fate and Transport of Contaminants

The Site is underlain by approximately 5 to 20 feet of urban fill. VOCs, SVOCs, and metals are present at varying depths within the historic fill throughout the Site. These contaminants are largely constituents of the historic fill material that was used to fill the land for development purposes. No distinct plumes or clusters of contamination were identified however some concentrations (including VOCs, and some of the SVOCs) may be attributed to the past industrial and automotive uses on the Site and vicinity. Elevated contaminant concentrations in the on-Site soil do not appear to be migrating significantly off-site via groundwater. Arsenic was detected in groundwater slightly exceeding its Class GA Groundwater Quality Standard. Arsenic was also detected in soils.

Petroleum and solvent-related VOCs were also detected in the soil vapor, which may be attributed to a combination of on-Site and/or off-Site sources. These VOCs were not detected at significant concentrations in site soil or groundwater.

4.6.3 Potential Routes of Exposure

The five elements of an exposure pathway include: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be ruled out. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

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

These routes of exposure are possible before, during and after the remedial action if proper precautions are not taken. The remedial plan outlined in this RAWP will ensure that routes of exposure are prevented during the development of the Site.

4.6.4 Evaluation for Human Health Exposure

Current Conditions: The potential for exposure to surficial historic fill does not exist under current conditions because Site is covered with asphalt and the soil is not exposed. Groundwater is marginally contaminated but is not exposed at the Site, and because the Site is served by the public water supply and groundwater use for potable supply is prohibited, groundwater is not used at the Site and there is no potential for exposure.

Construction/Remediation Activities: Once redevelopment activities begin, construction workers will come into direct contact with surface and subsurface soils and groundwater, as a result of on-Site construction and excavation activities. The work performed at the Site will include excavation of soil/fill material, dewatering, and general construction activities and will affect the on-Site construction/remediation workers and potentially the off-site local population. The construction and remediation work at the Site could expose the on-Site workers to the contaminants in a variety of ways, including direct contact with the soil and possibly groundwater (during dewatering) and inhalation/ingestion of soil (by means of fugitive dust), groundwater, and soil vapor. These exposures will be limited to short durations through the intrusive work. The construction and remediation work at the Site may expose the off-site community to the contaminants in a variety of ways, including inhalation of soil (by means of fugitive dust) and soil vapors. 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: Upon the completion of remediation and construction activities, there will be no exposures because contaminants exceeding Track 4 (Site-specific) SCOs will be removed from the Site and/or covered by an engineered composite cover and vapor barrier as part of development, and an SMP will address long-term management of residual contamination. The Site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and a vapor barrier system will prevent any exposure to potential off-site soil vapors in the future. The Site is served by a public water supply, and groundwater is not used at the Site for potable supply. There are no plausible off-site pathways for ingestion, inhalation, or dermal exposure to contaminants derived from the Site under future conditions.

4.6.5 Receptor Populations

On-Site Receptors: The receptors identified under current conditions include on-Site workers and visitors. During redevelopment of the Site, the on-Site potential receptors will include construction workers, Site representatives, and visitors. Once the Site is redeveloped, the on-Site potential sensitive receptors will include on-Site residents, workers and visitors.

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

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians and Trespassers – existing and future

4.6.6 Overall Human Health Exposure Assessment

Complete on-Site exposure pathways appear to be present only during the current unremediated phase. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the Site is developed. This assessment takes into consideration the reasonably anticipated use of the Site, which includes a residential structure, site-wide impervious surface cover cap, subsurface waterproofing/vapor barrier system for the building and a ventilated garage at the bottom level of the proposed building. In the event that a Track 1 cleanup cannot be achieved, the waterproofing system would be an engineering control and serve as a vapor barrier to prevent potential vapor intrusion from off-site sources. 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.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include:

Marc Godick AKRF Principal and Qualified Environmental Professional

Kate Brunner AKRF Project Manager

Robert Panczer AKRF Field Team Leader and Environmental Site Safety Officer

The Professional Engineer (PE) for this project is Michelle Lapin (New York State Professional Engineer #073934-1).

5.2 Site Security

Site access will be controlled by construction fencing with gated entrances to the fenced Site. Barriers will be installed as needed to delineate and restrict access to the work areas. If there are any work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

5.3 Work Hours

The hours for operation of remedial construction will conform to the NYCDOB construction code requirements or according to specific variances issued by NYCDOB.

5.4 Construction Health and Safety Plan

The Health and Safety Plan is included in Appendix F. The environmental Site Safety Officer (SSO) is expected to be Robert Panczer. 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 Hazardous Waste Operations and Emergency Response (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 with potential contact with gross contamination or hazardous waste will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

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

An emergency contact sheet with names and phone numbers is included in the HASP. That document defines 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 community air 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. During general excavation, continuous air monitoring will be performed through the use of two fixed stations to be deployed during work hours at upwind and downwind locations to be established based on site activities and wind direction.

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

5.5.1 VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during major 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.

5.5.2 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at two fixed 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 ($\mu\text{g}/\text{m}^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \mu\text{g}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \mu\text{g}/\text{m}^3$ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \mu\text{g}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

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

5.6 Agency Approvals

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

5.7 Site Preparation

5.7.1 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.

5.7.2 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each 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.

5.7.3 Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the 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.

5.7.4 Dewatering

Dewatering required for the future development activities will be performed via well points or excavated sumps for pumping as needed. The perimeter of the Site will include groundwater cutoff elements including interlocking sheet piling, tangent piles, and concrete retention piers. Dewatering discharge will include appropriate approvals obtained from NYC DEP for discharges to the combined sewer system, and if needed from NYS DEC. Pre-treatment of groundwater will be performed as needed for the permitted discharge.

5.7.5 Equipment and Material Staging

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

5.7.6 Stabilized Construction Entrance

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

5.7.7 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 potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

5.7.8 Extreme Storm Preparedness and Response Contingency Plan

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

5.7.9 Storm Preparedness

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

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

5.7.11 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 relocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of on-Site or off-Site exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; and 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 expected to be to the south on Eleventh Avenue towards the Lincoln Tunnel for trucks destined for New Jersey or other westward locations. The truck route is subject to change depending on destination, available truck routes at the time of the work, and allowable truck routes for the type of load.

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

5.10.1 Daily Reports

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

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any; and
- Photographs 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.

An alpha-numeric site map will be used to identify locations described in reports submitted to OER and is shown on Figure 4.

5.10.2 Record Keeping and Photo-Documentation

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

5.11 Complaint Management

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

5.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

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

6.0 REMEDIAL ACTION REPORT

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

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabulated summary of all endpoint sampling results and all material characterization results, QA/QC results for endpoint sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material;
- Account of the origin and required chemical quality testing for material imported onto the Site;
- Continue registration of the property with an E-Designation by the NYC Department of Buildings; and
- Reports and supporting material will be submitted in digital form.

6.1 Remedial Action Report Certification

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

I, _____, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for 606 West 57th Street, New York, NY, OER Site Number 14EHAN423M.

I, _____, am a Qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for for 606 West 57th Street, New York, NY, OER Site Number 14EHAN423M. (Optional)

I certify that the OER-approved Remedial Action Work Plan dated October 2014 was implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

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 16 to 18 month remediation period is anticipated.

Schedule Milestone	Weeks from RAWP Approval	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet announcing start of remedy	0	-
Mobilization	12	2
Remedial Excavation, Foundations and Site Capping	14	52 to 60
Submit Remedial Action Report	74 to 82	-

FIGURES



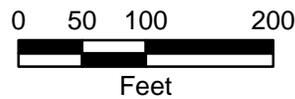
Note:
Former site lot numbers shown for reference.
Size lots 31, 40, 44, and 55 were merged in 2014 to lot 31.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Aerial Date: World Imagery Dec 2012

Legend

 Project Site



606 West 57th Street
New York, New York

SITE PLAN

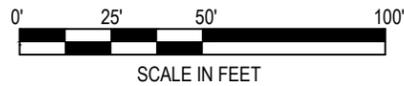
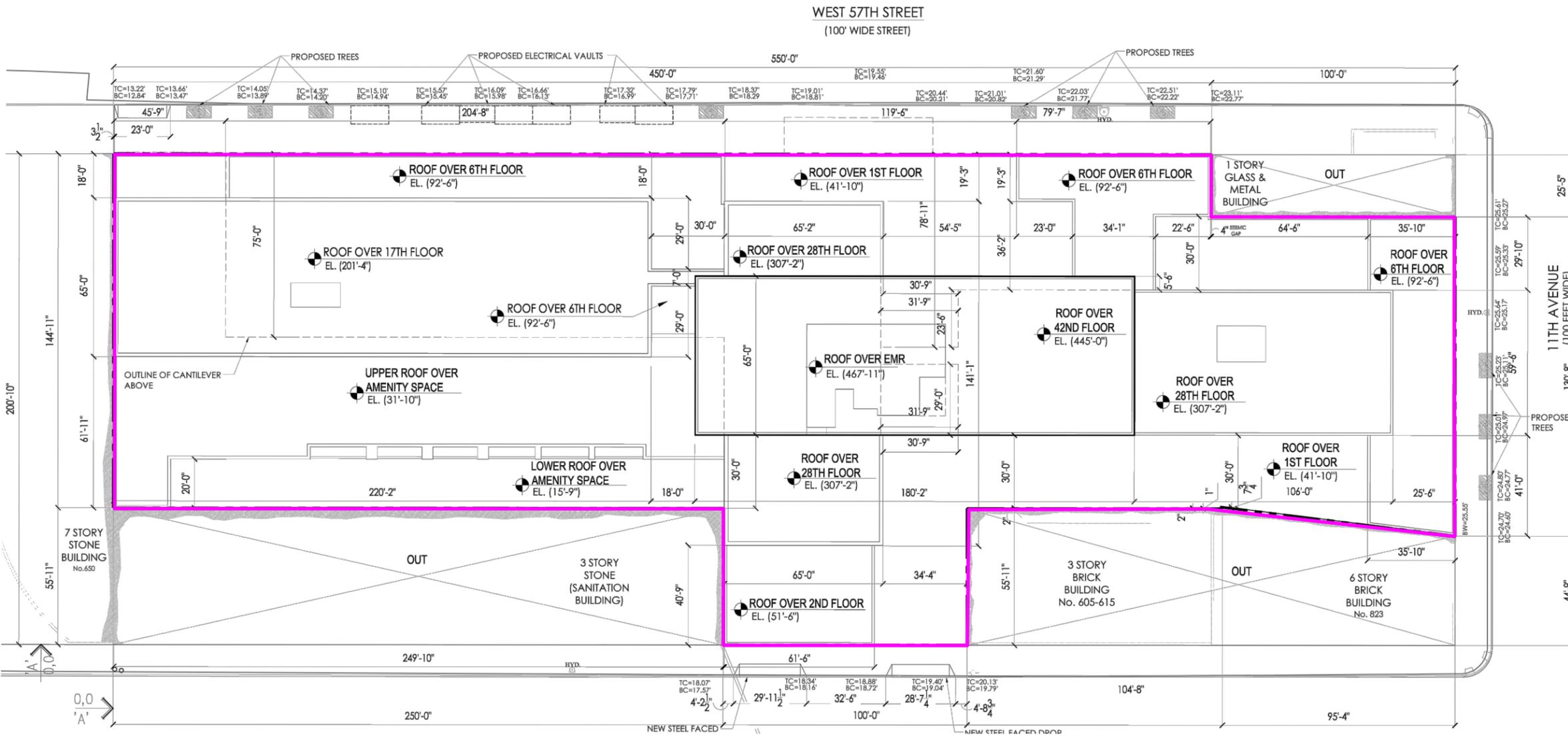


Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

DATE
9/25/2014

PROJECT No.
11402

FIGURE
2



LEGEND:

— PROJECT SITE BOUNDARY

Notes:

1. Basemap Source - Drawing Z-001.00, ZONING CALCULATION, NOTES, SITE PLAN Prepared by SLCE Architects, LLP. 1359 Broadway New York, New York
2. Reference drawings are scaled to best fit current property conditions.



Environmental Consultants
440 Park Avenue South, New York, NY 10016

606 W. 57th STREET
New York, New York

PLANNED DEVELOPMENT

DATE
9.25.2014

PROJECT NO.
11402

SCALE
as shown

FIGURE
3

**WEST 57TH STREET
(PUBLIC STREET) (100 FEET WIDE)
(ASPHALT PAVED)**



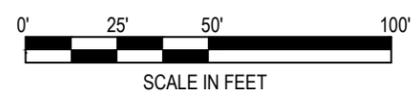
**11TH AVENUE
(PUBLIC STREET) (100 FEET WIDE)
(ASPHALT PAVED)**

Elevation +2 feet

LEGEND:

- APPROXIMATE BOTTOM OF PILE CAPS**
- ELEVATION -7 FEET
 - ELEVATION -11 TO -12 FEET
 - ELEVATION -16 FEET
 - ELEVATION -18 to -26 FEET (ELEVATOR PITS)
 - PROJECT SITE BOUNDARY

- Notes:
- Basemap source - Fehringer Surveying, P.C. - Surveyed: March 27, 2013, Revised August 15, 2014.
 - Surveying reference drawings are scaled to best fit current property conditions.
 - Elevation references are North American Vertical Datum of 1988 (NAVD 88).
 - "WC" References are grid cells established for waste characterization sampling.



Environmental Consultants
440 Park Avenue South, New York, NY 10016

606 W. 57th STREET
New York, New York

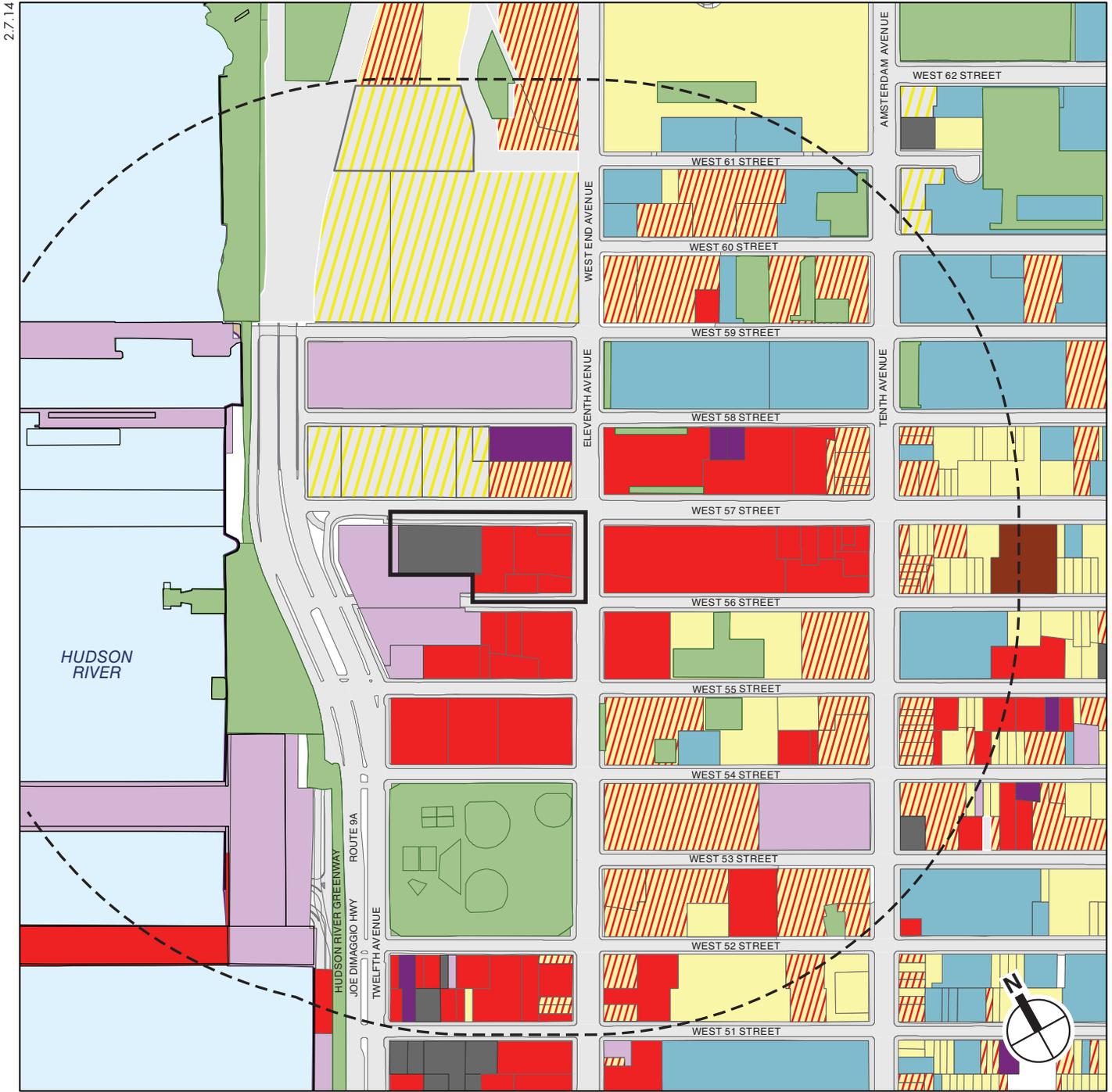
PROPOSED EXCAVATION PLAN

DATE
9.25.2014

PROJECT NO.
11402

SCALE
as shown

FIGURE
4



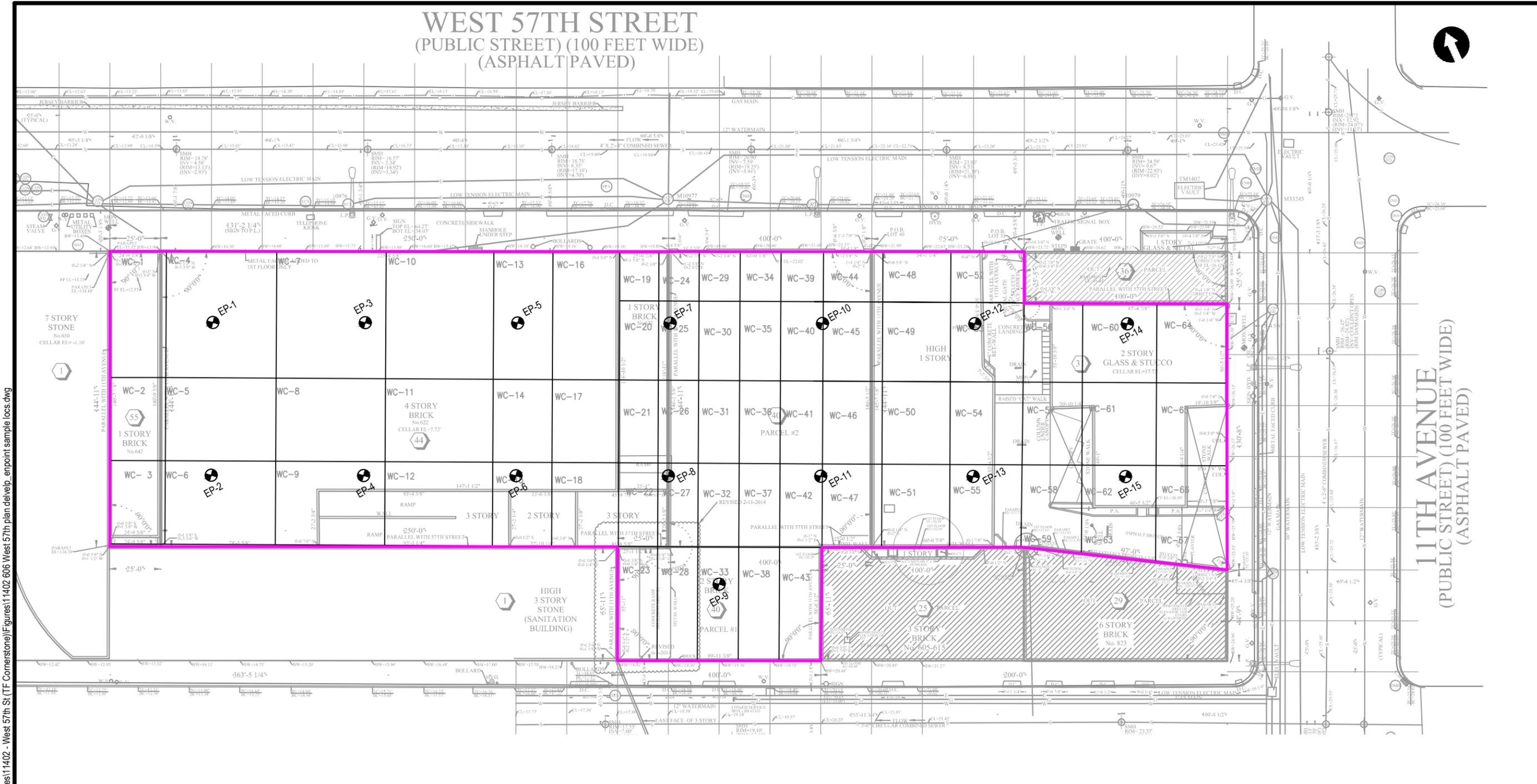
- Rezoning Area
- Study Area Boundary (1/4-Mile Perimeter)
- Residential
- Residential with Commercial Below
- Hotels
- Commercial and Office Buildings
- Industrial and Manufacturing
- Transportation and Utility

- Public Facilities and Institutions
- Open Space and Outdoor Recreation
- Parking Facilities
- Vacant Land
- Vacant Building
- Under Construction



Existing Land Use
Figure 5

**WEST 57TH STREET
(PUBLIC STREET) (100 FEET WIDE)
(ASPHALT PAVED)**



**11TH AVENUE
(PUBLIC STREET) (100 FEET WIDE)
(ASPHALT PAVED)**

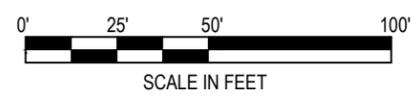
©2014 AKRF, Inc. Environmental Consultants M:\AKRF Project Files\11402 - West 57th St (TF Cornerstone)\Figures\11402_606 West 57th plan develop_epoint sample locs.dwg

Notes:

1. Basemap source - Fehringer Surveying, P.C. - Surveyed: March 27, 2013, Revised August 15, 2014.
2. Surveying reference drawings are scaled to best fit current property conditions

LEGEND:

- PROJECT SITE BOUNDARY
- ENDPOINT SAMPLE LOCATION



Environmental Consultants
440 Park Avenue South, New York, NY 10016

606 W. 57th STREET
New York, New York

ENDPOINT SAMPLE LOCATIONS

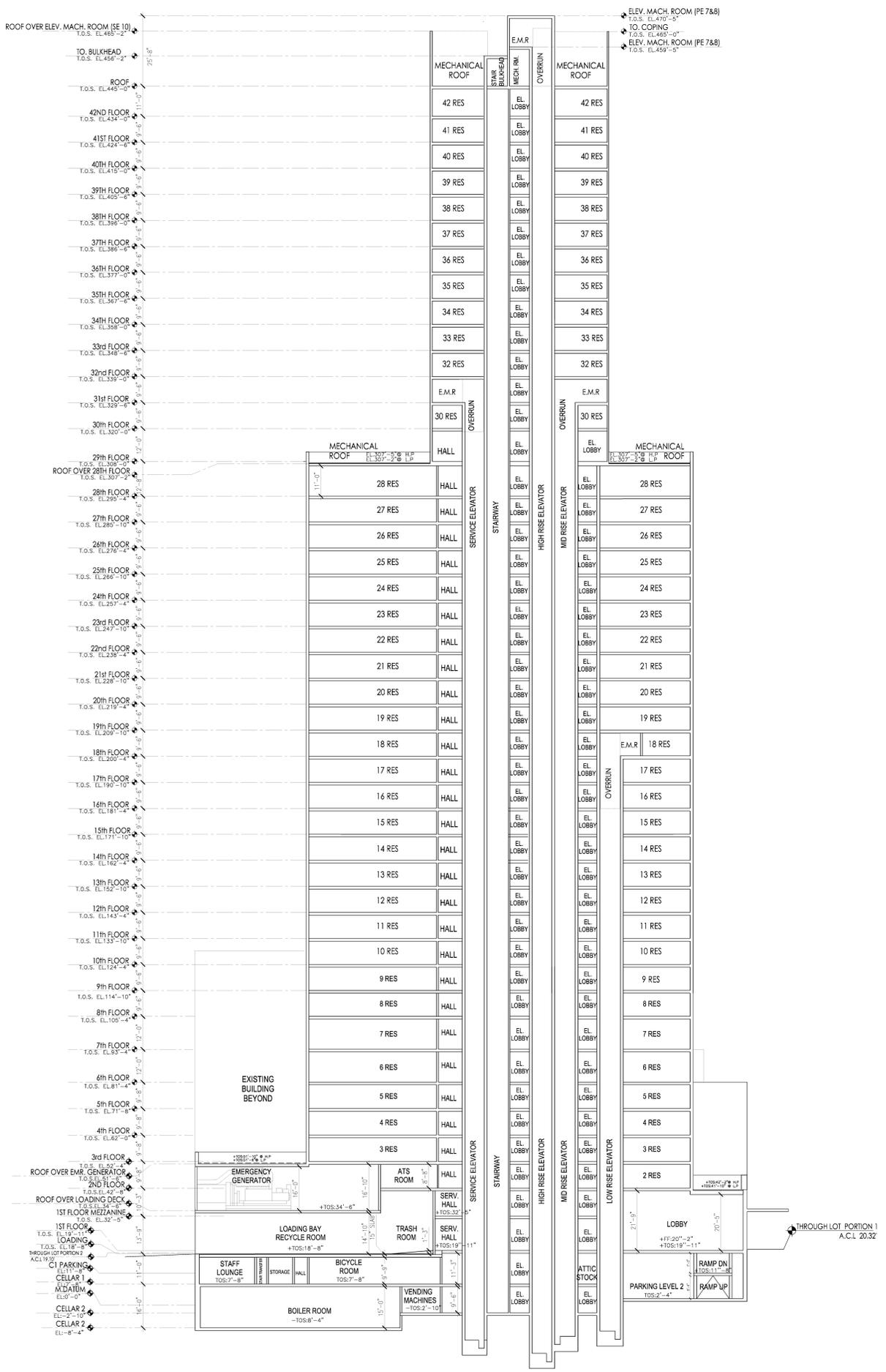
DATE
9.23.2014

PROJECT NO.
11402

SCALE
as shown

FIGURE
6

APPENDIX A
PROPOSED DEVELOPMENT PLANS



1 NORTH-SOUTH BUILDING SECTION LOOKING WEST
SCALE: 0 8 16 32



2 EAST-WEST BUILDING SECTION LOOKING NORTH

PROJECT:
606 WEST 57TH STREET
RESIDENTIAL / MIXED USE DEVELOPMENT
WEST 57th STREET & 11th AVENUE
NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57 LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000

ARCHITECT:
SLCEArchitects, LLP
1359 BROADWAY
NEW YORK, NY 10018
TEL: (212) 979-8400
FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
100 FIFTH AVENUE
NEW YORK, NY 10011
TEL: (212) 254-2700
FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN
CONSULTING ENGINEERS, P.C.
485 7TH AVENUE, SUITE 1510
NEW YORK, NY 10018
TEL: (212) 564-2424
FAX: (212) 564-6678
M.E.P.P.F. ENGINEER:

I.M. ROBBINS, P.C.
15 WEST 44TH STREET
NEW YORK, NY 10036
TEL: (212) 944-5564
FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN
LANDSCAPE ARCHITECTS, P.C.
120 BROADWAY SUITE 1040
NEW YORK, NY 10027
TEL: (212) 431-3609
FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
5 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 463-0334
FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
512 7th Avenue, 6th Floor
NEW YORK, NY 10018
TEL: (646) 484-3350
FAX: (646) 484-3231

CIVIL ENGINEERING:
The RBA GROUP
27 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 741-8090
FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
100 CHURCH STREET
NEW YORK, NY 10007
TEL: (212) 385-1818
FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
RIVE CUNHA ROAD
AVON, CONNECTICUT 06001
TEL: (800) 897-4051
FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
360 PARK AVENUE SOUTH
NEW YORK, NY 10010
TEL: (212) 689-5389
FAX: (212) 689-6449

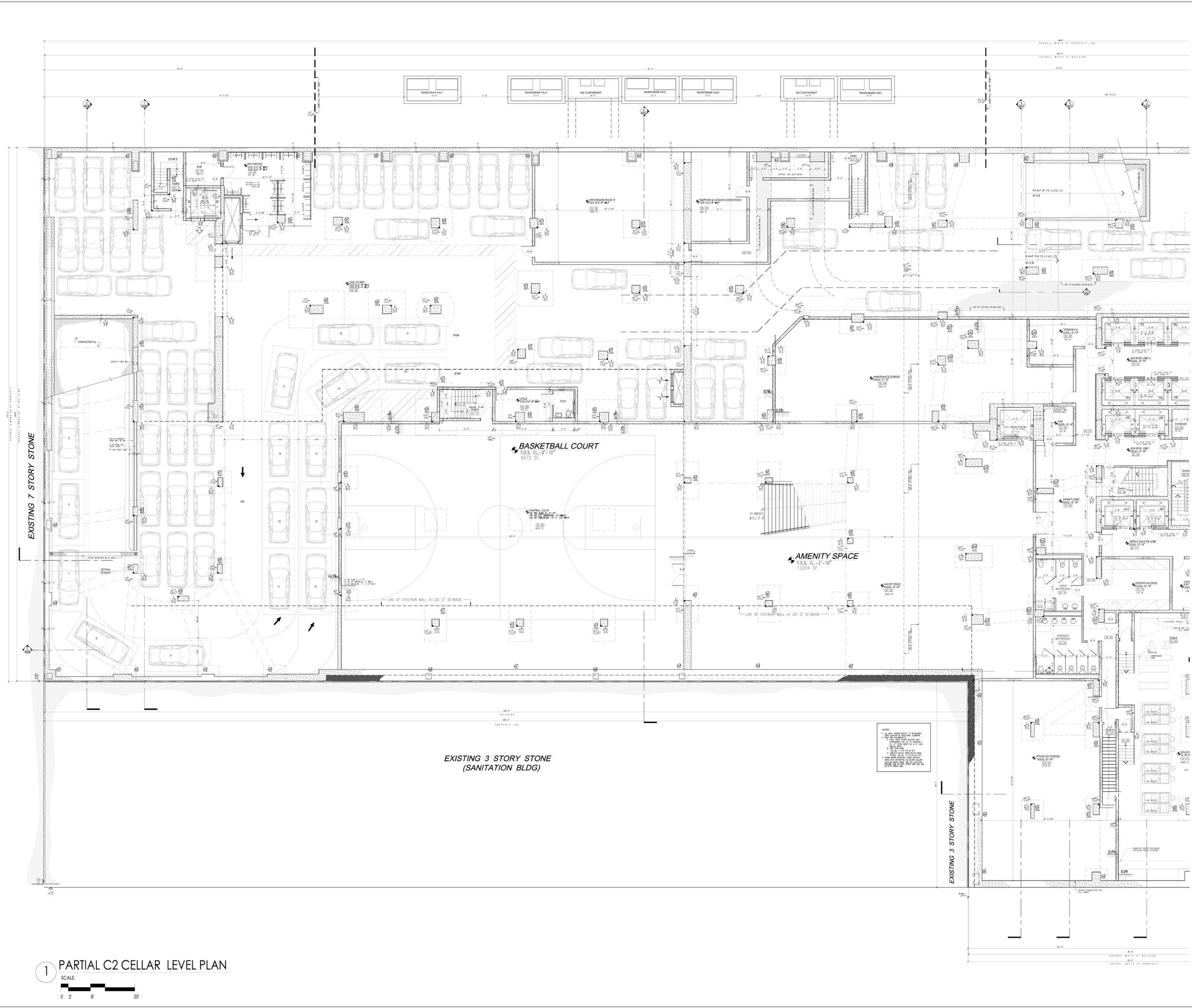
LIGHTING DESIGNER:
BLISS FASMAN INC.
23 LEONARD STREET
NEW YORK, NY 10013
TEL: (212) 343-8400
FAX: (212) 343-8146

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
417 88th AVENUE
NEW YORK, NY 10016
TEL: (212) 725-6800
FAX: (212) 725-0844

ENVIRONMENTAL CONSULTANT:
AKRF INC.
440 PARK AVENUE SOUTH
NEW YORK, NY 10016
TEL: (212) 696-0670
FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000
FAX: (212) 901-8114

10/21/2014 D.O.B. SUBMISSION
02/27/2014 DESIGN DEVELOPMENT SET
No. DATE REVISION
D.O.B. NUMBER
NB#
SCALE: 0 8 16 32
KEY PLAN: WEST 57th STREET, WEST 56th STREET, WEST 58th STREET, 11th AVENUE, 10th AVENUE
DRAWING TITLE: BUILDING SECTION
SEAL & SIGNATURE: DATE: 02-17-14
PROJECT No.: 2012-26
DRAWN BY: JP
CHECKED BY: RL
DATE: 02-17-14
SHEET No.: 006 OF 156
FILE No.: 01996-0710.dwg (6/2012) 2014.dwg (plan design development)



EXISTING 7 STORY STONE

EXISTING 3 STORY STONE
(SANITATION BLDG)

EXISTING 3 STORY STONE

NOTES
 1. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NYC DEPARTMENT OF BUILDINGS REGULATIONS AND THE LATEST EDITIONS OF THE NYC DEPARTMENT OF ENVIRONMENTAL CONSERVATION REGULATIONS.
 2. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NYC DEPARTMENT OF ENVIRONMENTAL CONSERVATION REGULATIONS.
 3. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NYC DEPARTMENT OF ENVIRONMENTAL CONSERVATION REGULATIONS.
 4. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NYC DEPARTMENT OF ENVIRONMENTAL CONSERVATION REGULATIONS.
 5. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NYC DEPARTMENT OF ENVIRONMENTAL CONSERVATION REGULATIONS.

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57 LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCEArchitects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8400
 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 FIFTH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN CONSULTING ENGINEERS, P.C.
 485 7TH AVENUE, SUITE 1510
 NEW YORK, NY 10013
 TEL: (212) 564-2424
 FAX: (212) 564-6578

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5564
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10271
 TEL: (212) 431-3679
 FAX: (212) 741-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3250
 FAX: (646) 484-3251

CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT:
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 385-1818
 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 RIVE CLERK ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4051
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 88TH AVENUE
 NEW YORK, NY 10016
 TEL: (212) 725-4800
 FAX: (212) 725-0844

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 696-0870
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

07/21/2014 D.O.B. SUBMISSION
 08/27/2014 DESIGN DEVELOPMENT SET
 09/17/2014 DESIGN DEVELOPMENT PROCESS SET

NO. DATE REVISION

DOB NUMBER:
NB#

SCALE: 1" = 8'-0"

KEY PLAN:

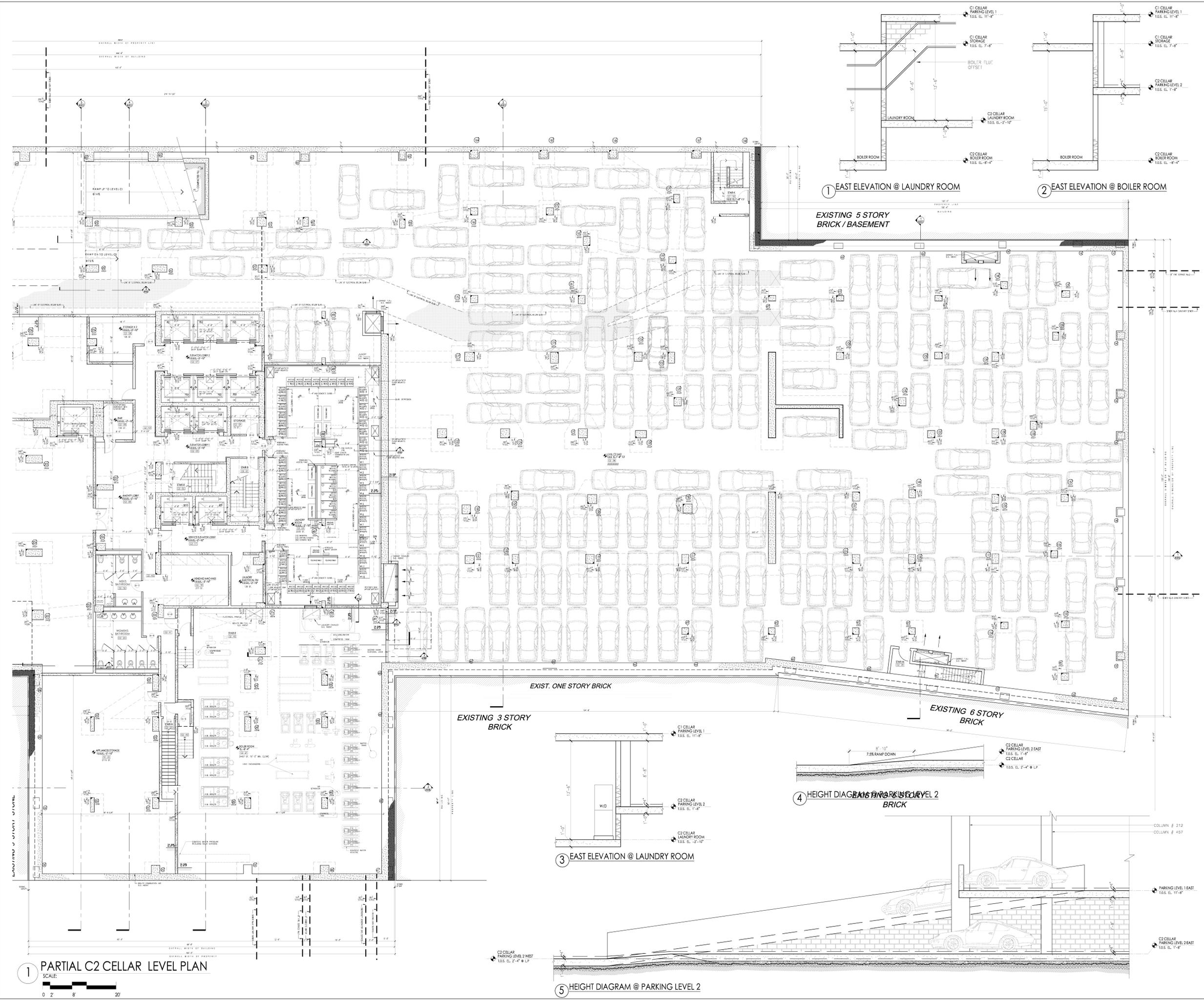
DRAWING TITLE:
PARTIAL C2 CELLAR LEVEL PLAN

SEAL & SIGNATURE: DATE: 02-17-14
 PROJECT NO: 2012-26
 DRAWN BY: JP
 CHECKED BY: RL
 DESIGNED BY: RL

A-102.00

SHEET No: 047 of 156

FILE No: 1096-0718.mxd; 06/2012/2014/c2-plan-level-development



PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57TH STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57 LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCEArchitects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8400
 FAX: (212) 979-8387

ARCHITECTONICA
 100 FIFTH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN
 CONSULTING ENGINEERS, P.C.
 485 7TH AVENUE, SUITE 1510
 NEW YORK, NY 10013
 TEL: (212) 564-2424
 FAX: (212) 564-6678

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5564
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN
 LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10271
 TEL: (212) 431-3609
 FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3350
 FAX: (646) 484-3231

CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 385-1818
 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 RIVE CIBOLA ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4051
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

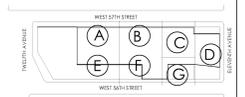
ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 88th AVENUE
 NEW YORK, NY 10016
 TEL: (212) 725-4800
 FAX: (212) 725-0844

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 696-0870
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

07/21/2014 D.O.B. SUBMISSION
 02/27/2014 DESIGN DEVELOPMENT SET
 02/17/2014 DESIGN DEVELOPMENT PROGRESS SET
 No. DATE REVISION

NOB#
 NORTH
 SCALE: 1" = 8'-0"



DRAWING TITLE:
PARTIAL C2 CELLAR LEVEL PLAN

SEAL & SIGNATURE: DATE: 02-17-14
 PROJECT No: 2012-26
 DRAWN BY: JP
 CHECKED BY: RL
 DESIGNED BY: [Signature]
A-103.00

SHEET No: 048 of 156
 FILE No: 10996-0710.mxd 06/2012 2012-26 partial cellar level development

NO.	DATE	REVISION
11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BUY	
11/14/2014	REVISED AS NOTED	
10/20/2014	UPDATED BID SET & REVISED AS NOTED FOR FND.	
09/22/2014	BID SET & REVISED AS NOTED FOR FOUNDATION	
08/27/2014	REVISED AS NOTED	
08/15/2014	ISSUED FOR PERM REVIEW	
08/11/2014	FOR FOUNDATION BID	
07/01/2014	SLAB SUBMISSION	
No.	DATE	REVISION

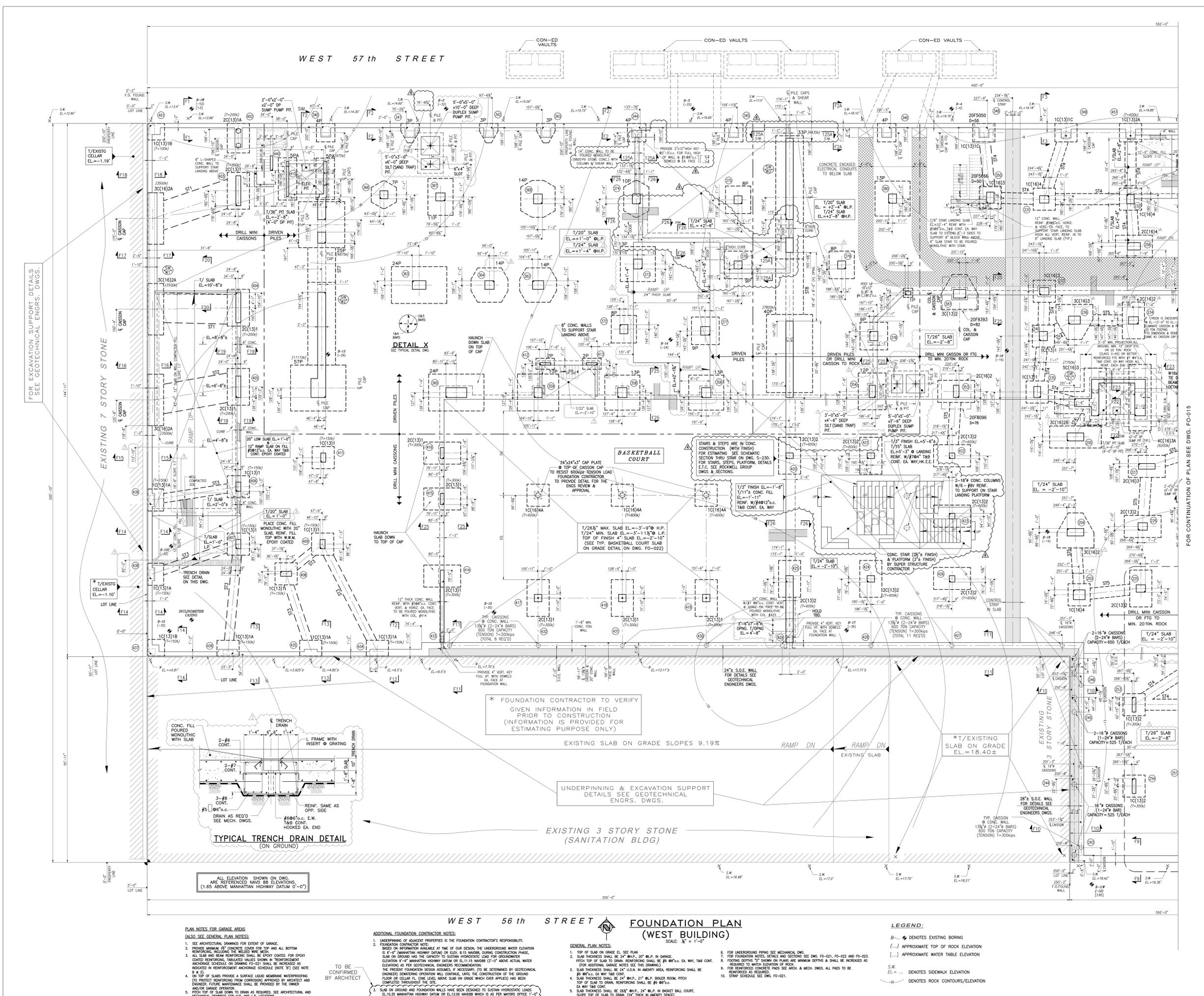
D.B.S. NUMBER:
NB#



DRAWING TITLE:
**FOUNDATION PLAN
(WEST BUILDING
C2 CELLAR LEVEL)**

SEAL & SIGNATURE: DATE: 07/21/2014
PROJECT NO: 2013-26
DRAWN BY: [Signature]
CHECKED BY: [Signature]
DWG. NO: **FO-010.00**

SHEET NO.: 1 OF 58
FILE NO: R7_01-057-FND-Plan.dwg



- PLAN NOTES FOR GARAGE AREAS**
(ALSO SEE GENERAL PLAN NOTES)
- SEE ARCHITECTURAL DRAWINGS FOR EXTENT OF GARAGE.
 - PROVIDE MINIMUM 4\"/>
 - ALL SLAB AND BEAM REINFORCING SHALL BE EPOXY COATED. FOR EPOXY COATED REINFORCING, TABLED VALUES SHOWN IN REINFORCEMENT ANCHORAGE SCHEDULE ON DRAWING FC-01 SHALL BE INCREASED AS INDICATED IN REINFORCEMENT ANCHORAGE SCHEDULE (NOTE 7) (SEE NOTE 8 & 9).
 - ON TOP OF SLABS PROVIDE A SURFACE LOAD MEMBRANE WATERPROOFING TO PREVENT REINFORCING FROM CORROSION APPROVED BY ARCHITECT AND ENGINEER. FUTURE MAINTENANCE SHALL BE PROVIDED BY THE OWNER AND/OR GARAGE OPERATOR.
 - PITCH TOP OF SLAB DOWN TO DRAIN AS REQUIRED. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR H.P. AND U.P. LOCATIONS.
 - PROVIDE FLOOR ADJUST & WATERPROOFING ADAPTURE PER NOTES ON DWG. FC-01.

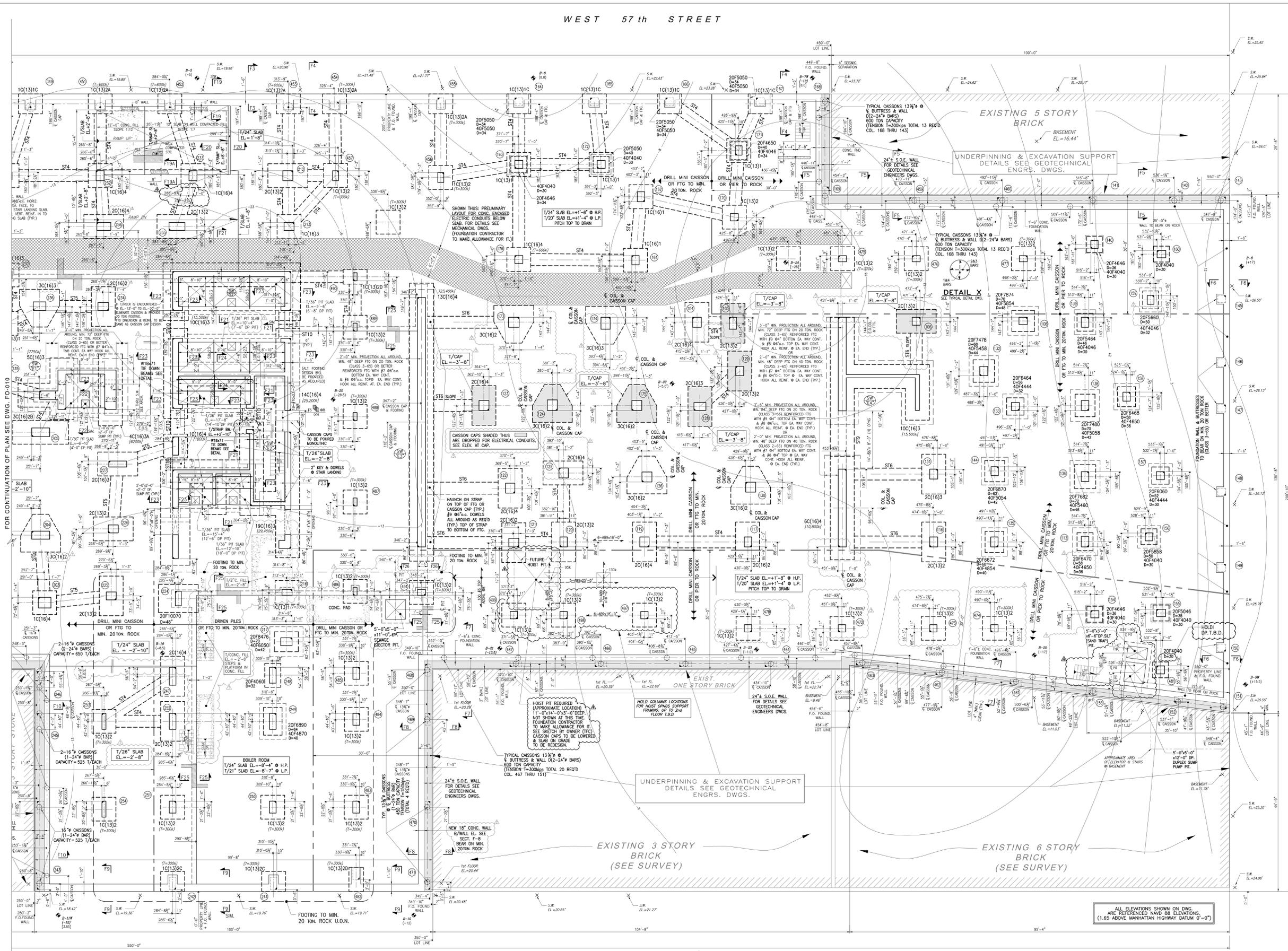
- ADDITIONAL FOUNDATION CONTRACTOR NOTES:**
- UNDERPINNING OF ADJACENT PROPERTIES IS THE FOUNDATION CONTRACTOR'S RESPONSIBILITY.
 - FOUNDATION CONTRACTOR NOTES:
BASED ON INFORMATION AVAILABLE AS TIME OF OUR DESIGN, THE UNDERPINNING WATER ELEVATION IS 6'-0\"/>
 - SLAB THICKNESS SHALL BE 24\"/>
 - SLAB THICKNESS SHALL BE 24\"/>
 - SLAB ON GROUND AND FOUNDATION WALLS HAVE BEEN DESIGNED TO SUSTAIN HORIZONTAL LOADS (E.L. TO 35' MANHATTAN HIGHWAY DATUM OR E.L. TO 30' WHICH IS AS PER MECHANICAL OFFICE 11-07) ABOVE 100 YEAR FLOOD (E.L. TO 35' MANHATTAN HIGHWAY DATUM OR E.L. TO 31'-0\"/>

- GENERAL PLAN NOTES:**
- TOP OF SLAB ON GRADE E.L. PLAN
 - SLAB THICKNESS SHALL BE 24\"/>
 - PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 24\"/>
 - SLAB THICKNESS SHALL BE 24\"/>
 - SLAB THICKNESS SHALL BE 24\"/>
 - FOR UNDERGROUND PIPING SEE MECHANICAL DWGS.
 - FOR FOUNDATION NOTES, DETAILS AND SECTIONS SEE DWG. FO-021, FO-022 AND FO-023.
 - FOOTING DEPTHS 7\"/>
 - FOR REINFORCED CONCRETE PADS SEE ARCH. & MECH. DWGS. ALL PADS TO BE REINFORCED AS REQUIRED.
 - STRAP SCHEDULE SEE DWG. FO-021.

- LEGEND:**
- B-... DENOTES EXISTING BORING
 - (---) APPROXIMATE TOP OF ROCK ELEVATION
 - (---) APPROXIMATE WATER TABLE ELEVATION
 - S.W. ... DENOTES SIDEWALK ELEVATION
 - (---) DENOTES ROCK CONTOURS/ELEVATION

FOR EXCAVATION SUPPORT DETAILS
SEE GEOTECHNICAL ENGRS. DWGS.

FOR CONTINUATION OF PLAN SEE DWG. FO-015



FOR CONTINUATION OF PLAN SEE DWG. FO-010

PROJECT:
606 WEST 57th STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57, LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCEArchitects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-9000
 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 FIFTH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN CONSULTING ENGINEERS, P.C.
 485 SEVENTH AVENUE, SUITE 1510
 NEW YORK, NY 10018
 TEL: (212) 979-8000
 FAX: (212) 944-6478

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 47th STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-5153

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
R2 CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3230
 FAX: (646) 484-3231

GEOTECHNICAL AND CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-6090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10002
 TEL: (212) 360-1818
 FAX: (212) 360-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4051
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 367 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 689-5389
 FAX: (212) 689-4449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10003
 TEL: (212) 343-8400
 FAX: (212) 343-8400

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 FIFTH AVENUE
 NEW YORK, NY 10014
 TEL: (212) 725-6800
 FAX: (212) 725-6864

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 480 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 496-0670
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-9114

REVISIONS:

11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BUY
11/14/2014	REVISED AS NOTED
10/09/2014	UPDATED BID SET & REVISED AS NOTED FOR FND.
09/22/2014	BID SET & REVISED AS NOTED FOR FOUNDATION
08/27/2014	REVISED AS NOTED
08/15/2014	ISSUED FOR PEER REVIEW
08/01/2014	FOR FOUNDATION BID
07/01/2014	SLAB SUBMISSION

DIST. NUMBER:
NB#

SCALE:
 NORTH
 SCALE: 1/8" = 1'-0"

KEY PLAN:

DRAWING TITLE:
FOUNDATION PLAN (EAST BUILDING) (C2 CELLAR LEVEL)

SEAL & SIGNATURE:
 DATE: 07/21/2014
 PROJECT NO: 2013-26
 DRAWN BY:
 CHECKED BY:
 DWG. NO: **FO-015.00**
 SHEET NO: 2 OF 58
 FILE NO: R7_01-051_015-00-Plan.dwg

FOUNDATION PLAN (EAST BUILDING)
SCALE: 1/8" = 1'-0"

- LEGEND:**
- B--- denotes existing boring
 - (---) approximate top of rock elevation
 - (---) approximate water table elevation
 - S.W. denotes sidewalk elevation
 - denotes rock contours/elevation

- PLAN NOTES FOR GARAGE AREAS**
 (ALSO SEE GENERAL PLAN NOTES):
- SEE ARCHITECTURAL DRAWINGS FOR EXIST OF GARAGE.
 - PROVIDE MINIMUM 1" CONCRETE COVER FOR TOP AND ALL BOTTOM REINFORCED CONCRETE.
 - ALL SLAB AND BEAM REINFORCING SHALL BE EPOXY COATED. FOR EPOXY COATED REINFORCING, LABELLED VALUES SHOWN IN REINFORCEMENT ANCHORAGE SCHEDULE ON DRAWING (FO-01) SHALL BE INCREASED AS INDICATED IN REINFORCEMENT ANCHORAGE SCHEDULE (NOTE "B" SEE NOTE B & E).
 - ON TOP OF SLABS PROVIDE A SURFACE LIQUID MEMBRANE WATERPROOFING TO PREVENT REINFORCING FROM CORROSION APPROVED BY ARCHITECT AND ENGINEER. FUTURE MAINTENANCE SHALL BE PROVIDED BY THE OWNER AND/OR CHANGE ORDER.
 - PITCH TOP OF SLAB DOWN TO DRAIN AS REQUIRED. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR S.W. AND L.P. LOCATIONS.
 - PROVIDE FIBER ADDITIVE & WATERPROOFING ADJUSTURE PER NOTES ON DWG. FO-021.

- ADDITIONAL FOUNDATION CONTRACTOR NOTES:**
- UNDERPINNING OF ADJACENT PROPERTIES IS THE FOUNDATION CONTRACTOR'S RESPONSIBILITY.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. IN GARAGE. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY. 18" CONC. FOR ADDITIONAL GARAGE NOTES SEE THIS DRAWING.
 - SLAB THICKNESS SHALL BE 24" U.O.A. IN AMENITY AREA. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. BOILER ROOM. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
- GENERAL PLAN NOTES:**
- TOP OF SLAB ON GRADE EL. SEE PLAN.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. IN GARAGE. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY. 18" CONC. FOR ADDITIONAL GARAGE NOTES SEE THIS DRAWING.
 - SLAB THICKNESS SHALL BE 24" U.O.A. IN AMENITY AREA. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. BOILER ROOM. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.

- PLAN NOTES FOR GARAGE AREAS**
 (ALSO SEE GENERAL PLAN NOTES):
- SEE ARCHITECTURAL DRAWINGS FOR EXIST OF GARAGE.
 - PROVIDE MINIMUM 1" CONCRETE COVER FOR TOP AND ALL BOTTOM REINFORCED CONCRETE.
 - ALL SLAB AND BEAM REINFORCING SHALL BE EPOXY COATED. FOR EPOXY COATED REINFORCING, LABELLED VALUES SHOWN IN REINFORCEMENT ANCHORAGE SCHEDULE ON DRAWING (FO-01) SHALL BE INCREASED AS INDICATED IN REINFORCEMENT ANCHORAGE SCHEDULE (NOTE "B" SEE NOTE B & E).
 - ON TOP OF SLABS PROVIDE A SURFACE LIQUID MEMBRANE WATERPROOFING TO PREVENT REINFORCING FROM CORROSION APPROVED BY ARCHITECT AND ENGINEER. FUTURE MAINTENANCE SHALL BE PROVIDED BY THE OWNER AND/OR CHANGE ORDER.
 - PITCH TOP OF SLAB DOWN TO DRAIN AS REQUIRED. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR S.W. AND L.P. LOCATIONS.
 - PROVIDE FIBER ADDITIVE & WATERPROOFING ADJUSTURE PER NOTES ON DWG. FO-021.

- ADDITIONAL FOUNDATION CONTRACTOR NOTES:**
- UNDERPINNING OF ADJACENT PROPERTIES IS THE FOUNDATION CONTRACTOR'S RESPONSIBILITY.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. IN GARAGE. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY. 18" CONC. FOR ADDITIONAL GARAGE NOTES SEE THIS DRAWING.
 - SLAB THICKNESS SHALL BE 24" U.O.A. IN AMENITY AREA. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. BOILER ROOM. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
- GENERAL PLAN NOTES:**
- TOP OF SLAB ON GRADE EL. SEE PLAN.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. IN GARAGE. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY. 18" CONC. FOR ADDITIONAL GARAGE NOTES SEE THIS DRAWING.
 - SLAB THICKNESS SHALL BE 24" U.O.A. IN AMENITY AREA. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.
 - SLAB THICKNESS SHALL BE 24" @ 11'-0" O.P. BOILER ROOM. PITCH TOP OF SLAB TO DRAIN. REINFORCING SHALL BE #6 @ 18" O.C. EA. WAY TAB CONT.



FOUNDATION NOTES

THIS BUILDING WAS DESIGNED IN ACCORDANCE WITH STRENGTH DESIGN REQUIREMENTS AS PER BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-2002) AS MODIFIED BY THE NEW YORK CITY BUILDING CODE 2009 (THE NYCBC). ALL STANDARDS FOR THE AMERICAN SOCIETY OF TESTING (ASTM) LISTED BELOW ARE REFERENCED TO LATEST EDITION APPROVED BY THE NYC BC. THE BORING INDICATE SEISMIC SITE CLASS C.

- THIS BUILDING WAS DESIGNED TO BEAR ON 40 TON ROCK (CLASS 1B) OR 20 TON ROCK (CLASS 1C), MIN. CAISSON TO MIN. 20" ON ROCK OR PILES (SEE PILE NOTES).
- THE SPECIAL INSPECTION OF CONCRETE (STRUCTURAL CONCRETE) SHALL BE IN ACCORDANCE WITH THE NYCBC. SEE STRUCTURAL CONCRETE NOTES AND NOTE FOR FIBER ADHESIVE ON A DRAWING. CONCRETE FOR WALLS, BUTTRESSES, PIERS, PILE CAPS & STRAPS SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 7000 P.S.I. FOR 48 HOURS.
- ALL SLABS ON GROUND FOOTINGS, FOUNDATION WALLS & BUTTRESSES SHALL BE 7000 P.S.I. STONE CONCRETE AT 56 DAYS. SEE PLAN NOTES FOR REINFORCING AND FINISHES. ALL SLABS ON GROUND PROVIDED WITH CONTINUOUS WATER CURING, NOT LESS THAN FOUR DAYS AFTER POUR. PUMPING OF UNDERGROUND WATER SHALL KEEP AREAS AROUND FOR SLABS ON GROUND DRY FOR THE DURATION OF THE POUR AND 48 HOURS AFTERWARDS. FOUNDATION CONTRACTOR TO REPAIR ALL CRACKS IN CONCRETE SLABS, SEE TYPICAL SLAB AND WATER PROOFING DETAIL.
- ALL REINFORCING BARS SHALL BE DEFORMED BARS WITH STEEL CONFORMING TO A.S.T.M. A-615 GRADE 60. (SEE REINFORCING NOTES ON THIS DRAWING).
- FOUNDATION WALLS:
 - PROVIDE POCKETS AND DOWELS FOR ALL BEAMS FRAMING INTO FOUNDATION WALLS.
 - PROVIDE 2-#5 BARS ALL AROUND OPENINGS IN FOUNDATION WALLS, UNLESS OTHERWISE SHOWN ON PLANS. BARS TO EXTEND 2'-0" ABOVE OPENINGS.
 - NO HORIZONTAL CONSTRUCTION JOINTS ARE PERMITTED IN FOUNDATION WALLS WITHOUT THE EXPRESS CONSENT OF THE ENGINEER. PROVIDE 2-#5 BARS ABOVE EACH JOINT.
 - NO BACK FILL SHALL BE PLACED AGAINST FOUNDATION WALLS, UNLESS SUPPORTING SLABS ARE IN PLACE AND SET OR THE WALLS HAVE BEEN ADEQUATELY BRACED.
 - CONSTRUCTION EQUIPMENT SHALL NOT BE PERMITTED CLOSER THAN 8'-0" FROM WALL UNLESS OTHERWISE SHOWN IN DETAIL OR PERMISSION FROM THE ENGINEER OF RECORD HAS BEEN GRANTED.
 - ALL HORIZONTAL REINFORCING IN WALLS & GRADE BEAMS TO BE SPLICED AND LAPPED AT CORNERS UNLESS OTHERWISE SHOWN IN DETAIL.
 - FOUNDATION CONTRACTOR TO REPAIR ALL CRACKS IN CONCRETE WALLS.
 - REINFORCING DETAIL DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW BEFORE WORK MAY PROCEED.
 - A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NY HIRED BY THE FOUNDATION CONTRACTOR SHALL PREPARE SCHEDULED DETAIL DRAWINGS SHOWING ANY NECESSARY UNDERPINNING, BRACING AND SHEETING OR OTHER CONSTRUCTION REQUIRED FOR THE SUPPORT OF ADJACENT PROPERTIES OR BUILDINGS. NO WORK SHALL BE DONE WITHOUT THE DRAWINGS AND APPROVAL BY THE ENGINEER OF RECORD. THE ENGINEER OF RECORD SHALL VERIFY DIMENSIONS AND LOCATIONS OF ALL OPENINGS, PIPE SLEEVES, ANCHOR BOLTS, ETC. AS REQUIRED BY ALL TRADES BEFORE CONCRETE IS POURED.

NOTE: FIBER ADHESIVE:
 ALL CONCRETE FOR SLAB ON GROUND AND FOUNDATION WALLS SHALL HAVE FIBER MESH FIBERS ADDED TO THE CONCRETE MIX. ONE AND HALF POUNDS OF FIBER MESH FIBERS SHALL BE ADDED FOR EVERY CUBIC YARD OF CONCRETE AS PER MANUFACTURER'S RECOMMENDATIONS. FIBER MESH SHALL BE POLYPROPYLENE FIBERLINED FIBERS 1/2" LONG, SUPER-NET, MANUFACTURED BY FORTEA OR EQUAL. DO NOT INCREASE QUANTITY OF WATER IN EXCESS OF THAT ESTABLISHED BY DESIGN MIX. IF FLOCCING OR SLUMP OCCURS BECAUSE OF THE USE OF FIBER MESH, AD SUPERPLASTICIZER IN ACCORDANCE WITH TESTING LABORATORIES INSTRUCTIONS.

WATERPROOFING ADJUSTIVE:
 1. CONCRETE FOR SLABS ON GROUND AND FOUNDATION WALLS SHALL CONTAIN WATERPROOFING ADMIXTURE PER CUBIC YARD OF CONCRETE AS RECOMMENDED BY MANUFACTURER.
 2. WATERPROOFING ADMIXTURE SUBJECT TO APPROVAL BY THE ENGINEER.
 3. WHERE CALLED FOR BY THE CONCRETE DESIGN REINFORCING CHART, CONTRACTOR SHALL PROVIDE WATERPROOFING ADMIXTURE TO BE SUBJECT TO ENGINEER'S APPROVAL.

STRUCTURAL CONCRETE NOTES:
 1. CONCRETE MIXES SHALL CONFORM TO THE NYC BUILDING CODE SECTION 1804.1. UNLESS OTHERWISE SPECIFIED, THE BASIS OF FIELD EXPERIENCE OR TESTS.
 2. NO CONCRETE SHALL BE PLACED UNTIL A PROFESSIONAL ENGINEER RETAINED BY THE OWNER AND APPROVED BY THE ENGINEER OF RECORD HAS FILED AN AMENDMENT WITH THE BUILDING DEPARTMENT CERTIFYING THAT THIS PROFESSIONAL ENGINEER ASSUMES THE RESPONSIBILITY FOR THE INSPECTION OF CONCRETE WORK IN ACCORDANCE WITH SECTION 1804.1 OF THE NEW YORK CITY BUILDING CODE.
 3. COMPRESSION TEST SAMPLES SHALL BE TAKEN FROM THE MIXER IN ACCORDANCE WITH A.S.T.M. C172, CURED IN ACCORDANCE WITH A.S.T.M. C-31 AND TESTED AT THE AGE NOTED BELOW IN ACCORDANCE WITH A.S.T.M. C-39. REQUIRED NUMBER OF "STRENGTH TEST" (SEE BELOW) SHALL BE MOULDED FOR EACH 50 CUBIC YARDS OR FRACTION THEREOF OF EACH CLASS OF CONCRETE PLACED IN ANY ONE DAY.
 4. FOR CONCRETE WITH A REQUIRED STRENGTH LESS THAN 6000 P.S.I., EACH "STRENGTH TEST" SHALL CONSIST OF 3 CYLINDERS. 2 SHALL BE TESTED AT 7 DAYS AND 3 SHALL BE TESTED AT 28 DAYS.
 5. ADDITIONAL CYLINDERS SHALL BE TAKEN FROM BUCKETS, HOPPERS OR FORMS AS DIRECTED BY THE INSPECTING ENGINEER WHEN CONCRETE IS PLACED FROM AN INTERMEDIATE CONVEYOR (BASKET, HOPPER, ETC.). THE CYLINDERS TO BE TAKEN FROM THE SAME BATCH AND CURED AND TESTED IN THE SAME MANNER AS THE SAMPLES TAKEN FROM THE MIXER. THIS ADDITIONAL CYLINDERS SHALL BE THREE FOR EACH 50 CUBIC YARDS OR FRACTION THEREOF OF EACH CLASS OF CONCRETE MIXED IN ANY ONE DAY'S CONCRETING.
 6. EACH CYLINDER SHALL BE SUITABLY IDENTIFIED BY A MARK AND THE AREA WHERE THE CONCRETE IS PLACED SHALL BE RECORDED.
 7. ADDITIONAL FIELD TESTS TO BE CONDUCTED AS REQUESTED BY THE SUPERINTENDENT.
 8. ALL TEST SHALL BE TAKEN IN ACCORDANCE WITH THE LABORATORY IN ACCORDANCE WITH SECTION 1805.6 OF THE NEW YORK CITY BUILDING CODE. TEST RESULTS SHALL BE SUBMITTED PROMPTLY TO THE ENGINEER OF RECORD.
 9. CONCRETE SHALL EXCEPT AS STATED ABOVE AND AS MODIFIED BY CHAPTER 19 OF THE NEW YORK CITY BUILDING CODE CONFORM TO THE RECOMMENDATIONS OF PRACTICE FOR WELDING REINFORCING STEEL, METAL INSERTS AND CONNECTIONS IN REINFORCED CONCRETE CONSTRUCTION (AASHTO M-318) AND SECTION 3.5.2 OF THE ACI 318-02.
 10. THE STEEL SUPPLIER SHALL PROVIDE THE ENGINEER WITH AN AFFIDAVIT OF THE PRODUCER OF STEEL CERTIFYING THAT THE STEEL MEETS THE REQUIREMENTS OF THE AMERICAN SOCIETY OF TESTING AND MATERIALS.
 11. ALL CONTINUOUS REINFORCING SHALL BE LAPPED AT SPICES, BENT AROUND CORNERS AND FULLY EMBEDDED AT NON-CONTINUOUS ENDS. (SEE TYPICAL DETAILS, EMBLEMMENT AND SPICES LENGTH SCHEDULES ON DETAIL DRAWINGS). THE SPACE BETWEEN SPLICED BARS SHALL NOT EXCEED THE LESSER OF 6' OR 1/5 OF THE REQUIRED LENGTH OF LAP.
 12. PROVIDE MINIMUM CONCRETE PROTECTION TO REINFORCING AS SHOWN IN SECTIONS AND DETAILS BUT NOT LESS THAN THAT REQUIRED BY SECTION 7.7 OF THE ACI 318-02.
 13. ALL REINFORCING SHALL BE FREE OF LOOSE FLAKY RUST, OIL, OR OTHER COATING THAT WILL REDUCE OR HINDER FULL BOND CAPACITY. PLACING REINFORCING SHALL CONFORM TO SECTION 7.5 AND SPACING OF BARS TO SECTION 7.6 OF ACI 318-02.

ADDITIONAL NOTES:
 1. AT LEAST 24 HOURS WRITTEN NOTICE SHALL BE GIVEN TO THE COMMISSIONER PRIOR TO THE COMMENCEMENT OF ANY WORK AS PER SECTIONS BC 105.5.1 & BC 330A.3.1 OF THE NYCBC.
 2. TEN DAYS PRIOR WRITTEN NOTICE SHALL BE GIVEN TO THE OWNERS OF ALL ADJOINING LOTS, BUILDING AND SERVICE FACILITIES WHICH MAY BE AFFECTED BY THE FOUNDATION WORK OR EXCAVATION OPERATIONS BEFORE APPLICATION FOR BUILDING DEPARTMENT CONSTRUCTION PERMIT AS PER SECTIONS BC 105.5 AND BC 330A.3.2 OF THE NYCBC, WHEN EXCAVATION IS 5'-0" OR GREATER IN DEPTH FROM THE LEVEL OF ADJACENT GROUND. THE SIDES SHALL BE SHORED AS PER SECTION BC 330A.4.1 OF THE NYCBC.
 3. PROVIDE GUARD RAILS OR FENCE AT EXCAVATIONS AS PER SECTION BC 330A.4.4.
 4. THE CONTRACTOR SHALL PROVIDE, MAINTAIN AND OPERATE ALL NECESSARY PUMPING AND HOSE WATER EQUIPMENT FOR THE REMOVAL OF WATER FROM ANY SOURCE OF CAUSE, BY WHATEVER MEANS AND EQUIPMENT NECESSARY, AND AS LONG AS MAY BE REQUIRED TO PROPERLY PERFORM THE FOUNDATION WORK. WATER SHALL BE CONDUCTED AWAY FROM EXCAVATIONS AND ALL NECESSARY PRECAUTIONS SHALL BE TAKEN TO PREVENT SETTLEMENT, EROSION OR ANY OTHER DAMAGE TO ADJOINING STRUCTURES DUE TO LOSS OF GROUND WATER.

REINFORCEMENT ANCHORAGE SCHEDULE

TABULATED VALUES ARE GIVEN IN INCHES AND ARE CALCULATED FOR $f_y = 60,000$ P.S.I.

BAR SIZE	STONE CONCRETE					
	1/2	3/4	1	1 1/4	1 1/2	2
#3	12	14	12	12	8/6	8
#4	12	14	12	12	8/6	8
#5	16	21	12	14	9/6	11
#6	22	28	13	17	11/8	14
#7	35	45	19	24	13/9	16
#8	43	56	23	29	14/10	18
#9	52	68	28	36	16/11	20
#10	63	81	35	45	18/13	23
#11	73	96	41	54	20/14	25

NOTES: A-E A/E A/B A/B A/B B/C D

FOUNDATION CONTRACTOR NOTES:

- PRIOR TO EXCAVATING AND INSTALLING FOOTINGS OR PILES IN THE PROXIMITY OF LOT LINES, THE FOUNDATION CONTRACTOR SHALL DO THE FOLLOWING:
- IT IS RECOMMENDED THAT AT THE NEIGHBORING BUILDINGS A SURVEY SHALL BE CONDUCTED TO SHOW EXISTING CONDITIONS. EACH BUILDING SHALL BE INSPECTED AND PHOTOGRAPHED, INSIDE AND OUT TO RECORD EXISTING CONDITIONS.
 - SETTLEMENTS LATERAL MOVEMENTS (INCLUDING AND VIBRATIONS AT ADJACENT BUILDINGS SHALL BE MONITORED BY AN INDEPENDENT COMPANY. THE SETTLEMENT MONITORING POINTS SHALL BE ESTABLISHED NOT MORE THAN 10 FEET APART ON THE WALLS OF ALL STRUCTURES ADJACENT TO THE SITE. ABOUT THE (5) FEET ABOVE GRADE. ELEVATIONS OF THESE POINTS SHOULD BE MEASURED NEAR THE MIDDLE AND AT THE END OF EACH DAY. THE CONTRACTOR SHOULD BE PREPARED TO MODIFY HIS EXCAVATION & ROCK REMOVAL PROCEDURES IF THE CUMULATIVE SETTLEMENT AT ANY POINT EXCEEDS 3/8 INCH.
 - MONITORING OF VIBRATIONS SHALL BE MONITORED AT LEAST TWICE A DAY ON ALL STRUCTURES ADJACENT TO THE SITE, WITH AN IMMEDIATE MEASUREMENT MADE EACH TIME THE ROCK REMOVAL OPERATION CHANGES LOCATION. THE MAXIMUM ALLOWED LEVEL OF VIBRATION MEASURED AT ANY ADJACENT STRUCTURE SHALL BE A PEAK PARTICLE VELOCITY OF 0.5 INCHES PER SECOND. THE CONTRACTOR SHOULD BE PREPARED TO MODIFY HIS EXCAVATION & ROCK REMOVAL PROCEDURES IF THE VIBRATION LEVEL EXCEEDS THAT VALUE.
 - CONTRACTOR'S P.F.E. SHALL FILE SIGNED AND SEALED DRAWING WITH THE BUILDING DEPARTMENT FOR APPROVAL PRIOR TO PROCEEDING WITH CONSTRUCTION, SHOWING NECESSARY MEASURES TO PROTECT EXISTING STRUCTURES (SUCH AS GROUNDING, UNDERPINNING, ADJUSTED PILES, ETC.) TO PREVENT ANY DISPLACEMENT OF SUPPORT MATERIALS.

WATERPROOFING NOTES:

- WATERPROOFING SHALL CONFORM TO THE REQUIREMENTS OF SECTION BC 1807 OF THE NYC BC. THE WATERPROOFING PANEL SHALL BE BELOW SLAB ON GRADE.
- AT ALL FOUNDATION WALLS AND BELOW SLAB ON GRADE.
 - AT ALL FOUNDATION WALLS AND BELOW SLAB ON GRADE AND ALL OTHER PITS AS SHOWN ON DETAILS.
 - CONSTRUCTION JOINTS IN WALLS AND WALLS ON GRADE, AND ALL PENETRATIONS FOR MECHANICAL AND ELECTRICAL SHALL BE WATER PROOFED WITH WATER PROOFING PANEL MANUFACTURERS DETAIL TO MAINTAIN THE INTEGRITY OF THE WATER PROOFING DETAIL.
 - CONTRACTOR TO USE APPROVED WATERPROOF FORM THE DETAIL AT ALL WALL LOCATIONS BELOW STREET GRADE E.L.
 - AT ALL NEW TO EXISTING WATERPROOFING SHALL NOT BE ALLOWED. ALL SINGLE FORMED WALLS MUST BE INTERNALLY BRACED.
 - AT ALL NEW TO EXISTING WATERPROOFING, THE EXISTING SURFACE TO BE PAINTED WITH AN APPROVED BRACING SLURRY PRIOR TO PLACING NEW CONCRETE.
 - AT CONDITIONS WHERE WATER STOP IS VERTICALLY ORIENTED (I.E. A HORIZONTAL CONSTRUCTION JOINT), THE TOP BARS IN THE BOTTOM HALF OF THE CONSTRUCTION JOINT ARE TO BE LOWERED SO THAT THE WATER STOP CAN BE INSTALLED CONTINUOUSLY WITHOUT HAVING TO CUT AROUND THE WATER STOP.
 - WATER STOPS ARE NOT TO BE CUT TO FACILITATE PLACEMENT OF BARS.
 - BENTONITE ROPES AND OTHER TYPE OF MATERIAL SHALL BE KEPT DRY UNTIL CONCRETE ACCORDANCE WITH SECTION BC 1804.1 OF THE NEW YORK CITY BUILDING CODE IS PLACED. SUBCONTRACTOR SHALL REPLACE IT.
 - ALL FLOOR DRAINS IN SLAB ON GRADE TO BE WATERPROOF TYPE WITH FLANGE. WHERE AREAS ARE DOWNTENDED FOR THE PLACING OF WATER STOP, WATER STOP WILL CONTINUE FOR A MINIMUM OF 72 HOURS AFTER PLACEMENT OF FIT CONCRETE SO THAT THE CONTRACTOR HAS TIME TO DEVELOP STRONG BEFORE BEING SET IN ANY ONE DAY.
 - SUBCONTRACTOR SHALL PATCH ANY CRACKS WHICH OCCUR IN NEWLY PLACED CONCRETE USING AN APPROVED PATCH REPAIR COMPOUND CONSISTING OF A PART OF CONCRETE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE DESIGN MIX SHOULD BE DESIGNED TO MINIMIZE SHRINKAGE IN ORDER TO MINIMIZE CRACKING. WHERE CRACKS OCCUR THEY WILL NEED TO BE CHASED AND PATCHED WITH AN EPOXY CRACK FILLER.
 - ALL SLEEVES WHICH ARE TO BE CAST INTO FOUNDATION WALLS SHALL HAVE A MINIMUM OF 1/2" MIN. FLANGE AT THE CENTER OF THE SLEEVE.
 - SLABS ON GRADE TO BE WATER CURED USING SPRINKLERS AND BURAP.
 - AT LOCATIONS WHERE CONSTRUCTION JOINTS OCCUR BETWEEN NEW AND EXISTING CONCRETE, CUT A 4" X 4" KEY INTO THE EXISTING CONCRETE. GROUT WATER STOP INTO THE KEY BEFORE PLACING THE NEW CONCRETE.
 - WATERPROOFING WILL ALSO FUNCTION AS VAPOR BARRIER TO SATISFY ENVIRONMENTAL REQUIREMENTS. WATERPROOFING SHALL BE EXTENDED TO INCLUDE ALL SUBGRADE WALLS TO SIDEWALK LEVEL GRADE.

PILE FOUNDATION NOTES:

- FILES AND DRIVING OF PILES SHALL CONFORM TO THE REQUIREMENTS OF CHAPTER 18 OF THE NEW YORK CITY BUILDING CODE.
- ALL PILES PENETRATING LESS THAN 10 FEET BELOW CUT-OFF OR LESS THAN 10 FEET BELOW GROUND LEVEL SHALL BE BRACED AGAINST LATERAL MOVEMENT.
- THE CONTRACTOR SHALL OBTAIN A PROFESSIONAL ENGINEER OF RECORD'S APPROVAL PRIOR TO DRIVING PILES.
- THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD:
 - PILE IDENTIFICATION PLAN.
 - PILE DRIVING LOGS SIGNED AND SEALED BY A LICENSED SURVEYOR OR A PROFESSIONAL ENGINEER.
 - PILE DEVIATION PLAN.
- THE CONTRACTOR SHALL NOT POUR ANY PILE CAPS OR STRAPS UNTIL THE ENGINEER OF RECORD AND BUILDING DEPARTMENT HAS APPROVED THE ABOVE DOCUMENTS.
- PILE CAPS CAN BE LOWERED, NOTICED, INCREASED IN THICKNESS OR ALTERED IN AN APPROPRIATE MANNER TO ACCOMMODATE MECHANICAL SERVICE LINES, PENDING APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD.
- DRIVEN PILE CAPACITIES GREATER THAN 75 TONS NOT BEARING ON CLASS 1A, 1B OR 1C BEDROCK SHALL BE VERIFIED BY TWO SPECIAL LOAD TEST (CYCLIC OR INSTRUMENTED WITH TELL TELS) IN ACCORDANCE WITH THE CODE AND LOAD TEST REQUIREMENTS AND PROCEDURE ARE SUBJECT TO GEOTECHNICAL ENGR'S APPROVAL.
- CENTRICITIES OF "AS-BUILT" PILE GROUPS SHALL BE ADJUSTED BY STRAPS. ADDITIONAL REINFORCING OR BY THE DRIVING OF ADDITIONAL PILES ON REDDESIGN SHEETS AS PREPARED BY THE STRUCTURAL ENGINEER.
- ALL DRIVEN PILES SHALL HAVE 1/4" (GRADE) SOUTHERN DRIVING SHOE AND HAVE A DESIGN CAPACITY OF 110 TON (SERVICE 100 TON).
- SPLICE IN THE STEEL PILE, IF REQUIRED, SHALL BE MADE USING A FULL PENETRATION, PRE-QUALIFIED, SINGLE VEE GROOVED BUTT WELD, OR APPROVED SPICE CONNECTOR. NO SPLICES SHALL BE PERMITTED IN TOP 15' IN PILES BELOW THE SHEAR WALL AND PILE CAPS IMMEDIATELY ADJACENT TO SHEAR WALL.

SPECIAL INSPECTIONS:

- THE SPECIAL INSPECTIONS OF CONCRETE (STRUCTURAL CONCRETE) SHALL BE IN ACCORDANCE WITH CHAPTER 17 OF THE NYCBC.
- STRUCTURAL STEEL - WELDING.
 - STRUCTURAL STEEL - BOLTING.
 - CONCRETE - CAST IN PLACE.
 - MASONRY.
 - SOILS - SITE PREPARATION.
 - PILE FOUNDATIONS & DRILLED PIER INSTALLATION.
 - SPRAYED FIRE - RESISTANT MATERIALS.
 - FIRESTOP, DRAFTSTOP AND FIREBLOCK SYSTEMS.
 - CONCRETE TEST CYLINDERS.
 - CONCRETE DESIGN MIX.
 - SOILS - INVESTIGATIONS (BORING/TEST PITS)

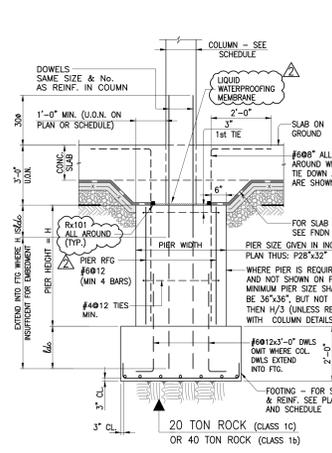
ALL UNDERPINNING SHEETING, SHORING OR OTHER CONSTRUCTIONS REQUIRED FOR THE SUPPORT OF ADJACENT PROPERTIES OR BUILDINGS SHALL BE SUBJECT TO SPECIAL INSPECTION AS ESTABLISHED BY NEW YORK CITY BUILDING CODE SECTION BC 1814. THE CONTRACTOR SHALL OBTAIN A PROFESSIONAL ENGINEER OF RECORD'S APPROVAL PRIOR TO DRIVING PILES.

REQUIRED INSPECTIONS

- FOOTING AND FOUNDATION.
- FRAME INSPECTION.

TYPICAL ROCK ANCHOR DETAIL AND SLAB WATERPROOFING DETAIL

- CONTRACTOR SHALL SUBMIT A SHOP DRAWING SHOWING THE DOWN ANCHOR LAYOUT FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.
- THE DOWN SPACING AND LOCATIONS ARE SHOWN ON PLAN.
- CONTRACTOR TO PROVIDE SHOP DRAWING FOR ENGINEER'S APPROVAL.
- FOR TYPICAL FOOTING DETAIL SEE THIS DRAWING.
- THE DOWN ANCHORS ARE SUBJECT TO SPECIAL INSPECTION IN ACCORDANCE WITH THE NYC BUILDING CODE.



TYPICAL COLUMN, PIER AND FOOTING DETAIL

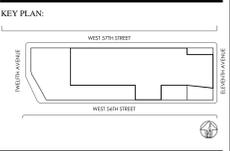
- WATER PROOFING DETAILS ARE SAME AS FOR TYPICAL COLUMN AND FOOTING DETAIL ABOVE.
- DIMENSION SHOWN IS A MINIMUM. ACTUAL DIMENSION SHALL BE 4" LARGER THAN SLAB THICKNESS.

FOOTING REINFORCEMENT SCHEDULE

FOOTING DEPTH (SEE PLAN)	BOTTOM REINFORCEMENT (SEE PLAN)
24" TO 30"	#7 @ 6" o.c.
31" TO 36"	#7 @ 5" o.c.
37" TO 42"	#7 @ 4" o.c.
43" TO 48"	#8 @ 5" o.c.
49" TO 60"	#8 @ 4" o.c.
61" TO 72"	#9 @ 6" o.c.
73" TO 84"	#9 @ 4" o.c.
85" TO 96"	#10 @ 4" o.c.
97" TO 110"	#11 @ 4" o.c.

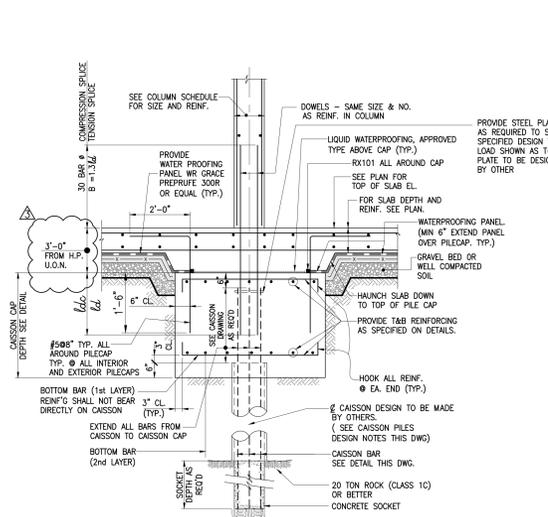
11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BIDDING	
10/29/2014	UPDATED BID SET & REVISED AS NOTED FOR FND.	
09/22/2014	BID SET A REVISED AS NOTED FOR FOUNDATION	
08/27/2014	REVISED AS NOTED	
08/15/2014	ISSUED FOR PEER REVIEW	
08/01/2014	FOR FOUNDATION BID	
07/01/2014	SUBMISSION	
No.	DATE	REVISION

D.I.B. NUMBER:
NB#



FOUNDATION DETAILS - 2 & CAISSON DETAILS

SEAL & SIGNATURE: DATE: 07/21/2014
 PROJECT NO: 2013-26
 DRAWN BY: CHECKED BY:
 DWG. NO.: **FO-022.00**
 SHEET NO.: 4 OF 58



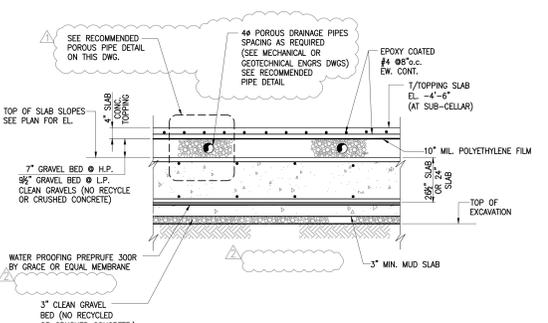
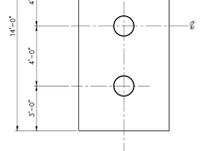
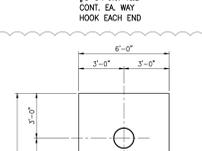
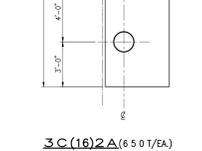
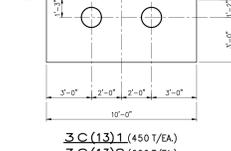
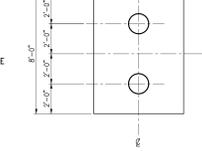
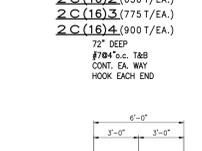
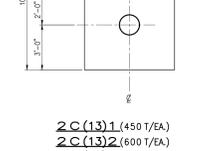
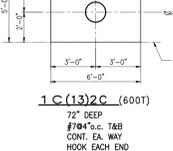
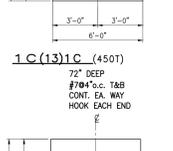
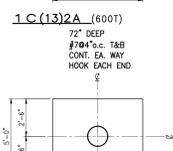
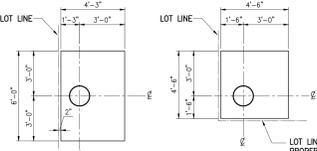
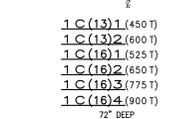
TYPICAL COLUMN, CAISSON AND CAP DETAIL
 SCALE: 3/4"=1'-0"

CAISSON DESIGN CAPACITY (FOR ESTIMATING ONLY)
 CAISSONS ARE DESIGNED BY GEOTECHNICAL ENGR.

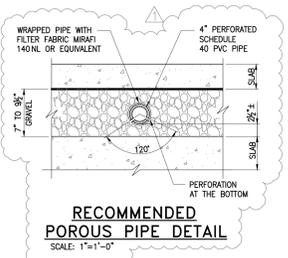
CAISSON O.D.	13 3/8"	16"
#24 BARS	2	1
SOCKET DEPTH	16'-0"	14'-0"
ALLOWABLE AXIAL LOAD	600 T, 450 T	900 T, 775 T, 650 T, 525 T
ALLOWABLE TENSION LOAD	300 kips, 150 kips	600 kips, 450 kips, 300 kips, 150 kips

TYPICAL CAISSON DETAIL

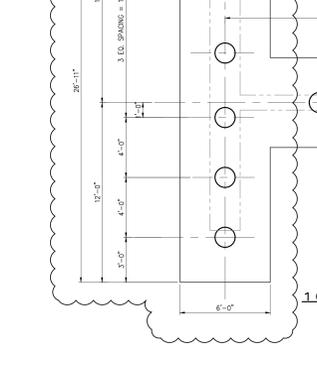
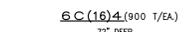
- MINI-CAISSON DESIGN NOTES:**
- A PROFESSIONAL ENGINEER RETAINED BY FOUNDATION CONTRACTOR (UPON CONSULTATION WITH SOIL GEOTECHNICAL CONSULTANT AND REVIEW OF SOIL REPORT) OR GEOTECHNICAL CONSULTANT SHALL PROVIDE SUPPLEMENTAL CAISSON DESIGN DWGS FILED AND APPROVED BY THE BUILDING DEPARTMENT, TO THE ENGINEER OF RECORD PRIOR TO COMMENCING CONSTRUCTION.
 - ALL CAISSON SHALL BE SUBJECT TO CONTROL INSPECTION BY GEOTECHNICAL CONSULTANT AS REQUIRED BY NEW YORK CITY BUILDING CODE, 2008.



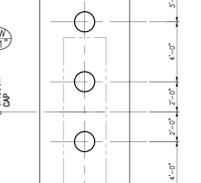
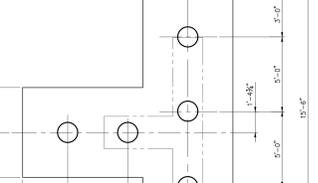
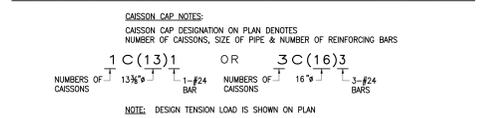
TYPICAL BASKETBALL COURT SLAB ON GRADE & WATERPROOFING DETAIL



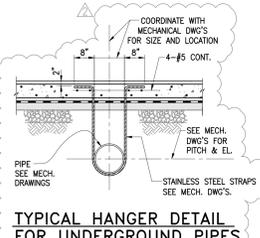
RECOMMENDED POROUS PIPE DETAIL
 SCALE: 1"=1'-0"



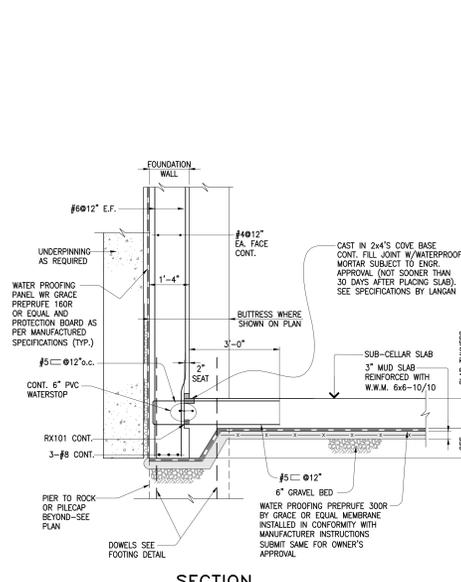
MINI-CAISSON CAP DETAILS



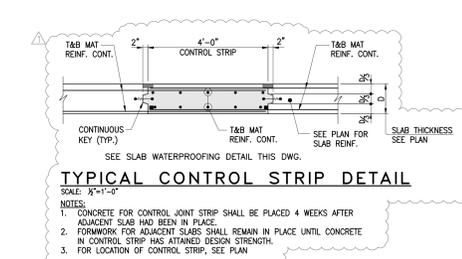
- WATERPROOFING NOTES:**
- WATER PROOFING PANEL SHALL BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS AT ALL FOUNDATION JOINTS AND BELOW SLAB ON GRADE.
 - PROVIDE A 1" H.L.T. ON ALL SLABS AND WALLS OF ELEVATOR PITS AND ALL OTHER PITS, AS SHOWN ON DETAILS.
 - CONSTRUCTION JOINTS IN WALLS AND SLABS ON GRADE, AND ALL PENETRATIONS FOR PLUMBING AND MECHANICAL SHALL BE DETAILED IN CONFORMITY WITH WATER PROOF PANEL MANUFACTURER'S DETAILS TO MAINTAIN THE INTEGRITY OF THE WATER PROOFING ENVELOPE.
 - CONTRACTOR TO USE APPROVED WATERPROOF FORM THE DETAIL AT ALL LOCATIONS BELOW EL.+20'-0".
 - WATERSTOPS ARE NOT TO BE CUT TO FACILITATE PLACEMENT OF BARS.
 - BENTONITE ROPES AND OTHER TYPE MATERIAL MUST BE KEPT DRY UNTIL CONCRETE IS PLACED ON IT. IF THE BENTONITE BECOMES WET BEFORE CONCRETE PLACEMENT, SUBCONTRACTOR SHALL REPLACE IT.
 - ALL FLOOR DRAINS IN SLAB ON GRADE TO BE WATERPROOF TYPE WITH FLANGE.
- SLAB NOTES:**
- ALL SLABS ON GROUND SHALL BE 18" OR 12" THICK, AS SPECIFIED ON NOTES U.O.N. REINFORCED WITH #9@8" O.C. TOP AND BOTTOM EA. WAY CONTINUOUS, U.O.N.
 - ALL REINFORCING SHALL BE EPOXY COATED, TOP AND BOTTOM OUTER LAYER SHALL HAVE 19" CONCRETE COVER.
 - ALL SLAB ON GROUND TO BE PLACED ON TOP OF WATERPROOFING PANELS SANDWICH BETWEEN 2-10 MIL. POLYETHYLENE FILM OVER 3" MINIMUM MUD SLAB. MUD SLAB TO BE 3000 PSI STONE CONC. REINFORCED WITH #6@10-12" O.C. OVER 10 MIL. POLYETHYLENE FILM OVER 3" GRAVEL BED.
 - FOR ADDITIONAL DETAILS, SEE ARCHITECTS DWGS.



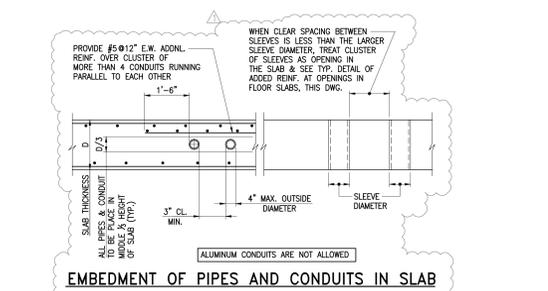
TYPICAL HANGER DETAIL FOR UNDERGROUND PIPES



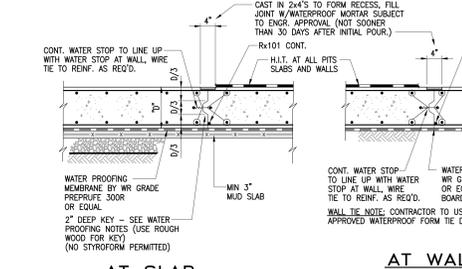
TYPICAL SLAB PENETRATION DETAIL



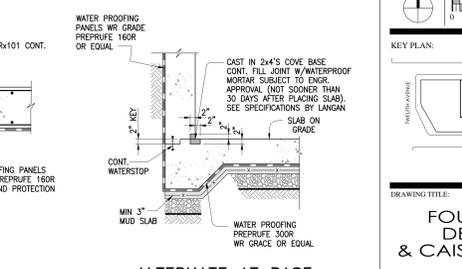
TYPICAL CONTROL STRIP DETAIL
 SCALE: 3/4"=1'-0"



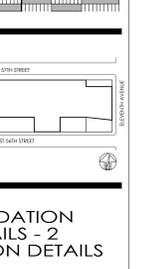
EMBEDMENT OF PIPES AND CONDUITS IN SLAB



AT SLAB



AT WALL



ALTERNATE AT BASE OF FOUNDATION WALL

- NOTES:**
- SEE SPECIFICATIONS AND ARCH. DWG'S FOR ADD'L EXTERIOR JOINT/WALL MOISTURE PROTECTION DETAILS.
 - PLACE WATER STOP OUTSIDE OF OUTERMOST BARS.
 - PREPARE SURFACE SO IT IS CLEAN, DRY AND DUST FREE. APPLY ADHESIVE PRIMER AS PER MANUFACTURER'S SPECIFICATIONS.

TYPICAL SLAB AND WALL WATERPROOFING DETAIL

WATERPROOFING WILL ALSO FUNCTION AS VAPOR BARRIER TO SATISFY ENVIRONMENTAL REQUIREMENTS. WATERPROOFING SHALL BE EXTENDED TO INCLUDE ALL SUBGRADE WALLS TO SIDEWALK LEVEL GRADE.

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57, LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8400
 FAX: (212) 979-8387

DESIGN ARCHITECT:
 ARQUITECTONICA
 100 FIFTH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN
 CONSULTING ENGINEERS, P.C.
 485 Seventh Avenue, Suite 1510
 NEW YORK, NY 10018
 TEL: (212) 564-2424
 FAX: (212) 564-6678

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5997

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN
 LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th FLOOR
 NEW YORK, NY 10018
 TEL: (646) 484-3230
 FAX: (646) 484-3231

GEOTECHNICAL AND CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 365-1818
 FAX: (212) 365-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4051
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

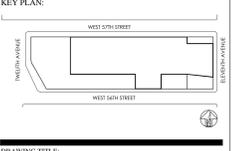
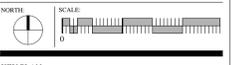
ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 FIFTH AVENUE
 NEW YORK, NY 10016
 TEL: (212) 725-6800
 FAX: (212) 725-0864

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 496-0670
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

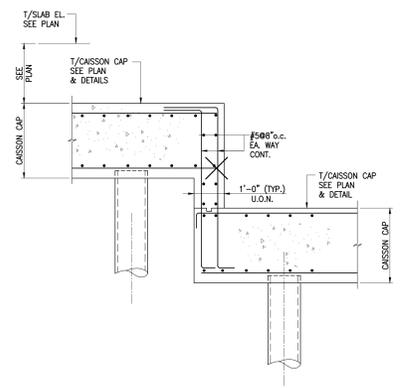
11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BUY
09/22/2014	NO REVIEW
08/27/2014	NO REVIEW
06/15/2014	ISSUED FOR PEER REVIEW
08/01/2014	FOR FOUNDATION BID
07/01/2014	SUB. SUBMISSION
DATE:	REVISION:

D.O.B. NUMBER:
NB#

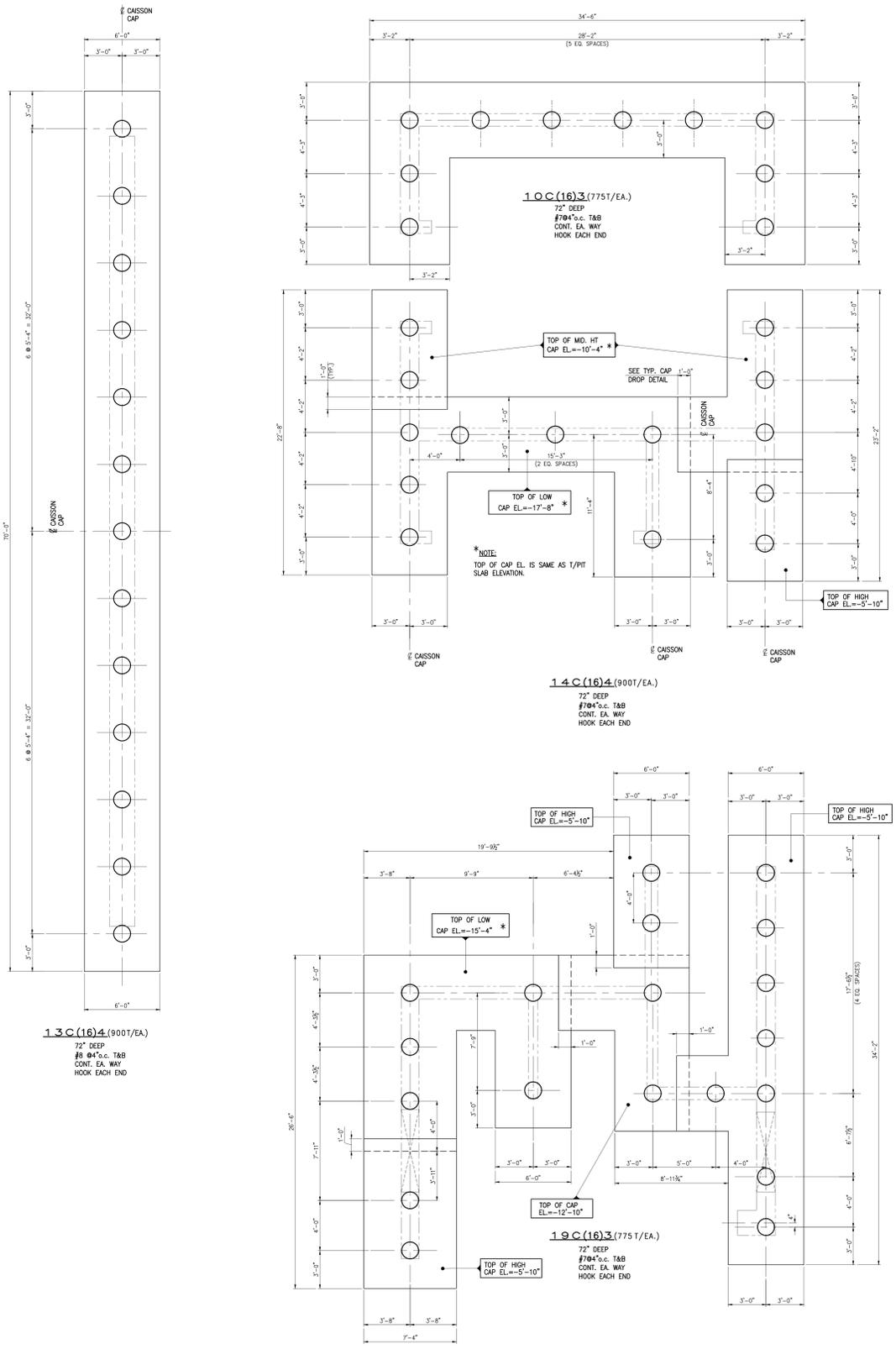


DRAWING TITLE:
CAISSON DETAILS - 2

SEAL & SIGNATURE: [Signature] DATE: 07/21/2014
 PROJECT No: 2013-26
 DRAWN BY:
 CHECKED BY:
 DWG. No: **FO-023.00**
 SHEET No: 5 OF 58
 FILE No: R:_2013-26\F-DET-2-CAISS-DET.dwg



DETAIL AT STEPPED CAISSON CAP
 SCALE: 1/2"=1'-0"



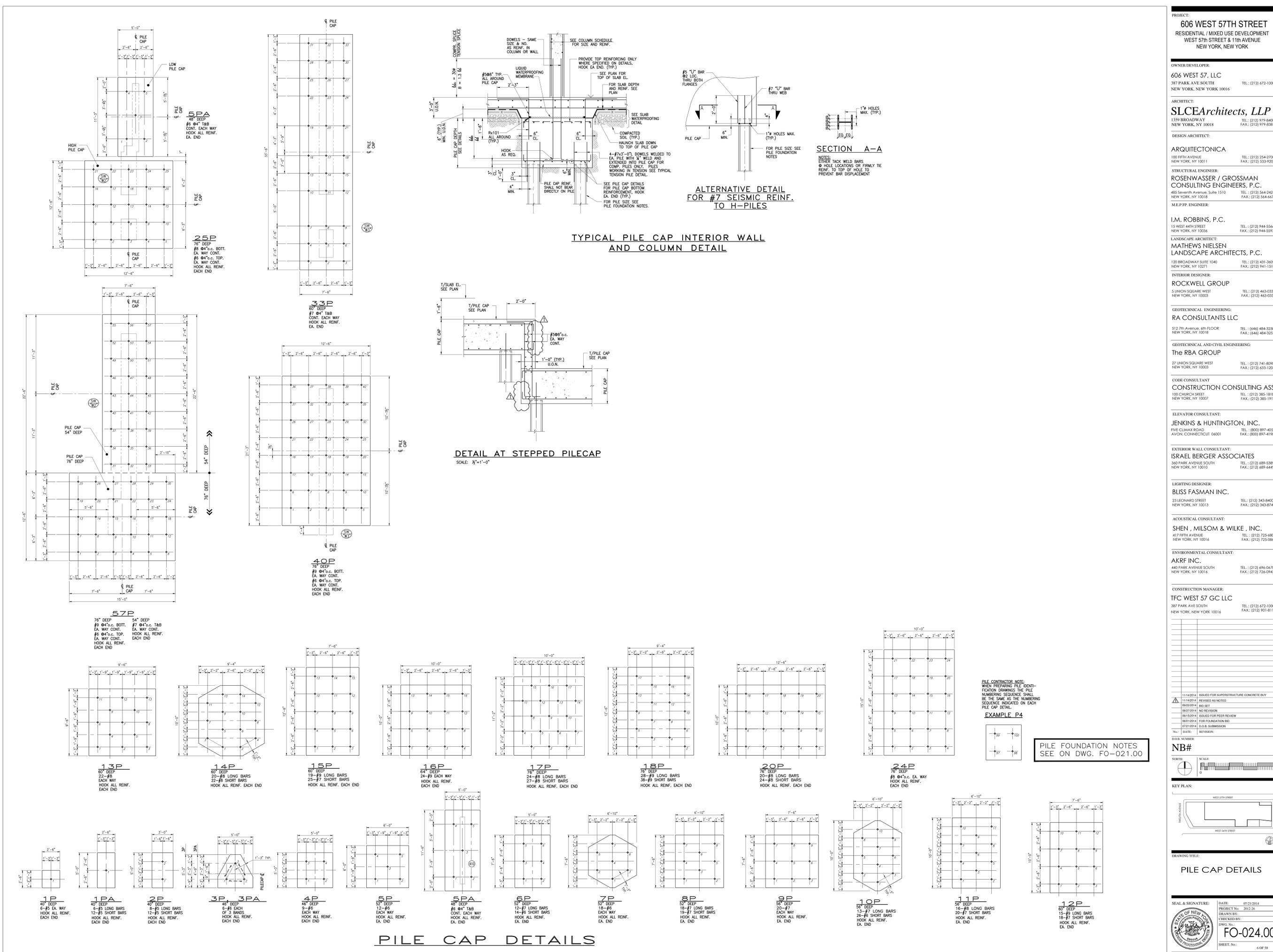
MINI-CAISSON CAP DETAILS

CAISSON CAP NOTES:
 CAISSON CAP DESIGNATION ON PLAN DENOTES
 NUMBER OF CAISSONS, SIZE OF PIPE & NUMBER OF REINFORCING BARS

1 C(13)1 OR 3 C(16)3
 NUMBERS OF CAISSONS 1 13 1/4" BAR NUMBERS OF CAISSONS 3 16" BAR

NOTE: DESIGN TENSION LOAD IS SHOWN ON PLAN WITH CAP DESIGNATION THIS: (T=k)

R:\00-2013-26\F-DET-2-CAISS-DET.dwg, 11/18/2014, 10:48:04 AM, rosenwasser/grossman consulting engineers p.c., ACAD 2014.2



PROJECT:
606 WEST 57TH STREET
RESIDENTIAL / MIXED USE DEVELOPMENT
WEST 57th STREET & 11th AVENUE
NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57, LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
1359 BROADWAY
NEW YORK, NY 10018
TEL: (212) 979-8400
FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
100 FIFTH AVENUE
NEW YORK, NY 10011
TEL: (212) 254-2700
FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN CONSULTING ENGINEERS, P.C.
485 SEVENTH AVENUE, SUITE 1510
NEW YORK, NY 10018
TEL: (212) 564-2424
FAX: (212) 564-6178

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
15 WEST 48TH STREET
NEW YORK, NY 10036
TEL: (212) 944-5566
FAX: (212) 944-5997

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN LANDSCAPE ARCHITECTS, P.C.
120 BROADWAY SUITE 1040
NEW YORK, NY 10021
TEL: (212) 431-3609
FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
5 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 463-0334
FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
512 7th Avenue, 6th FLOOR
NEW YORK, NY 10018
TEL: (646) 484-3230
FAX: (646) 484-3231

GEOTECHNICAL AND CIVIL ENGINEERING:
The RBA GROUP
27 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 741-8090
FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
100 CHURCH STREET
NEW YORK, NY 10007
TEL: (212) 360-1818
FAX: (212) 360-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
FIVE CLIMAX ROAD
AVON, CONNECTICUT 06001
TEL: (800) 897-4051
FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
360 PARK AVENUE SOUTH
NEW YORK, NY 10010
TEL: (212) 689-5389
FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
23 LEONARD STREET
NEW YORK, NY 10013
TEL: (212) 343-8400
FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSOM & WILKE, INC.
417 FIFTH AVENUE
NEW YORK, NY 10014
TEL: (212) 725-6800
FAX: (212) 725-6864

ENVIRONMENTAL CONSULTANT:
AKRF INC.
480 PARK AVENUE SOUTH
NEW YORK, NY 10016
TEL: (212) 496-0670
FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000
FAX: (212) 901-4814

11/14/2014 ISSUED FOR SUPERSTRUCTURE CONCRETE BUY
11/14/2014 REVISED AS NOTED
08/22/2014 80 SET
08/22/2014 NO REVISION
08/15/2014 ISSUED FOR PEER REVIEW
08/01/2014 FOR FOUNDATION BID
07/01/2014 SUB. SUBMISSION

No. DATE: 10/29/14
D.O.B. NUMBER: 10/29/14

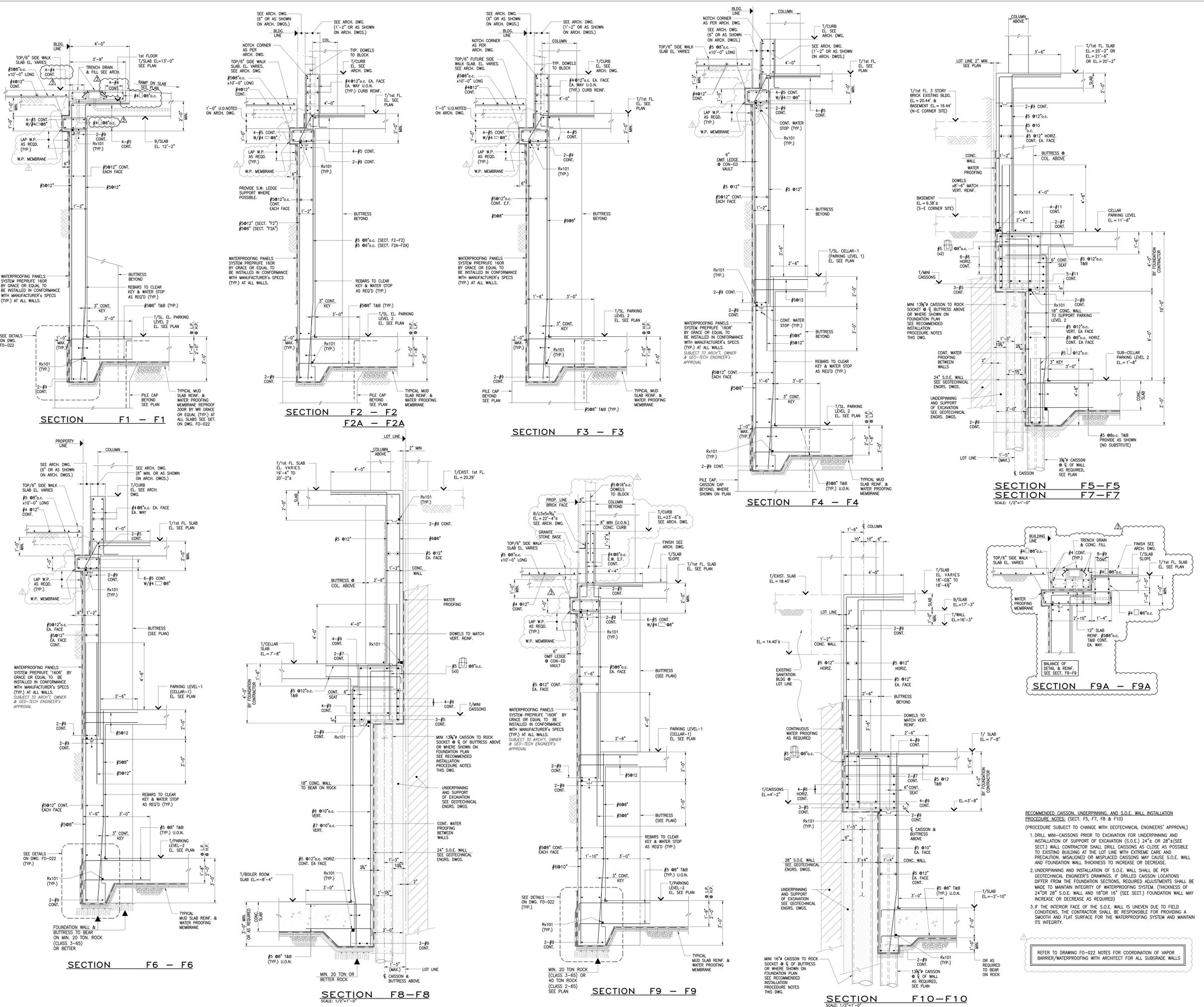
SCALE:
1"=1'-0"

KEY PLAN:

DRAWING TITLE:
PILE CAP DETAILS

SEAL & SIGNATURE: DATE: 07/21/2014
PROJECT No.: 2013-26
DRAWN BY: CHECKED BY: DWG. No.:
FO-024.00
SHEET No.: 6 OF 58
FILE No: R:_2013\2014\FO-024.00-DET.dwg

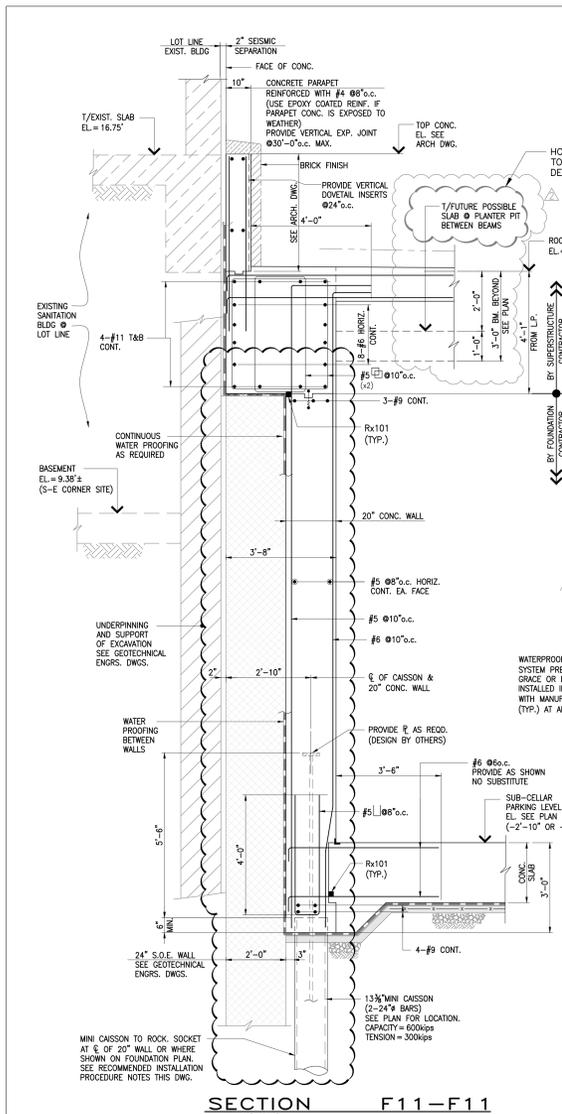
R:\2013\2014\FO-024.00-DET.dwg 11/10/2014 2:44:53 PM c:\rosenwasser\rosenwasser\consulting\engineers\p.c.\ACAD\2014.2



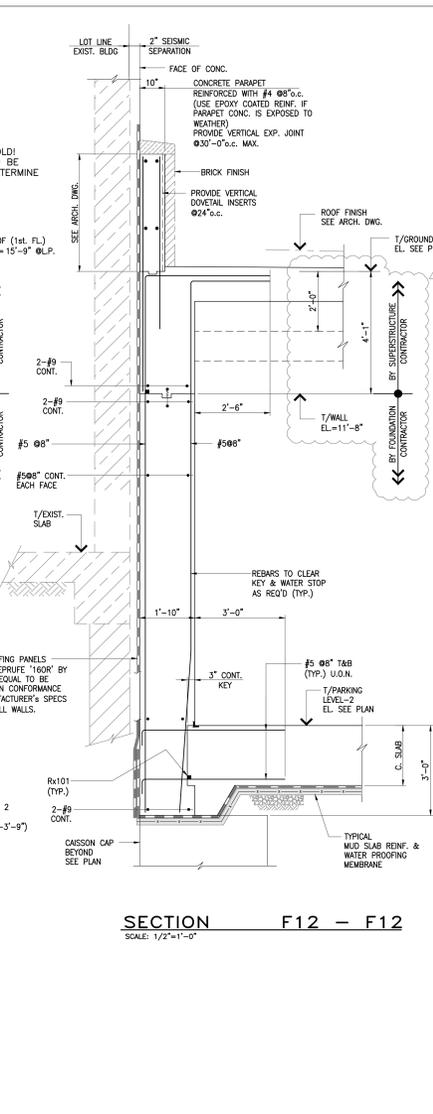
RECOMMENDED CAISSON, UNDERPINNING, AND S.O.E. WALL INSTALLATION PROCEDURE NOTES: (SECT. F5, F7, F8 & F10)
 (PROCEDURE SUBJECT TO CHANGE WITH GEOTECHNICAL ENGINEERS' APPROVAL)

- DRILL MINI-CAISSONS PRIOR TO EXCAVATION FOR UNDERPINNING AND INSTALLATION OF SUPPORT OF EXCAVATION (S.O.E.) 24" OR 28" (SEE SECT.) WALL CONTRACTOR SHALL DRILL CAISSONS AS CLOSE AS POSSIBLE TO EXISTING BUILDING AT THE LOT LINE WITH EXTREME CARE AND PRECAUTION. MISALIGNED OR MISPLACED CAISSONS MAY CAUSE S.O.E. WALL AND FOUNDATION WALL THICKNESS TO INCREASE OR DECREASE.
- UNDERPINNING AND INSTALLATION OF S.O.E. WALL SHALL BE PER GEOTECHNICAL ENGINEER'S DRAWINGS. IF DRILLED CAISSON LOCATIONS DIFFER FROM THE FOUNDATION SECTIONS, REQUIRED ADJUSTMENTS SHALL BE MADE TO MAINTAIN INTEGRITY OF WATERPROOFING SYSTEM. (THICKNESS OF 24" OR 28" S.O.E. WALL AND 18" OR 16" (SEE SECT.) FOUNDATION WALL MAY INCREASE OR DECREASE AS REQUIRED)
- IF THE INTERIOR FACE OF THE S.O.E. WALL IS UNLEVEL DUE TO FIELD CONDITIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A SMOOTH AND FLAT SURFACE FOR THE WATERPROOFING SYSTEM AND MAINTAIN ITS INTEGRITY.

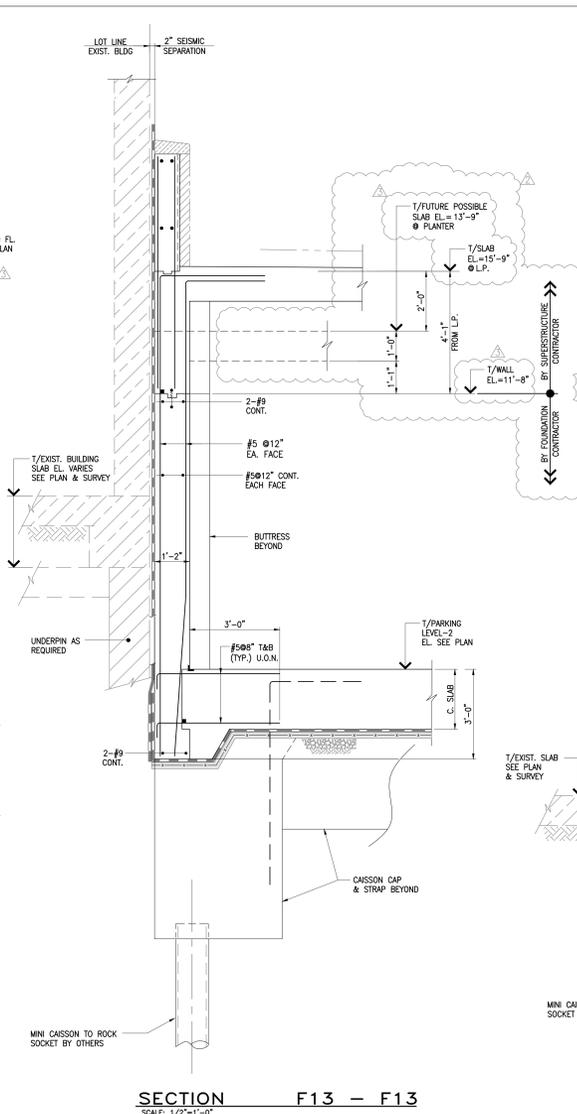
REFER TO DRAWING FO-022 NOTES FOR COORDINATION OF VAPOR BARRIER/WATERPROOFING WITH ARCHITECT FOR ALL SUBGRADE WALLS



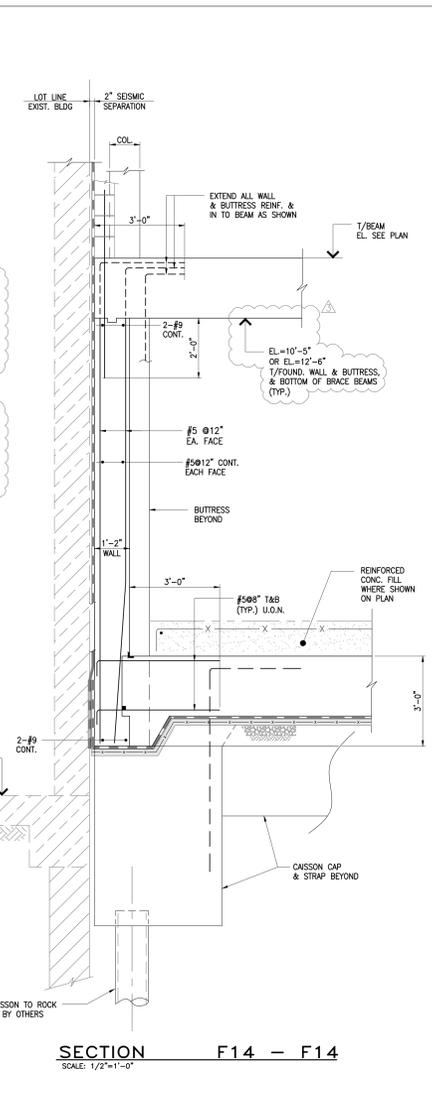
SECTION F11-F11
SCALE: 1/2"=1'-0"



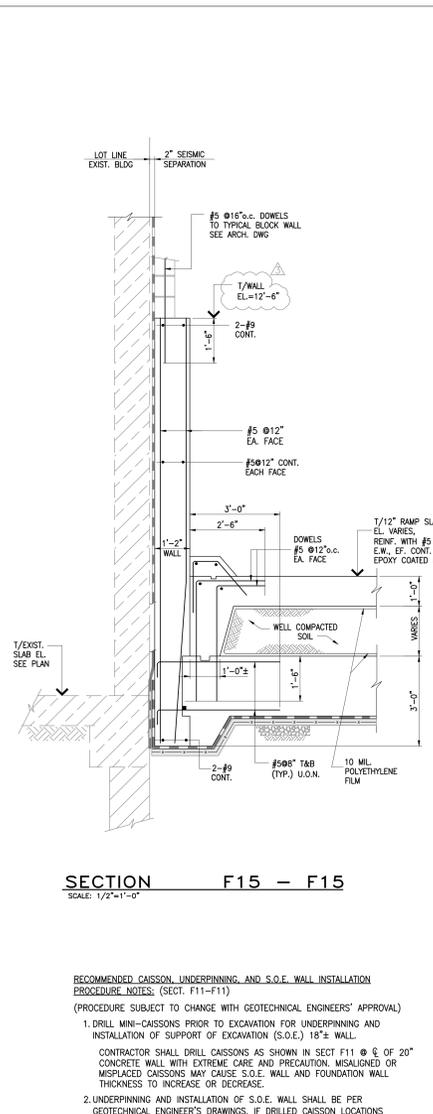
SECTION F12-F12
SCALE: 1/2"=1'-0"



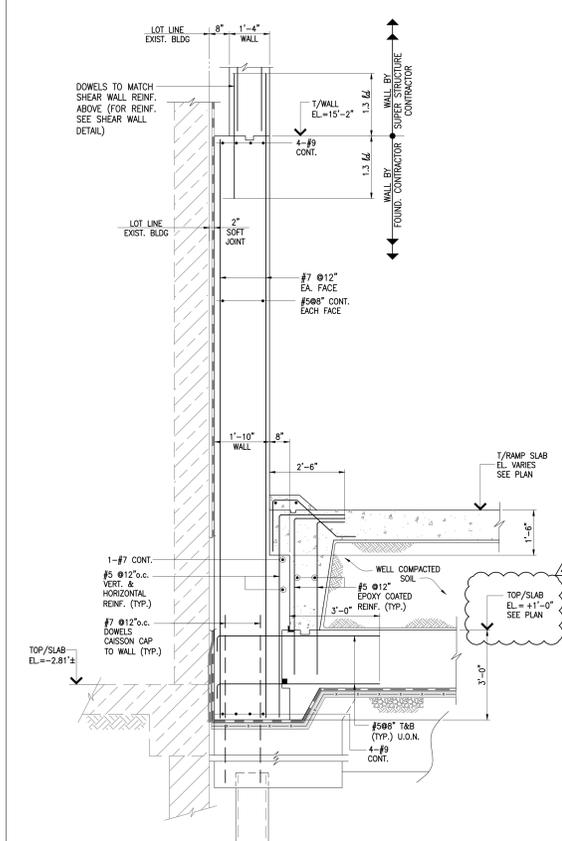
SECTION F13-F13
SCALE: 1/2"=1'-0"



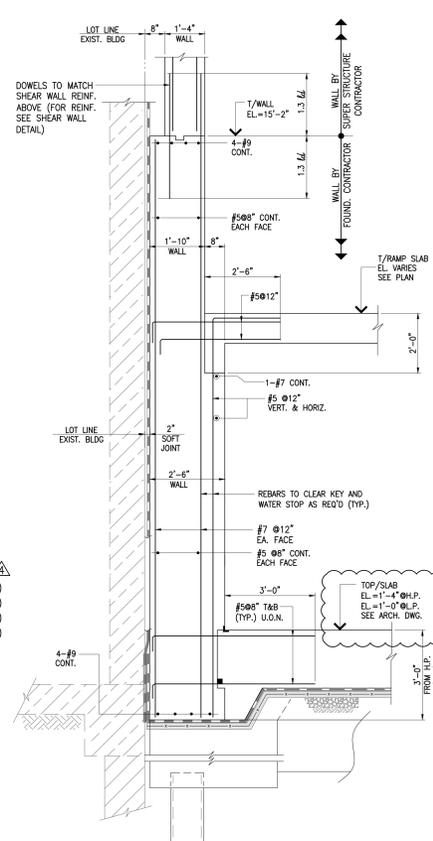
SECTION F14-F14
SCALE: 1/2"=1'-0"



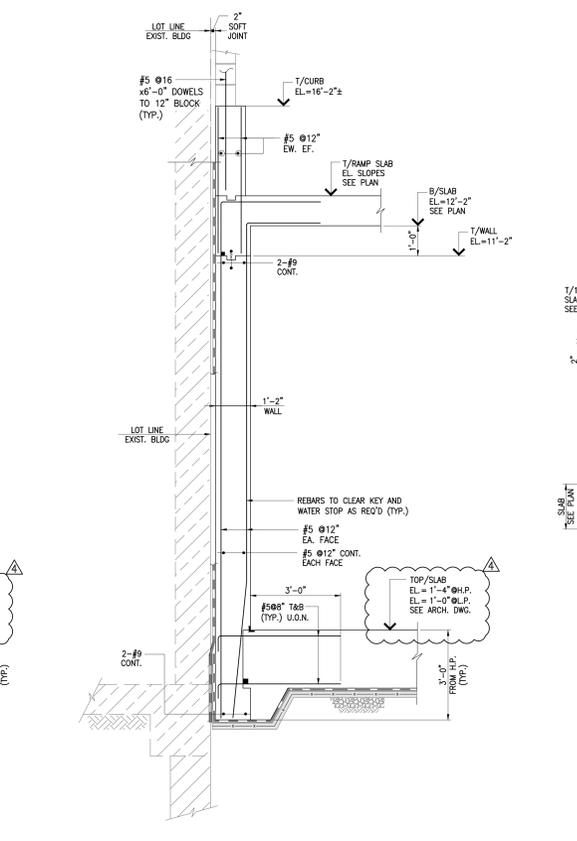
SECTION F15-F15
SCALE: 1/2"=1'-0"



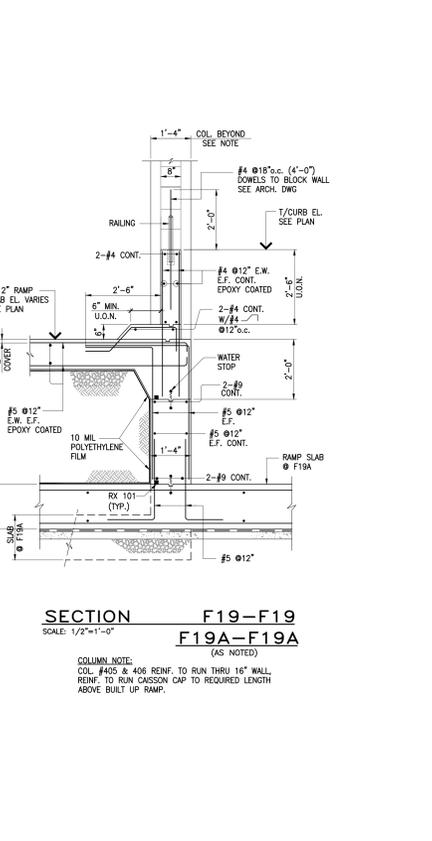
SECTION F16-F16
SCALE: 1/2"=1'-0"



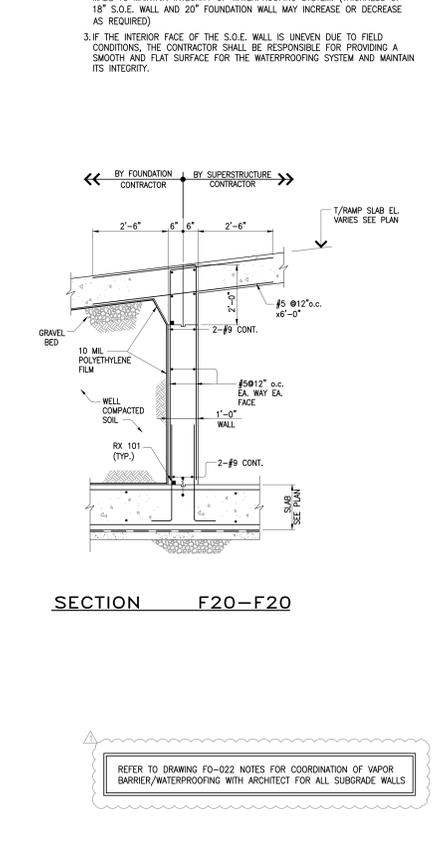
SECTION F17-F17
SCALE: 1/2"=1'-0"



SECTION F18-F18
SCALE: 1/2"=1'-0"



SECTION F19-F19
SCALE: 1/2"=1'-0"



SECTION F20-F20
SCALE: 1/2"=1'-0"

REFER TO DRAWING FO-022 NOTES FOR COORDINATION OF VAPOR BARRIER/WATERPROOFING WITH ARCHITECT FOR ALL SUBGRADE WALLS

PROJECT:
606 WEST 57TH STREET
RESIDENTIAL / MIXED USE DEVELOPMENT
WEST 57th STREET & 11th AVENUE
NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57, LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000

ARCHITECT:
SLCEArchitects, LLP
1359 BROADWAY
NEW YORK, NY 10018
TEL: (212) 979-9400
FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
100 FIFTH AVENUE
NEW YORK, NY 10011
TEL: (212) 254-2700
FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN
CONSULTING ENGINEERS, P.C.
485 SEVENTH AVENUE, SUITE 1510
NEW YORK, NY 10018
TEL: (212) 564-2424
FAX: (212) 564-6178

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
15 WEST 44TH STREET
NEW YORK, NY 10036
TEL: (212) 944-5566
FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN
LANDSCAPE ARCHITECTS, P.C.
120 BROADWAY SUITE 1040
NEW YORK, NY 10021
TEL: (212) 431-3609
FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
5 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 463-0334
FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
512 7th Avenue, 6th Floor
NEW YORK, NY 10018
TEL: (646) 484-3230
FAX: (646) 484-3231

GEOTECHNICAL AND CIVIL ENGINEERING:
THE RBA GROUP
27 UNION SQUARE WEST
NEW YORK, NY 10003
TEL: (212) 741-8090
FAX: (212) 633-1205

CODE CONSULTANT:
CONSTRUCTION CONSULTING ASS.
100 CHURCH STREET
NEW YORK, NY 10002
TEL: (212) 360-1818
FAX: (212) 360-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
FIVE CLIMAX ROAD
AVON, CONNECTICUT 06001
TEL: (800) 897-4051
FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
360 PARK AVENUE SOUTH
NEW YORK, NY 10010
TEL: (212) 689-5389
FAX: (212) 689-4449

LIGHTING DESIGNER:
BLISS FASMAN INC.
23 LEONARD STREET
NEW YORK, NY 10003
TEL: (212) 343-8400
FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
417 FIFTH AVENUE
NEW YORK, NY 10014
TEL: (212) 725-6800
FAX: (212) 725-6864

ENVIRONMENTAL CONSULTANT:
AKRF INC.
480 PARK AVENUE SOUTH
NEW YORK, NY 10016
TEL: (212) 496-0670
FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
387 PARK AVE SOUTH
NEW YORK, NEW YORK 10016
TEL: (212) 672-1000
FAX: (212) 901-4114

REVISIONS:

11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BUY
11/14/2014	REVISED AS NOTED
10/02/2014	UPDATED BID SET & REVISED AS NOTED FOR FND.
08/22/2014	BID SET REVISED AS NOTED FOR FOUNDATION
08/22/2014	REVISED AS NOTED
08/15/2014	ISSUED FOR PEER REVIEW
08/01/2014	FOR FOUNDATION BID
07/01/2014	SUBMITTAL

NO. DATE: REVISION:

NB#

KEY PLAN:

DRAWING TITLE:
FOUNDATION SECTIONS - 2

SEAL & SIGNATURE:

DATE: 07/21/2014
PROJECT NO.: 2013-26
DRAWN BY:
CHECKED BY:
DWG. NO.: FO-026.00
SHEET NO.: 8 OF 58
FILE NO.: R7_709-NS7_740-507.dwg

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57, LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-9400
 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 FIFTH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN CONSULTING ENGINEERS, P.C.
 485 SEVENTH AVENUE, SUITE 1510
 NEW YORK, NY 10018
 TEL: (212) 564-2424
 FAX: (212) 564-6678

M.E.P.P. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-5153

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3230
 FAX: (646) 484-3231

GEOTECHNICAL AND CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10002
 TEL: (212) 360-1818
 FAX: (212) 368-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06020
 TEL: (800) 897-4051
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-4449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSOM & WILKE, INC.
 417 FIFTH AVENUE
 NEW YORK, NY 10016
 TEL: (212) 725-6800
 FAX: (212) 725-0864

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 480 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 496-0670
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

11/14/2014	ISSUED FOR SUPERSTRUCTURE CONCRETE BUY	
09/22/2014	REVISED AS NOTED FOR FOUNDATION	
08/27/2014	REVISED AS NOTED	
06/15/2014	ISSUED FOR PEER REVIEW	
06/01/2014	FOR FOUNDATION BID	
05/01/2014	SUBMISSION	
No.	DATE	REVISION

D.I.B. NUMBER:
NB#

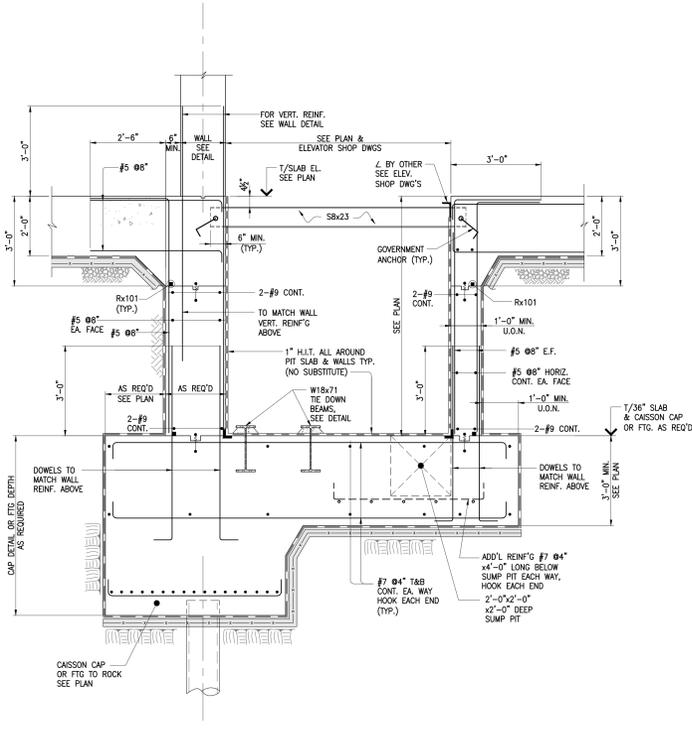
NORTH
 SCALE

KEY PLAN:

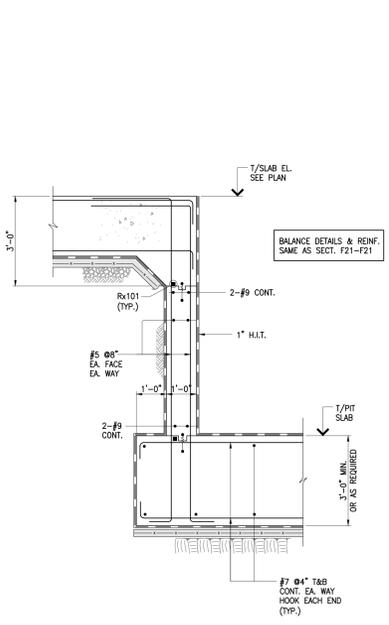
DRAWING TITLE:
FOUNDATION SECTIONS - 3

SEAL & SIGNATURE:

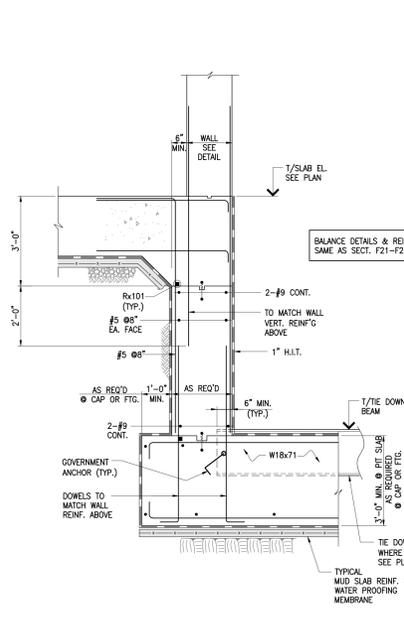
DATE: 07/21/2014
 PROJECT No.: 2013-26
 DRAWN BY:
 CHECKED BY:
 DWG. No.: **FO-027.00**
 SHEET No.: 9 OF 58
 FILE No.: R_7_105-057-FD-SECT.dwg



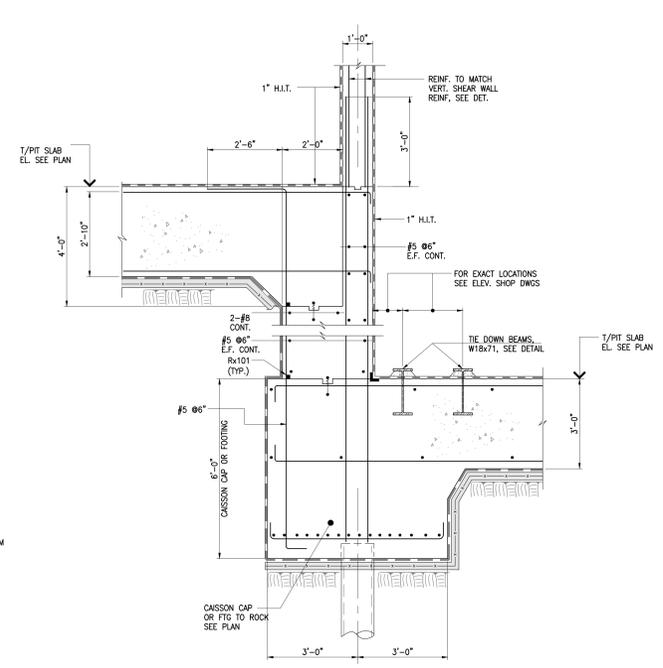
SECTION F21 - F21



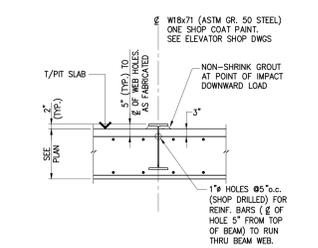
SECTION F22 - F22



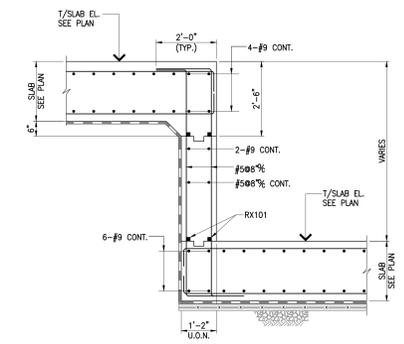
SECTION F23 - F23



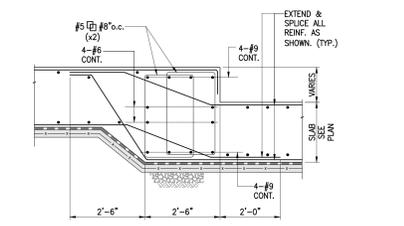
SECTION F24 - F24



TYPICAL ELEVATOR TIE DOWN BEAM DETAIL



SECTION F25 - F25 TYP. WALL DETAIL @ SLAB DROP



SECTION F26 - F26 TYP. SLAB DROP DETAIL

REFER TO DRAWING FO-022 NOTES FOR COORDINATION OF VAPOR BARRIER/WATERPROOFING WITH ARCHITECT FOR ALL SUBGRADE WALLS

GENERAL

- THESE DRAWINGS MAY BE USED FOR CONSTRUCTION ONLY IF RA CONSULTANTS LLC IS THE SPECIAL INSPECTION AGENCY.
- IF RA CONSULTANTS LLC HAS BEEN RELEASED OR HAS WITHDRAWN ITS RESPONSIBILITY FOR SPECIAL INSPECTIONS AND A FIRM OTHER THAN RA CONSULTANTS LLC IS ENGAGED BY THE OWNER, OWNERS REPRESENTATIVE, OR CONTRACTOR FOR SPECIAL INSPECTION OF THE DESIGN SHOWN ON THESE DRAWINGS, THEN WE REQUIRE THAT RA CONSULTANTS LLC BE RETAINED TO REVIEW THE INSPECTION AGENCY'S FIELD REPORTS AND FOR SITE VISITS BY OUR PERSONNEL DURING RELEVANT CONSTRUCTION ACTIVITIES.
- ALL ELEVATIONS ARE REFERENCED TO NAVD88 WHICH IS 1.1 FT ABOVE THE NATIONAL GEODETIC SURVEY VERTICAL DATUM OF 1929 (MEAN SEA LEVEL, SANDY HOOK, NEW JERSEY).
- BASE PLANS AND SECTIONS ARE DEVELOPED FROM:
 - SURVEY BY FEHINGER SURVEYING, P.C. DATED MARCH 27, 2013
 - STRUCTURAL DRAWINGS BY ROSENWASSER / GROSSMAN CONSULTING ENGINEERS RECEIVED MAY 29, 2014.
- SOIL DATA OBTAINED FROM:
 - REPORT OF GEOTECHNICAL INVESTIGATION FOR 606 WEST 57TH STREET BY RA CONSULTANTS LLC DATED FEBRUARY 11, 2014.
- LOCATION OF EXISTING AND PROPOSED CONDITIONS INCLUDING BUT NOT LIMITED TO FOUNDATION WALLS, FOOTINGS, AND SLAB LOCATIONS AND ELEVATIONS WERE TAKEN FROM STRUCTURAL AND ARCHITECTURAL DRAWINGS.
- LOCATIONS AND ELEVATIONS OF ALL PROPOSED STRUCTURAL BUILDING ELEMENTS SHOWN ON THIS DRAWING MAY BE APPROXIMATE AND SHALL BE SUPERSEDED BY FINAL STRUCTURAL AND ARCHITECTURAL DRAWINGS.
- IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE UTILITIES AND BELOW GROUND STRUCTURES IN THE AREA OF PRIOR TO COMMENCEMENT OF WORK.
- IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL DIMENSIONS IN THE FIELD. IF CONDITIONS OBSERVED IN THE FIELD DIFFER FROM THESE DRAWINGS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER TO EVALUATE THE CONDITION. MODIFICATIONS TO THESE DRAWINGS MAY BE NECESSARY.
- THESE DRAWINGS DO NOT ADDRESS SAFETY ISSUES RELATED TO THE EXCAVATION AND SHORING WORK. OTHERS SHALL BE RESPONSIBLE FOR SITE SAFETY AND PROVIDE A SAFETY PLAN CONFORMING TO OSHA AND ALL APPLICABLE LAWS.
- BARRIERS AND FENCING AROUND SITE MUST BE PROVIDED BY CONTRACTOR IN ACCORDANCE WITH NEW YORK CITY DEPARTMENT OF BUILDINGS AND ALL APPLICABLE LAWS.
- IF THE CONDITIONS OBSERVED AS THE EXCAVATION ADVANCES ARE DIFFERENT THAN THE CONDITIONS SHOWN ON THE DESIGN DRAWINGS, THE CONTRACTOR SHALL STOP WORK AND NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
- OBSERVED MOVEMENTS OF THE SUPPORT OF EXCAVATION OR OTHER STRUCTURES SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND ENGINEER.
- LOOSE AREAS OF FOUNDATION WALL OR FOOTINGS THAT ARE DAMAGED OR LOOSE SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR EVALUATION AND REMEDIAL MEASURES.
- PINS, WIRE MESH, AND PARGING MAY BE REQUIRED TO STABILIZE THE FOUNDATION WALL OR FOOTINGS.
- ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1 USING E-70 ELECTRODES.
- ALL STRUCTURAL STEEL SHALL BE GRADE 50, ASTM A-36.
- 1-8AG MIX SHALL CONSIST OF 1-84 LB. BAG OF CEMENT TO 1 CY OF SAND. QUANTITY OF WATER SHALL BE ADEQUATE TO ALLOW THE MIX TO FLOW.
- THE DESIGNS ON THESE DRAWINGS ARE INTENDED FOR TEMPORARY SUPPORT OF EXCAVATION ONLY.
- LINE DRILL ROCK ADJACENT TO EXISTING BUILDINGS PRIOR TO ROCK EXCAVATION.
- NOTIFY DOB 24- TO 48-HRS PRIOR TO EXCAVATION (RULE 52)

SURVEY AND MONITORING

- A PRE-CONSTRUCTION (PRE-CONDITION) SURVEY OF THE ADJACENT STRUCTURES SHALL BE DONE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REVIEW AND FAMILIARIZE HIMSELF WITH THE RESULTS OF THE SURVEY. THE CONTRACTOR SHALL MAKE A VISUAL RECORDATION OF THE ADJACENT STRUCTURES (INSIDE AND OUT) PRIOR TO STARTING THE WORK.
- MONITOR THE ADJACENT BUILDINGS AT ABOUT 25-FT INTERVALS FOR VERTICAL AND LATERAL MOVEMENT. NOTE THAT MONITORING LOCATIONS ARE NOT SHOWN ON THE SUPPORT OF EXCAVATION PLAN FOR CLARITY.
- BASELINE READINGS OF THE MONITORING POINTS SHALL BE OBTAINED PRIOR TO AND DURING EXCAVATION AND NEW CONSTRUCTION.
- PERFORM OPTICAL SURVEYS AT LEAST TWICE PER WEEK. IF MOVEMENTS OCCUR, INCREASE THE FREQUENCY OF THE READINGS AS DIRECTED BY THE ENGINEER.
- VIBRATION MONITORS (SEISMOGRAPHS) SHALL BE PLACED ADJACENT TO AREAS WHERE WORK IS BEING PERFORMED. NOTE THAT SEISMOGRAPH LOCATIONS ARE NOT SHOWN ON THE SUPPORT OF EXCAVATION PLAN FOR CLARITY.

NON-LANDMARK BUILDING MOVEMENT AND VIBRATION CRITERIA:

- IF THE VERTICAL OR LATERAL BUILDING MOVEMENT REACHES 1/4-INCH IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
- IF THE BUILDING MOVEMENT REACHES 1/2-INCH IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER.
- IF THE VIBRATIONS REACH 1/8 IPS (INCHES PER SECOND) THE CONSTRUCTION MANAGER AND ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
- IF THE VIBRATIONS EXCEED 2-IPS, IMMEDIATELY INFORM THE CONSTRUCTION MANAGER AND ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER.
- VIBRATION MONITORS SHALL TAKE REAL TIME READINGS.
- ALL MONITORING DATA SHALL BE PRESENTED TO THE CONSTRUCTION MANAGER AND ENGINEER AT THE END OF EACH DAY.

MATERIALS & TESTING

- THE OWNER/CONSTRUCTION MANAGER SHALL RETAIN THE SERVICES OF AN INDEPENDENT TESTING LABORATORY/COMPANY.
- CONCRETE PLACEMENT TIME SHALL NOT EXCEED 2-HOURS OR AS RECOMMENDED BY THE TESTING COMPANY.
- PERFORM ONE SLUMP TEST FOR EACH BATCH OF CONCRETE. SLUMP SHALL BE BETWEEN 4- AND 6-INCHES FOR UNDERPINNING.
- MAKE A SET OF 5 (MINIMUM) CYLINDERS OR CUBES EACH DAY CONCRETE IS CAST OR GROUT IS BEING PLACED.
- PERFORM COMPRESSION TEST ON 1 CYLINDER AT 7 DAYS AND 1 AT 14 DAYS. IF THE DESIGN STRENGTH IS ACHIEVED AT 14 DAYS, NO FURTHER TESTING IS REQUIRED. OTHERWISE TEST ONE OR TWO CYLINDERS, DEPENDING IF THE DESIGN STRENGTH IS ACHIEVED AT 28 DAYS. ONE OR TWO SAMPLES SHALL BE SAVED FOR 56 DAY TESTING. THE PREVIOUS CYLINDERS FAIL TO MEET DESIGN STRENGTH REQUIREMENTS.
- PROVIDE TESTING RESULTS TO THE CONSTRUCTION MANAGER AND/OR OWNER.
- IF THE DESIGN STRENGTH REQUIREMENTS ARE NOT MET, THE CONTRACTOR SHALL PERFORM REMEDIATION AS DIRECTED BY THE CONSTRUCTION MANAGER, AT NO ADDITIONAL COST TO THE OWNER.
- ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1 USING E-70 ELECTRODES.
- ALL STRUCTURAL STEEL SHALL BE GRADE 50, ASTM A-36.
- 1-8AG MIX SHALL CONSIST OF 1-84 LB. BAG OF CEMENT TO 1 CY OF SAND. QUANTITY OF WATER SHALL BE ADEQUATE TO ALLOW THE MIX TO FLOW.
- TIMBER LAGGING SHALL BE ROUGH CUT, FULL SIZE CONSTRUCTION GRADE, WITH A MINIMUM ALLOWABLE BENDING STRESS OF 1200-PSI. TIMBER SIZES SHOWN ARE ACTUAL SIZES.
- MISCELLANEOUS STEEL (PLATES AND WEDGES) SHALL BE ASTM A36.
- SOLDIER PILE AND LAGGING (DRILLED IN PILES)
- SOLDIER PILE CASING SHALL BE INSTALLED USING INTERNAL FLUSH DUPLEX DRILLING METHOD. DRILLING WITH AIR AS A FORM OF ADVANCING THE CASING WILL NOT BE PERMITTED. CONTRACTOR SHALL ADJUST DRILLING PROCEDURE AS REQUIRED TO PREVENT LOSS OF GROUND, SETTLEMENT AND/OR LATERAL MOVEMENT OF BUILDINGS, UTILITIES, AND OTHER STRUCTURES.
- NO LOSS OF MATERIAL FROM THE OUTSIDE OF THE SOLDIER PILE WILL BE PERMITTED. THE CONTRACTOR SHALL ADJUST DRILLING PROCEDURE AS REQUIRED TO PREVENT LOSS OF MATERIAL FROM AROUND THE OUTSIDE OF THE SOLDIER PILE.
- STEEL CASING SHALL HAVE A MINIMUM WALL THICKNESS OF 0.50-INCHES. SPLICES IN THE CASING SHALL BE THREADED AND FULLY WELDED.
- THE BOTTOM OF EACH DRILLED SOLDIER PILE SHALL BE PROTECTED BY A HIGH-STRENGTH CUTTING SHOE WITH HARDENED CUTTING EDGE.
- NO CONCRETE OR GROUT SHALL BE PLACED AT ANY SOLDIER PILE LOCATION UNTIL TIP ELEVATION HAS BEEN CONFIRMED. CLEANED OF MUD AND ANY EXTRANEOUS MATERIAL, AND INSPECTED AND APPROVED BY THE ENGINEER.
- CONCRETE OR GROUT SHALL BE PLACED CONTINUOUSLY FOR THE FULL DEPTH OF THE SOLDIER PILE STARTING AT THE BOTTOM AND UP TO THE DESIGNATED CUTOFF ELEVATION. NO COLD JOINT IS ALLOWED.
- FINAL DETERMINATION OF THE ELEVATION OF THE CAISSON TIP WILL BE DETERMINED BY THE ENGINEER.
- THE ENGINEER MAY DIRECT AN INCREASE IN SOLDIER PILE DEPTH FROM THAT SPECIFIED HEREIN OR AS SHOWN ON THE DRAWINGS IF EXISTING SOIL IS ENCOUNTERED ABOVE THE ORIGINAL MINIMUM TIP ELEVATION.
- NO SOLDIER PILE SHALL BE CUT OF PLUMBS MORE THAN ONE PERCENT (1%) OF ITS EMBEDDED LENGTH.
- IF ANY OF THE ABOVE TOLERANCES ARE EXCEEDED AND IN THE OPINION OF THE ENGINEER REQUIRE CORRECTIVE MEASURES, SUCH CORRECTIVE MEASURES, INCLUDING COSTS OF ENGINEERING AND REDESIGN, SHALL BE PAID FOR BY THE CONTRACTOR.
- BEFORE BRACING IS INSTALLED, MAXIMUM EXCAVATION BELOW BRACING LEVEL IS 2-FT FOR ANCHORS AND RAKERS UNLESS NOTED ON DRAWING.
- LAGGING SHALL BE INSTALLED AS THE EXCAVATION ADVANCES WITH A MAXIMUM DEPTH OF 2-FT PRIOR TO LAGGING.
- IF MATERIAL BEHIND LAGGING HAS BEEN LOST OR DISTURBED, LEAVE A 1- TO 1-1/2 INCH SPACE BETWEEN LAGGING BOARDS TO IMMEDIATELY BACKFILL OR GROUT.
- HAY OR FILTER FABRIC SHALL BE USED TO MINIMIZE MIGRATION OF FINES INTO THE EXCAVATION.

SOIL MIX WALL (SM)

- DESIGN MIX (A PRE-CONSTRUCTION, LABORATORY DESIGN MIX PROGRAM IS REQUIRED TO DETERMINE APPROPRIATE MATERIALS AND MATERIAL PROPORTIONS FOR THE REQUIRED SM PERFORMANCE. IN THE CASE OF CONTRACTOR PROPOSED, A CONTINUOUS STABILIZATION (E.G. SFL, TOLP, ETC.) MAY ALSO BE REQUIRED.)

IN ADDITION TO THE WORK PLAN, THE FOLLOWING SPECIFIC INFORMATION SHALL BE SUBMITTED PRIOR TO THE START OF SM CONSTRUCTION:

- SAMPLING PLAN. A DESCRIPTION OF THE METHODS AND LOCATIONS OF ALL SAMPLES USED IN THE DESIGN MIX TESTING. (GENERALLY, TEST BORINGS AND/OR TEST PITS ARE USED TO OBTAIN SOILS SAMPLES. MIXING WATER, LEACHATE (CEMENT, BENTONITE CLAY, ETC.) SHOULD ALSO BE OBTAINED AND TESTED.)
- LABORATORY SM GROUT MIX AND SM SOIL MIXTURES, INCLUDING GROUT INGREDIENTS, SOILS MIXED, AND INJECTION RATIOS. THE SM MIXTURE SUBMITTAL SHALL REPORT MOISTURE CONTENT AND UNCONFINED COMPRESSIVE STRENGTH (AND HYDRAULIC CONDUCTIVITY) ON AT LEAST [4] SAMPLES OF EACH PROPOSED DESIGN MIX. (NOTE: LABORATORY TESTING MAY BE REQUIRED UP TO 90 DAYS TO COMPLETE.) B. SOURCE OF ALL IMPORTED MATERIAL, INCLUDING, MIX WATER, CEMENT, BENTONITE AND ANY ADDITIVES. SHIPMENT OF MATERIALS TO THE SITE SHALL BE ACCOMPANIED BY THE VENDORS WRITTEN CERTIFICATION OF THE QUALITY OR SPECIFICATION OF THE MATERIAL.
- MATERIALS
 - GROUT: GROUT SHALL CONSIST OF A STABLE COLLOIDAL SUSPENSION OF CEMENT, BENTONITE OR OTHER ADITIVES IN WATER. THE PURPOSE OF THE GROUT IS TO ASSIST IN LOOSENING THE SOILS FOR MIXING AND TO MODIFY THE SOILS FOR BETTER STRENGTH PERMEABILITY, REDUCED LEACHATE PENETRATION, ETC.) THE GROUT SHALL BE PUMPABLE AND WORKABLE WITH THE SM INJECTION EQUIPMENT.
 - CEMENT: CEMENT USED IN PREPARING GROUT SHALL CONFORM TO ASTM C 150. THE CEMENT SHALL BE ADEQUATELY PROTECTED FROM OXIDATION AND CONTAMINATION IN STORAGE ON THE JOBSITE. RECLAIMED CEMENT OR CEMENT CONTAINING LUMPS OR DELETERIOUS MATTER SHALL NOT BE USED.
 - WATER: FRESH WATER, FREE OF EXCESSIVE AMOUNTS OF DELETERIOUS SUBSTANCES THAT ADVERSELY AFFECT THE MIXING AND USE OF THE GROUT SHALL BE USED TO MANUFACTURE GROUT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR THAT THE GROUT RESULTING FROM THE WATER SHALL ALWAYS MEET THE STANDARDS OF THIS SPECIFICATION.
 - ADDITIONS: ADMIXTURES MAY BE USED TO ENHANCE THE WORKABILITY OR FINAL PROPERTIES OF THE TREATED SOIL. COMMON ADDITIVES INCLUDE BENTONITE, FLY ASH, LIME, SET RETARDER, ETC.) ADDITIVES MAY BE ADDED TO THE WATER OR THE GROUT. PROPERLY CHEMICALS MAY BE APPROVED BASED ON THE RESULTS OF PRE-CONSTRUCTION TESTS. THE OWNERS REPRESENTATIVE SHALL APPROVE ALL ADDITIVES USED.
 - SM MATERIAL: THE MATERIAL FORMED BY MIXING THE GROUT WITH THE INSITU SOIL SHALL HAVE AN UNCONFINED COMPRESSIVE STRENGTH OF [TYPICALLY 25 TO 150 PSI MINIMUM] AT 28 DAYS [AND A PERMEABILITY OF [1 X10-6 CM/SEC.
- CONSTRUCTION OF THE SOIL MIX WALL SHALL BE CONSTRUCTED USING SM TO THE LINES, GRADES, AND CROSS SECTIONS INDICATED ON THE DRAWINGS. THE SM STRUCTURE SHALL BE ESSENTIALLY VERTICAL WITH A PATTERN OF OVERLAPPING COLUMNS AND SHALL EXTEND THROUGH THE UNDESIGNED AND KEY INTO THE DESIGNATED LAYER. A GENERALIZED DESCRIPTION OF THE SOIL PROFILE THROUGH WHICH THE SM IS TO BE CONSTRUCTED IS PROVIDED ON THE BORINGS LOGS SHOWN ON THESE DRAWINGS.
 - TOLERANCES: THE FOLLOWING TOLERANCES SHALL APPLY TO THE SM DIMENSIONS AND CONSTRUCTION
 - THE SM COLUMNS SHALL BE ESSENTIALLY VERTICAL. THE WORKING PLATFORM AND/OR CRANE SHALL BE LEVELLED TO BE PLUMB WITHIN [1%] OF VERTICAL, AND/OR THE KELLY BAR SHALL BE MEASURED TO BE WITHIN [1%] OF VERTICAL.
 - THE DEPTH OF THE SM COLUMNS SHALL BE MEASURED OR SURVEYED TO WITHIN [8 INCHES] OF THE DESIRED ELEVATION. THE DEPTH SHALL BE MEASURED FROM THE SURFACE TO THE BOTTOM OF THE MIXING AUGER/TOOL.
 - THE SM WALL SHALL FOLLOW THE DESIGNED ALIGNMENT WITHIN 1 FT OF THE CENTERLINE. THE SM WALL MAY VARY FROM THE DESIGNED ALIGNMENT TO ACCOMMODATE EQUIPMENT LIMITATIONS IF APPROVED BY THE ENGINEER.
 - THE SM PATTERN OF OVERLAPS SHALL BE SURVEYED AND STAKED TO ENSURE THAT THE OVERLAP RATIOS ARE CONSIDERED AS DESIGNED. THE CENTER OF EACH SM COLUMN SHALL BE CONSTRUCTED WITHIN [8] INCHES OF THE DESIGNATED LOCATION.
 - CONSTRUCTION WILL NOT BE PERMITTED WHEN THE AIR TEMPERATURE IS BELOW [20°F] OR WHEN SEVERE WEATHER CONDITIONS MAY COMPROMISE THE QUALITY OF THE WORK.
 - THE INJECTION RATIO SHALL BE CALCULATED AND CHECKED FOR EACH SM COLUMN. THE INJECTION RATIO MAY BE CORRECTED FOR PREVIOUS OVERLAPS IN THE SAME COLUMN. IN ALL CASES, THE MINIMUM INJECTION RATIO SHALL BE OBSERVED. THERE SHALL BE NO MAXIMUM INJECTION RATIO.
- EQUIPMENT
 - SM MACHINE: GENERALLY, THE SM MACHINE CONSISTS OF A CRANE-MOUNTED DRIVE TABLE (TURNABLE) THAT HAS A HOLLOW KELLY BAR. THE TOP OF THE KELLY BAR IS ATTACHED TO A GROUT SWIVEL TO PERMIT THE INJECTION OF GROUT THROUGH THE BAR, AND THE BOTTOM OF THE KELLY BAR IS ATTACHED TO THE MIXING AUGER/TOOL. THE MIXING TOOL HAS A SERIES OF HOLES OR JETS TO PERMIT THE DISCHARGE OF GROUT INTO THE SOIL. THE MIXING TOOL MAY BE CONFIGURED WITH MIXING PADDLES OR SPECIAL TEETH TO BE CAPABLE OF BLENDING THE SOIL AND GROUT INTO A HOMOGENEOUS MIXTURE. THE POWER SOURCE FOR THE DRIVE TABLE SHALL BE SUFFICIENT TO MAINTAIN THE REQUIRED PENETRATION RATE AND MIXING SPEED FROM A STOPPED POSITION AT THE DEPTHS SPECIFIED.
 - GROUT MIXING PLANT: THE GROUT MIXING PLANT SHALL INCLUDE THE NECESSARY EQUIPMENT INCLUDING A HIGH SHEAR MIXER CAPABLE OF PRODUCING A COLLOIDAL SUSPENSION OF CEMENT AND ADDITIVES IN WATER AND PUMPS, VALVES, HOSES, SUPPLY LINES, AND ALL OTHER EQUIPMENT AS REQUIRED TO ADEQUATELY SUPPLY GROUT TO THE MIXING TOOL. POSITIVE DISPLACEMENT GROUT PUMPS SHALL BE USED TO TRANSFER THE GROUT TO THE MIXING AUGER. THE GROUT PUMP SHALL BE CAPABLE OF PUMPING THE REQUIRED DISTANCE AND ELEVATIONS TO PROVIDE AN ADEQUATE SUPPLY OF GROUT TO THE MIXING TOOL. THE PLANT SHALL BE EQUIPPED TO ACCEPT DRY OR LIQUID ADDITIVES IN MEASURED AMOUNTS. STORAGE TANKS (OR PONDS) SHALL BE PROVIDED [AS NEEDED] TO STORE TO ALLOW FOR AN ADEQUATE SUPPLY OF BATCHES OR CONTINUOUSLY MIXED GROUT TO THE SM MACHINE. GROUT SHALL BE AGITATED UNTIL FULLY MIXED AND RECIRCULATED IN THE STORAGE TANKS TO MAINTAIN A HOMOGENEOUS MIX AND PREVENT FLASH SET. GROUT METERS OR CALIBRATED TANKS SHALL BE PROVIDED TO MEASURE INJECTION VOLUMES.
 - INSITU SAMPLING TOOL: A SPECIAL SAMPLING TOOL WILL BE PROVIDED BY THE CONTRACTOR FOR OBTAINING SAMPLES OF THE WET, MIXED SOIL AT DEPTH IN THE SM COLUMN. THE SAMPLER SHALL CONSIST OF A WEIGHTED CHAMBER, WHICH CAN BE OPENED AND CLOSED FROM THE SURFACE TO OBTAIN MIXED SOIL AND GROUT. THE SAMPLER MAY BE ATTACHED TO THE SM MACHINE OR SUPPORTED BY A SECOND MACHINE.

EXECUTION OF THE WORK

- ALIGNMENT:
 - THE CONTRACTOR SHALL ACCURATELY STAKE THE ALIGNMENT OF THE PROPOSED SOIL MIX CONSTRUCTION, AS SHOWN ON THE DRAWINGS.
- TWO SETS OF CONTROL LINES (E.G. EAST-WEST AND NORTH-SOUTH) SHALL BE ESTABLISHED BY SURVEY OUTSIDE THE LIMITS OF THE WORK. THE CENTER OF EACH SM COLUMN SHALL BE MEASURED (OR ESTABLISHED BY STRING LINES BETWEEN THE CONTROL LINES) FROM THESE CONTROL LINES BASED ON A DRAWING OF THE OVERLAP PATTERN. (ALTERNATELY, A MULTIPLE LASER GRID SYSTEM OR OTHER REMOTE SURVEY DEVICE MAY BE USED). THE SM WALL SHALL ADVANCE STEPWISE, USING PRIMARY, SECONDARY, ETC. COLUMN AND OVERLAPPING PORTIONS OF PREVIOUSLY COMPLETED COLUMNS TO ENSURE A PROPER OVERLAP AND CONTINUITY.

COLUMN DEPTH:

- THE DEPTH OF THE SM COLUMNS WALL SHALL BE DETERMINED BY THE LINES AND GRADES SHOWN ON THE DRAWINGS AND BASED ON PRE-CONSTRUCTION SOIL BORINGS. THE ENGINEER MAY OBSERVE THE POWER USAGE OF THE SM MACHINE AS AN AID IN VERIFYING THE PROPER DEPTH.
- THE TOTAL DEPTH OF PENETRATION SHALL BE MEASURED AND RECORDED ON EACH COLUMN. THE DEPTH MAY BE OBSERVED BY PRE-MEASURED MARKS ON THE KELLY BAR OR SURVEY OF A FIXED POINT ON THE KELLY BAR. THE DEPTH OF EACH COLUMN SHALL BE MEASURED FROM THE BOTTOM OF THE AUGER TO THE EMBEDDED LENGTH.
- THE DEPTH OF THE SM COLUMN MAY BE INCREASED OR DECREASED BASED ON FIELD CONDITIONS IF DIRECTED BY RA CONSULTANTS LLC.

OBSTRUCTIONS: IF OBSTRUCTIONS INCLUDING BOULDERS, EXISTING PILES (TIMBER OR OTHERWISE), BEDROCK OR OTHER POTENTIALLY DAMAGING MATERIALS ARE ENCOUNTERED, THE SM OPERATOR SHALL STOP DRILLING UNTIL THE NATURE OF THE OBSTRUCTION IS KNOWN. OBSTRUCTIONS, WHICH CANNOT BE PENETRATED, MAY BE REMEDIATED BY REMOVAL, GROUTING OR OTHER ACCEPTABLE MEANS.

GROUT PLANT: THE GROUT PLANT SHALL CONSIST OF A SLURRY MIXER, TRANSFER PUMPS, STORAGE TANKS, METERING, PROPORTIONING (OR WEIGHING) EQUIPMENT AND OTHER EQUIPMENT, AS NEEDED. THE PROPORTIONING EQUIPMENT MAY USE METERS, WEIGHTS OR WEIGHT VOLUMES TO ENSURE PROPER PROPORTIONS. THE DENSITY (AND VISCOSITY) OF THE GROUT SHALL BE MONITORED AND RECORDED, AS PER THE QUALITY CONTROL PLAN TO VERIFY GROUT PROPORTION. WEIGHING EQUIPMENT SHALL BE CALIBRATED TO WITH 2% AT THE BEGINNING OF THE PROJECT AND VERIFIED MONTHLY THEREAFTER.

SOIL MIXING AND PENETRATION: EACH SOIL COLUMN SHALL BE PENETRATED WHILE SIMULTANEOUSLY INJECTING GROUT AND THEN MIXED BY REPEATED PASSES OF THE MIXING AUGER. THE NUMBER OF MIXING PASSES SHALL BE MONITORED AND RECORDED FOR EACH COLUMN TO ENSURE ADEQUATE MIXING. THE MIXING ROTATION SPEED SHALL BE ADJUSTED TO ACCOMMODATE DRILL CONDITIONS BASED ON THE DEGREE OF DRILLING DIFFICULTY. ADDITIONAL MIXING OR PASSES MAY BE REQUIRED TO EVENLY DISTRIBUTE THE GROUT THROUGHOUT THE COLUMN AFTER THE INITIAL PENETRATION. THE ROTATION SPEED SHALL BE INCREASED TO MAXIMIZE MIXING.

INJECTION RATE: THE GROUT INJECTION RATE SHALL BE MONITORED AND RECORDED FOR EACH COLUMN AND ADJUSTED AS NECESSARY FOR MINIMUM DRILLING RESISTANCE AND TO ACCOMMODATE THE DESIGN MIX. THE MINIMUM INJECTION RATE SHALL BE CALCULATED FOR EACH STROKE BASED ON THE VOLUME OF UNMIXED SOIL IN THE COLUMN (WHETHER PRIMARY OR SECONDARY, ETC.). THE DENSITY OF THE SOIL, AND THE VOLUME OF GROUT REQUIRED TO ACHIEVE THE DESIGN MIX PROPORTIONS. THE FLOW OF GROUT THROUGH KELLY BAR SHALL BE VERIFIED PRIOR TO EACH STROKE BY OBSERVING THE FLOW OUT OF THE MIXING AUGER. IT IS SUSPENDED IN THE AIR ABOVE COLUMN, ANY BLOCKAGE IN MIXING AUGER OR KELLY BAR SHALL BE CLEARED PRIOR TO INJECTION AND MIXING.

SWELL MANAGEMENT: THE CONTRACTOR SHALL PLACE, REGRADE, AND OTHERWISE MANAGE EXCESS MATERIALS RESULTING FROM THE SM TREATMENT. THESE MATERIALS SHALL BE PLACED OVER THE SM MATERIALS (OR OTHER DESIGNATED AREA) IN A MANNER SO THAT THE FINAL SM MATERIAL PROPERTIES ARE STABLE. THE OWNER SHALL NOT BE RESPONSIBLE FOR RETREATMENT OF SWELL THAT IS IMPROPERLY MANAGED.

QUALITY CONTROL: THE CONTRACTOR SHALL MAINTAIN HIS OWN QUALITY CONTROL FOR THE SM WALL CONSTRUCTION UNDER THE DIRECTION OF THE SM SPECIALIST. TESTING REQUIREMENTS ARE SUMMARIZED HEREIN.

- SM WALL CONTINUITY AND DEPTH: THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEMONSTRATING TO THE SATISFACTION OF THE ENGINEER THAT THE WORK IS CONTINUOUS AND EXTENDS TO THE MINIMUM SPECIFIED DEPTH. RA CONSULTANTS LLC WILL BE AVAILABLE ON SITE TO VERIFY THESE MEASUREMENTS. SM CONTINUITY SHALL BE ASSURED BY AN OVERLAPPING PATTERN OF THE SM COLUMNS CONSTRUCTED IN ACCORDANCE WITH THESE DRAWINGS.
- MATERIALS: ALL PERMANENT MATERIALS SHALL BE CERTIFIED BY THE MANUFACTURER TO COMPLY WITH THE SPECIFIED STANDARD. CERTIFICATES OF COMPLIANCE WITH THE SPECIFICATION SHALL ACCOMPANY EACH TRUCKLOAD OF MATERIALS RECEIVED ON SITE.
- GROUT: A SERIES OF TESTS SHALL BE CONDUCTED AT THE MIXER OR HOLDING TANK CONTAINING FRESH GROUT READY FOR INJECTION INTO THE SOIL. TESTS SHALL INCLUDE DENSITY OR WEIGHT OF EACH MATERIAL TO ENSURE THAT THE SPECIFIED DESIGN MIX IS PROPERLY PREPARED FOR INJECTION INTO THE SOILS.
- SOIL MIXED MATERIAL: SAMPLES OF THE SOIL MIXED MATERIALS SHALL BE OBTAINED WITH THE INSITU SAMPLER, FORMED INTO TEST CYLINDERS, CURED AND TESTED. A SERIES OF TEST CYLINDERS SHALL BE MADE AT LEAST ONCE EVERY DAY. THE SOIL MIXED MATERIAL SHALL BE TESTED AT 7 AND 28 DAYS AFTER SAMPLING AND EXHIBIT AN UNCONFINED COMPRESSIVE STRENGTH OF 200 PSI AT 28 DAYS AND A PERMEABILITY OF 1 X 10-6 CM/SEC.
- DOCUMENTATION: ALL QUALITY CONTROL RECORDS, TEST, AND INSPECTIONS SHALL BE DOCUMENTED BY THE CONTRACTOR AND AVAILABLE FOR REVIEW BY RA CONSULTANTS LLC. THE CONTRACTOR SHALL RECORD ALL MEASUREMENTS AND TEST RESULTS FOR SUBMITTAL TO RA CONSULTANTS LLC EACH DAY.
- ALL PERMANENT MATERIALS SHALL BE CERTIFIED BY THE MANUFACTURER TO COMPLY WITH THE SPECIFIED STANDARD. CERTIFICATES OF COMPLIANCE WITH THE SPECIFICATION SHALL ACCOMPANY EACH TRUCKLOAD OF MATERIALS RECEIVED ON SITE.
- THE WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARDS, SPECIFICATIONS, AND CODES OF JURISDICTIONAL AUTHORITIES.
- THE DEWATERING SYSTEM SHALL LOWER GROUNDWATER BY 2-FT BELOW SUBGRADE AS SHOWN ON THESE DRAWINGS.
- GROUNDWATER MUST BE MAINTAINED BELOW THE SUBGRADE LEVELS UNTIL BASEMENT SLAB IS POURED, WATERPROOFED AND A SUFFICIENT STRUCTURE WEIGHT IS BUILT IN PLACE TO OVERCOME THE UPLIFT PRESSURE BENEATH THE SLAB.
- SURFACE AREAS ADJACENT TO EXCAVATIONS SHALL BE GRADED TO PREVENT DRAINAGE OF SURFACE WATER INTO THE EXCAVATIONS.
- THE DEWATERING SYSTEM SHALL BE INSTALLED AND OPERATED IN SUCH A MANNER AS TO AVOID MOVEMENT OF FINES OR LOSS OF GROUND AND SHALL NOT INFLUENCE THE STABILITY OF SURROUNDING AREAS.
- THE CONTRACTOR IS RESPONSIBLE FOR MONITORING THE DEWATERING EFFORTS TO DETERMINE IF THE DEWATERING REQUIREMENTS ARE BEING MET.
- THE DEWATERING PROGRAM SHALL BE MODIFIED BY THE CONTRACTOR AS NECESSARY TO ACHIEVE THE DEWATERING REQUIREMENTS.

SHEET PILE WALL

- SHEET PILES SHALL BE INSTALLED PRIOR TO CONSTRUCTION OF SOIL MIX PILES.
- VIBRATE SHEET PILES TO PROPER ELEVATION. DRIVING WILL NOT BE PERMITTED.
- MONITOR VIBRATION OF ADJACENT BUILDING AND MODIFY INSTALLATION PROCEDURE AS NECESSARY NOT TO EXCEED VIBRATION LIMITS.
- NO SHEET PILE SHALL BE CUT OF PLUMBS MORE THAN ONE PERCENT (1%) OF ITS EMBEDDED LENGTH.
- IF THE ABOVE TOLERANCES ARE EXCEEDED AND IN THE OPINION OF THE ENGINEER REQUIRE CORRECTIVE MEASURES, SUCH CORRECTIVE MEASURES, INCLUDING COSTS OF ENGINEERING AND REDESIGN, SHALL BE PAID FOR BY THE CONTRACTOR.
- BEFORE BRACING IS INSTALLED, MAXIMUM EXCAVATION BELOW BRACING LEVEL IS 2-FT UNLESS NOTED ON DRAWING.

SPECIAL INSPECTIONS

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

LIST OF DRAWINGS

NO.	DATE	DESCRIPTION
1 OF 13	SOE-001	SUPPORT OF EXCAVATION NOTES
2 OF 13	SOE-100	SUPPORT OF EXCAVATION PLAN
3 OF 13	SOE-200	SUPPORT OF EXCAVATION ELEVATIONS
4 OF 13	SOE-201	SUPPORT OF EXCAVATION ELEVATIONS
5 OF 13	SOE-202	SUPPORT OF EXCAVATION ELEVATIONS
6 OF 13	SOE-203	SUPPORT OF EXCAVATION ELEVATIONS
7 OF 13	SOE-300	SUPPORT OF EXCAVATION SECTIONS
8 OF 13	SOE-301	SUPPORT OF EXCAVATION SECTIONS
9 OF 13	SOE-302	SUPPORT OF EXCAVATION SECTIONS
10 OF 13	SOE-303	SUPPORT OF EXCAVATION SECTIONS
11 OF 13	SOE-304	SUPPORT OF EXCAVATION SECTIONS
12 OF 13	SOE-305	SUPPORT OF EXCAVATION SECTIONS
13 OF 13	SOE-400	SUPPORT OF EXCAVATION DETAILS

HOLLOW BAR TIE-BACK INSTALLATION

- CEMENT GROUT SHALL BE UTILIZED TO FLUSH THE DRILL CUTTINGS FROM THE BOREHOLE AND STABILIZE THE BOREHOLE DURING INSTALLATION.
- GROUT PRESSURE SHALL BE HIGH ENOUGH TO OBTAIN CIRCULATION AT ALL TIME WITH A SMALL AMOUNT OF GROUT AND SOIL CUTTING RETURN.
- DRILLING WITH AIR AS A MEANS OF ADVANCING OR REMOVING CUTTINGS FROM THE BOREHOLE WILL NOT BE ALLOWED.
- ALL TIE-BACKS SHALL BE PROOF AND/OR PERFORMANCE TESTED IN ACCORDANCE WITH PTI RECOMMENDATIONS AND GUIDELINES.
- TIE-BACK SOIL/GROUT BOND ZONE LENGTH AND DIAMETER IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DESIGN THE GROUT MIX AND INCREASE OR DECREASE THE SOIL/GROUT BOND ZONE AND/OR DIAMETER TO CONSTRUCT A TIE-BACK THAT MEETS THE REQUIRED DESIGN LOAD AND PASSES PTI PROOF/PERFORMANCE TEST.
- CONTRACTOR SHALL LOCATE THE EXTENT OF THE PILE CAPS FOR THE NEW SCHOOL BUILDING AT 425 EAST 38TH STREET AND TAKE ALL PRECAUTIONS TO NOT DAMAGE THE EXISTING PILES BELOW THE SCHOOL.
- SHOP DRAWINGS SHALL BE PROVIDED SHOWING THE EXACT LOCATION OF THE TIE-BACKS, THE LOCATION OF THE EXISTING PILES, AND THE LOCATION OF THE PROPOSED TIE-BACKS IN PLAN AND SECTION.

EXCAVATION & SHORING

- IF SOILS RUN DURING THE EXCAVATION, GROUTING MAY BE REQUIRED TO STABILIZE SOIL AT UNDERPINNING PITS BY USING SODIUM SILICATE OR MICRO-FINE CEMENT. GROUT MIX DESIGN, EQUIPMENT, DRILLING PROCEDURE, AND SEQUENCE SHALL BE PERFORMED BY THE CONTRACTOR AND SUBMITTED FOR REVIEW.
- TIMBER LAGGING SHALL BE ROUGH CUT, FULL SIZE CONSTRUCTION GRADE, WITH A MINIMUM ALLOWABLE BENDING STRESS OF 1200-PSI. TIMBER SIZES SHOWN ARE ACTUAL SIZES.
- DEPTH OF EXCAVATION BELOW PREVIOUSLY INSTALLED LAGGING BOARDS SHALL NOT EXCEED 18-INCHES. MAINTAIN TIGHT CONTACT BETWEEN SOIL AND LAGGING BOARDS. IF MATERIAL IS CAVING INTO EXCAVATION, DECREASE THE UNBRACED EXCAVATION DEPTH AND/OR GROUT THE MATERIAL TO MINIMIZE LOSS.
- IF MATERIAL BEHIND LAGGING HAS BEEN LOST OR DISTURBED, LEAVE A 1- TO 1-1/2 INCH SPACE BETWEEN LAGGING BOARDS TO IMMEDIATELY BACKFILL OR GROUT.

DEWATERING SPECIFICATION

- THE CONTRACTOR SHALL SUBMIT A PROPOSED DEWATERING PLAN FOR REVIEW BY RA CONSULTANTS LLC PRIOR TO START OF EXCAVATION OPERATIONS.
- THE CONTRACTOR SHALL PROVIDE LABOR, MATERIAL, EQUIPMENT AND SERVICES NECESSARY TO PERFORM DEWATERING TO ALLOW EXCAVATION IN DRY AND MAINTAIN THE SUBGRADE STABILITY.
- THE CONTRACTOR SHALL PROVIDE ALL DEWATERING NECESSARY TO KEEP THE CONSTRUCTION AND WORK AREAS DRY FROM GROUNDWATER OR FROM SURFACE WATER.
- THE CONTRACTOR SHALL DESIGN, INSTALL, OPERATE AND MAINTAIN AN ADEQUATE SYSTEM. THE SYSTEM SHALL BE OF SUFFICIENT SIZE AND CAPACITY TO MAINTAIN DRY CONDITIONS WITHOUT DELAY TO CONSTRUCTION OPERATIONS.
- THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS INCLUDING WELL PERMITS AND GROUNDWATER DISCHARGE PERMITS.
- THE TEMPORARY DEWATERING SYSTEMS SHALL BE DESIGNED AND INSTALLED USING ACCEPTED AND PROFESSIONAL METHODS OF DESIGN AND CONSTRUCTION CONSISTENT WITH THE CURRENT STATE-OF-PRACTICE IN THE FIELD.
- THE WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARDS, SPECIFICATIONS, AND CODES OF JURISDICTIONAL AUTHORITIES.
- THE DEWATERING SYSTEM SHALL LOWER GROUNDWATER BY 2-FT BELOW SUBGRADE AS SHOWN ON THESE DRAWINGS.
- GROUNDWATER MUST BE MAINTAINED BELOW THE SUBGRADE LEVELS UNTIL BASEMENT SLAB IS POURED, WATERPROOFED AND A SUFFICIENT STRUCTURE WEIGHT IS BUILT IN PLACE TO OVERCOME THE UPLIFT PRESSURE BENEATH THE SLAB.
- SURFACE AREAS ADJACENT TO EXCAVATIONS SHALL BE GRADED TO PREVENT DRAINAGE OF SURFACE WATER INTO THE EXCAVATIONS.
- THE DEWATERING SYSTEM SHALL BE INSTALLED AND OPERATED IN SUCH A MANNER AS TO AVOID MOVEMENT OF FINES OR LOSS OF GROUND AND SHALL NOT INFLUENCE THE STABILITY OF SURROUNDING AREAS.
- THE CONTRACTOR IS RESPONSIBLE FOR MONITORING THE DEWATERING EFFORTS TO DETERMINE IF THE DEWATERING REQUIREMENTS ARE BEING MET.
- THE DEWATERING PROGRAM SHALL BE MODIFIED BY THE CONTRACTOR AS NECESSARY TO ACHIEVE THE DEWATERING REQUIREMENTS.

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
 606 WEST 57 LLC
 387 PARK AVE SOUTH NEW YORK, NEW YORK 10016 TEL: (212) 672-1000 FAX: (212) 672-1006

ARCHITECT:
SLC Architects, LLP
 1359 BROADWAY NEW YORK, NY 10018 TEL: (212) 979-8400 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 FIFTH AVENUE NEW YORK, NY 10011 TEL: (212) 254-2700 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
ROSENWASSER / GROSSMAN CONSULTING ENGINEERS, P.C.
 485 7th AVENUE, SUITE 1510 NEW YORK, NY 10018 TEL: (212) 564-0424 FAX: (212) 564-6478

M.E.P.F.F. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET NEW YORK, NY 10036 TEL: (212) 944-5566 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
MATHEWS NIELSEN LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040 NEW YORK, NY 10021 TEL: (212) 431-3609 FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST NEW YORK, NY 10003 TEL: (212) 463-0334 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 4TH FLOOR NEW YORK, NY 10018 TEL: (646) 484-2520 FAX: (646) 484-2521

CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST NEW YORK, NY 10003 TEL: (212) 741-8090 FAX: (212) 433-1255

CODE CONSULTANT:
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET NEW YORK, NY 10007 TEL: (212) 385-1818 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 575 CLAWSON ROAD AVON, CONNECTICUT 06001 TEL: (800) 897-4918 FAX: (860) 897-4918

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH NEW YORK, NY 10010 TEL: (212) 689-5389 FAX: (212) 689-5449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET NEW YORK, NY 10013 TEL: (212) 343-8400 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 8TH AVENUE NEW YORK, NY 10014 TEL: (212) 735-6800 FAX: (212) 735-5844

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 460 PARK AVENUE SOUTH NEW YORK, NY 10016 TEL: (212) 694-0670 FAX: (212) 728-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH NEW YORK, NEW YORK 10016 TEL: (212) 672-1000 FAX: (212) 901-6114

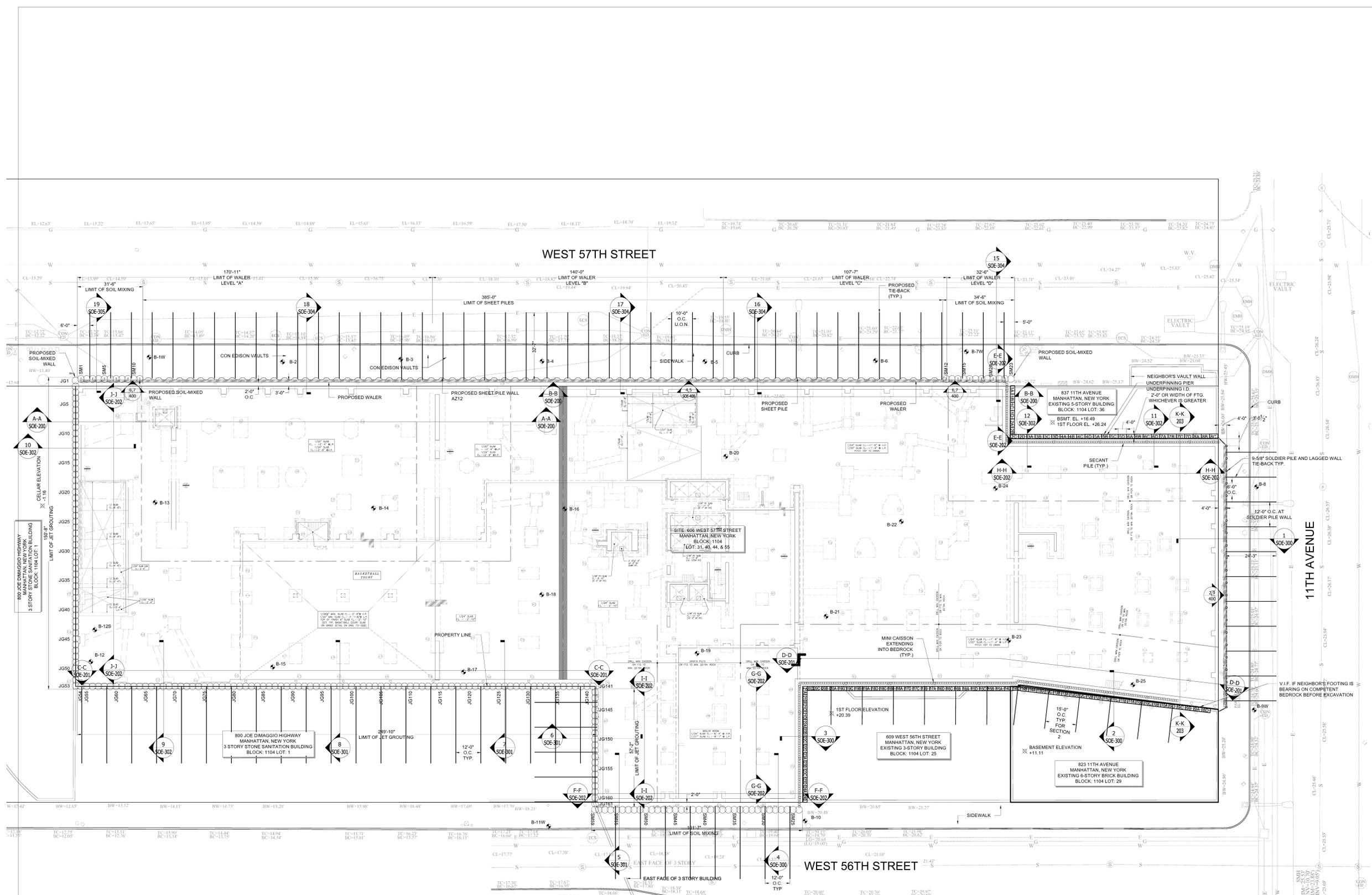
KEY PLAN:

DRAWING TITLE:
SUPPORT OF EXCAVATION NOTES

SEAL & SIGNATURE:

DATE: 2012-06
 DRAWN BY: PS, JCR
 CHECKED BY: WJP
 DWG. NO.: **SOE-001.00**
 SHEET NO.: **1 OF 13**

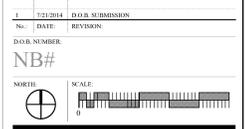
FILE NO.:



NOTES:
 1. REFER TO SOE-001 FOR LIST OF DRAWINGS AND GENERAL NOTES

LEGEND:
 BORING LOCATION
 ELEVATION (NAVD88)

UNDERPINNING CONSTRUCTION SEQUENCE:
 UNDERPINNING PIERS SHALL BE CONSTRUCTED UNDER THE FULL TIME OBSERVATION OF RA CONSULTANTS LLC AND IN ACCORDANCE WITH PROCEDURES OUTLINED ON SOE-300 AND NOTES ON SOE-001. RA CONSULTANTS LLC MAY MODIFY THE SEQUENCE BASED ON FIELD CONDITIONS.
 1. AT ALL PIERS, EXCAVATE TO SUBGRADE ELEVATION CALLED OUT ON APPLICABLE SECTIONS OR AS DIRECTED BY RA CONSULTANTS LLC. IF BEDROCK IS ENCOUNTERED, CONSTRUCT CONVENTIONAL UNDERPINNING PIER. IF BEDROCK IS NOT ENCOUNTERED, CONSTRUCT JACKED PILE UNDERPINNING PIER.
 2. CONSTRUCT "A" PIERS AND WAIT TO CURE.
 3. SHIM, WEDGE, AND DRYPACK "A" PIERS (IF CONVENTIONAL PIER).
 4. CONSTRUCT "B" PIERS AND WAIT TO CURE.
 5. SHIM, WEDGE, AND DRYPACK "B" PIERS (IF CONVENTIONAL PIER).
 6. CONSTRUCT "C" PIERS AND WAIT TO CURE.
 7. SHIM, WEDGE, AND DRYPACK "C" PIERS (IF CONVENTIONAL PIER).
 8. CONSTRUCT "D" PIERS AND WAIT TO CURE.
 9. SHIM, WEDGE, AND DRYPACK "D" PIERS (IF CONVENTIONAL PIER).



SEAL & SIGNATURE:
 DATE: 2023-06
 DRAWN BY: PS, JH
 CHECKED BY: WJ
 DWG. No.:
SOE-100.00
 SHEET No.: **2 OF 13**
 FILE No.:

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE
 DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57 LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
 1159 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8000
 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 8TH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
**ROSENWASSER / GROSSMAN
 CONSULTING ENGINEERS, P.C.**
 485 7TH AVENUE, SUITE 1510
 NEW YORK, NY 10018
 TEL: (212) 564-2424
 FAX: (212) 564-6678
 M.E.P.F. ENGINEER:

I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
**MATHEWS NIELSEN
 LANDSCAPE ARCHITECTS, P.C.**
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3250
 FAX: (646) 484-3251

CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 385-1818
 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4031
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSON & WILKE, INC.
 417 88TH AVENUE
 NEW YORK, NY 10014
 TEL: (212) 725-6800
 FAX: (212) 725-0604

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 694-0670
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

NO.	DATE	REVISION
1	7/21/2014	DWG. SUBMISSION

DWG. NUMBER:
NB#

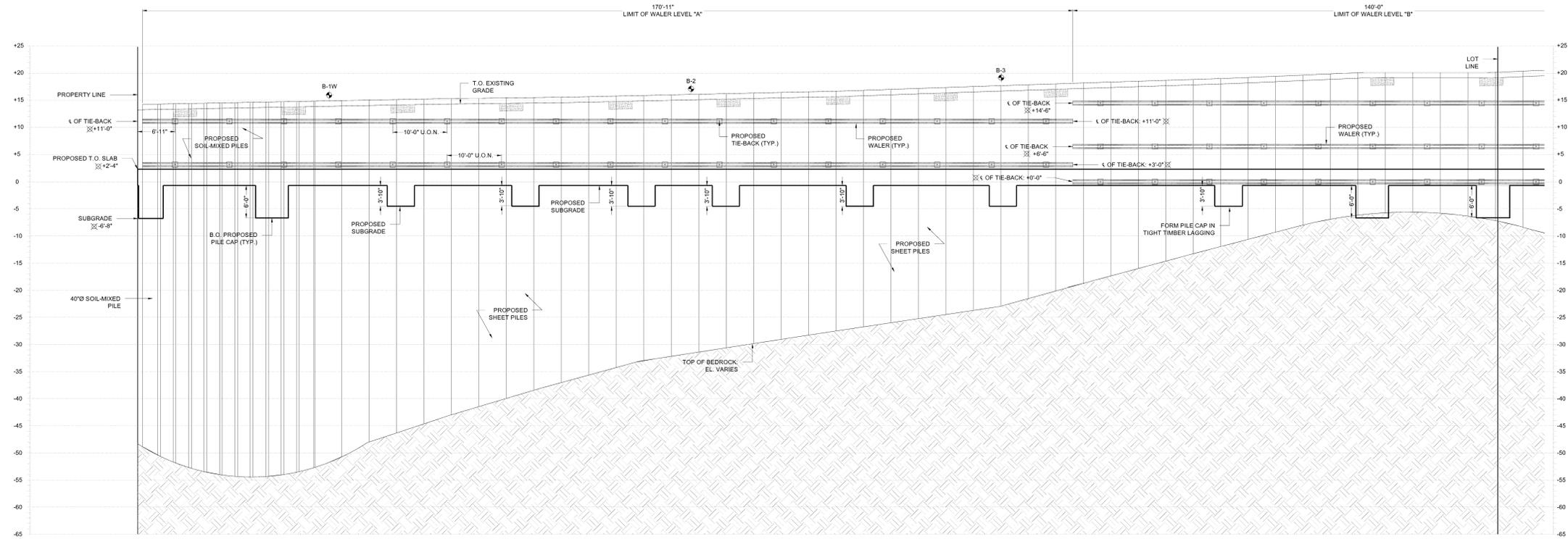
KEY PLAN:


DRAWING TITLE:
ELEVATION

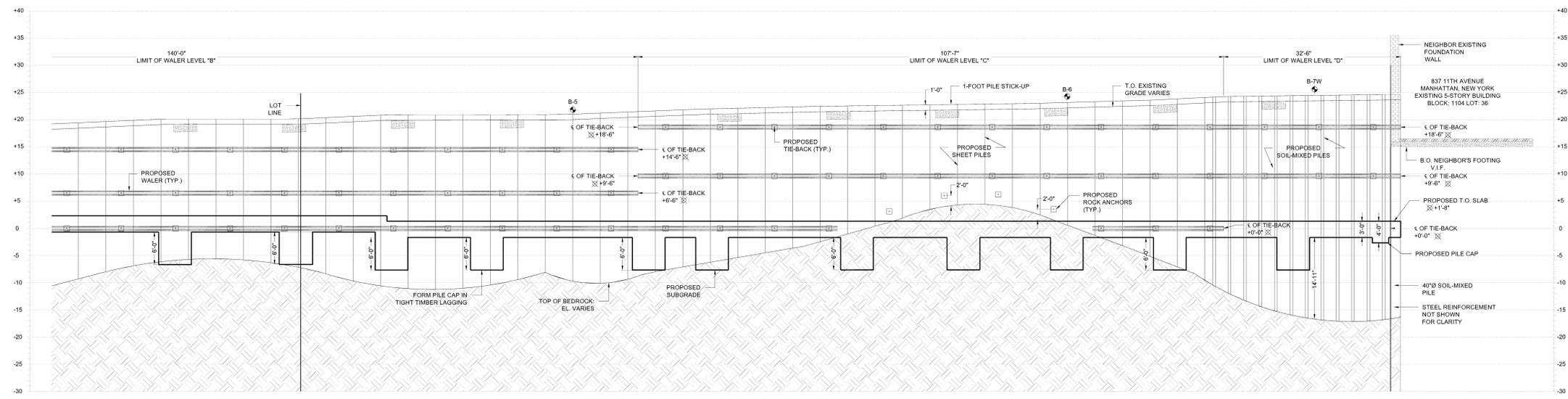
SEAL & SIGNATURE:

 DATE: 2015-26
 DRAWN BY: P.L.H.C./B
 CHECKED BY: W/P
 DWG. No.: **SOE-200.00**
 SHEET No.: **3 OF 13**

FILE No:



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



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

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE
 DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
606 WEST 57 LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
 1359 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8400
 FAX: (212) 979-8387

DESIGN ARCHITECT:
ARQUITECTONICA
 100 8TH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
**ROSENWASSER / GROSSMAN
 CONSULTING ENGINEERS, P.C.**
 485 7TH AVENUE, SUITE 1510
 NEW YORK, NY 10018
 TEL: (212) 564-2424
 FAX: (212) 564-4678

M.E.P.F. ENGINEER:
I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5997

LANDSCAPE ARCHITECT:
**MATHEWS NIELSEN
 LANDSCAPE ARCHITECTS, P.C.**
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-1513

INTERIOR DESIGNER:
ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
RA CONSULTANTS LLC
 512 7th Avenue, 6th Floor
 NEW YORK, NY 10018
 TEL: (646) 484-3250
 FAX: (646) 484-3251

CIVIL ENGINEERING:
The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 385-1818
 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4031
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
SHEN, MILSOM & WILKE, INC.
 417 88TH AVENUE
 NEW YORK, NY 10014
 TEL: (212) 725-6800
 FAX: (212) 725-9804

ENVIRONMENTAL CONSULTANT:
AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 494-0570
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 472-1000
 FAX: (212) 901-8114

NO.	DATE	REVISION
1	02/13/14	D.B.S. SUBMISSION
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		
91		
92		
93		
94		
95		
96		
97		
98		
99		
100		

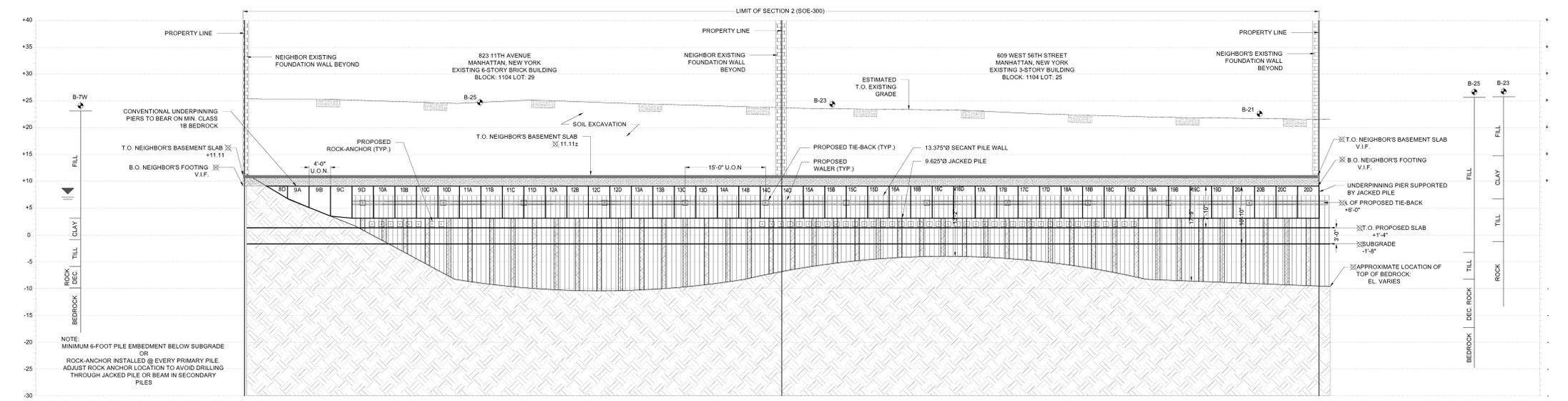
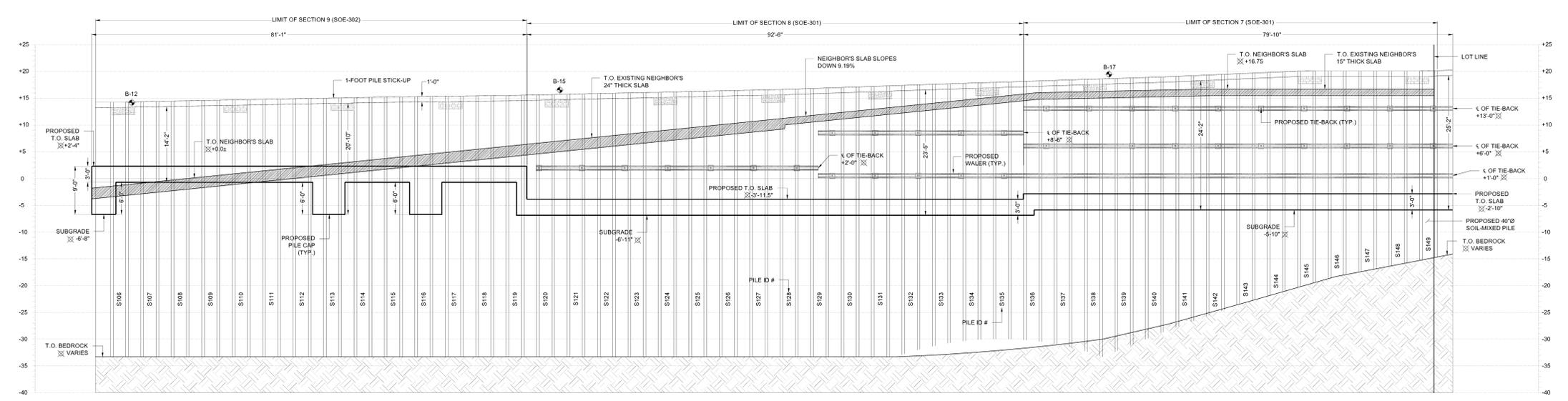
NOTE:
 MINIMUM 6-FOOT PILE EMBEDMENT BELOW SUBGRADE OR
 ROCK ANCHOR INSTALLED @ EVERY PRIMARY PILE.
 ADJUST ROCK ANCHOR LOCATION TO AVOID DRILLING
 THROUGH JACKED PILE OR BEAM IN SECONDARY
 PILES

KEY PLAN:

DRAWING TITLE:
ELEVATION

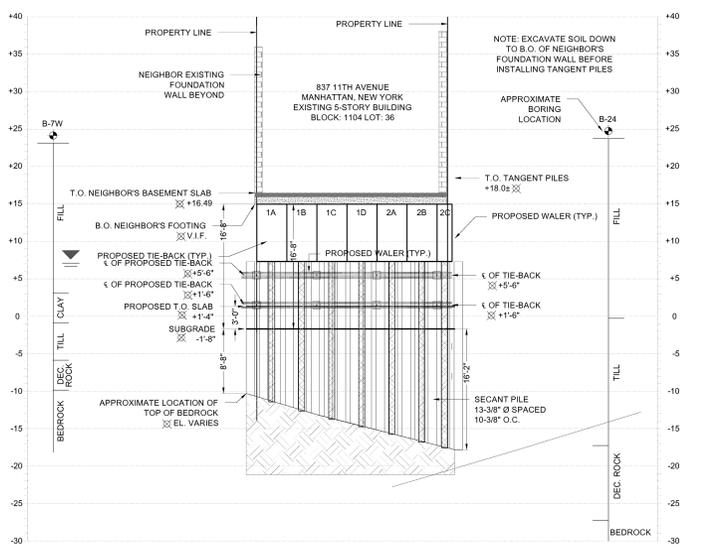
SEAL & SIGNATURE:

 DATE: 2013-20
 PROJECT No.: 2013-20
 DRAWN BY: P.L.C./J.B.
 CHECKED BY: W.P.
 DWG. No.:
SOE-201.00
 SHEET No.: **4 OF 13**

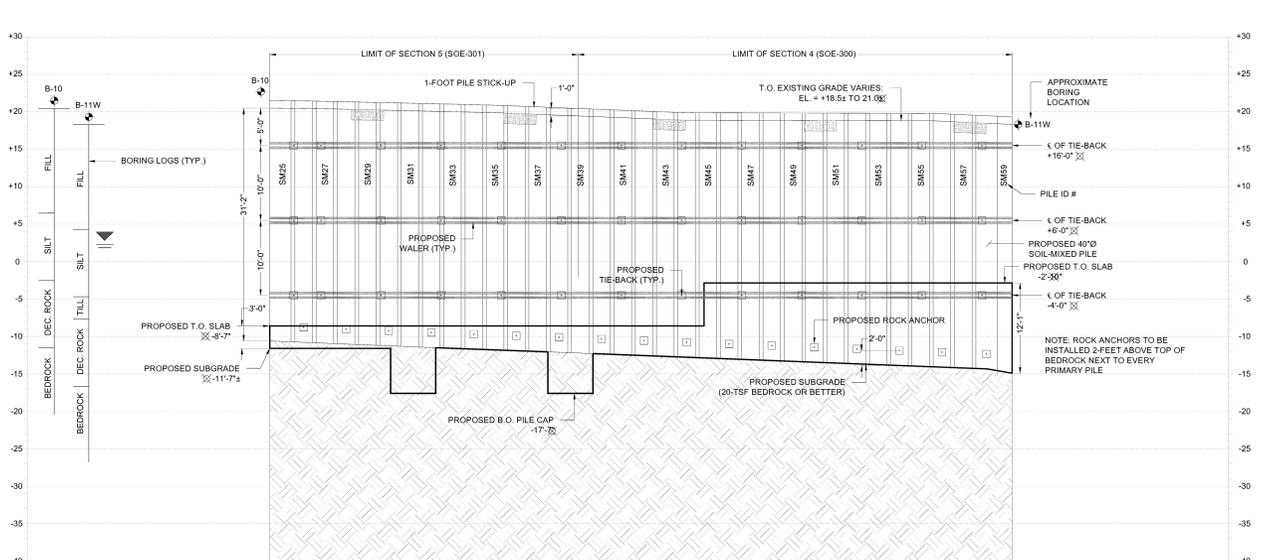


ELEVATION
 Scale: 1/8" = 1'-0"

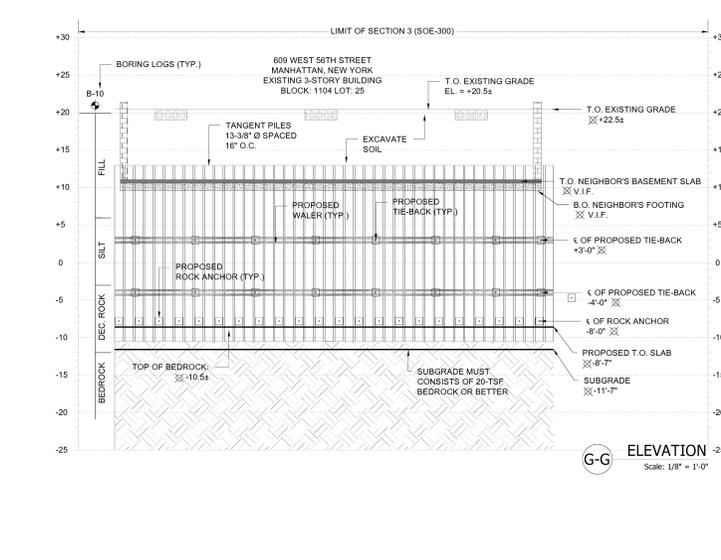
ELEVATION
 Scale: 1/8" = 1'-0"



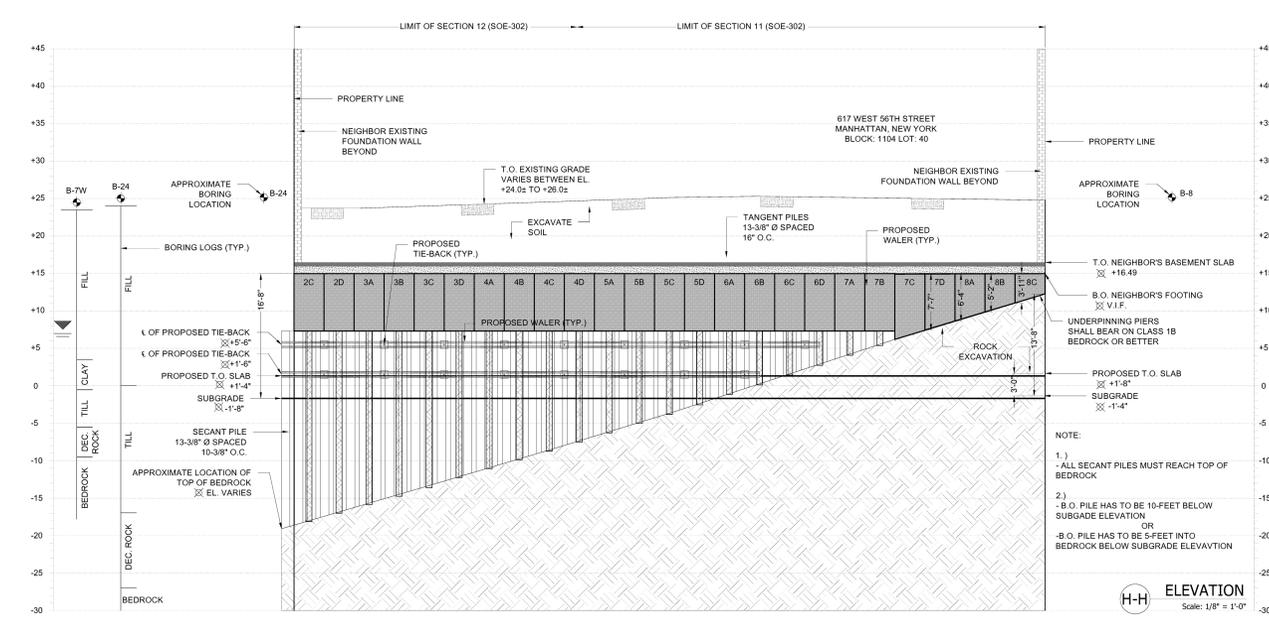
E-E ELEVATION
 Scale: 1/8" = 1'-0"



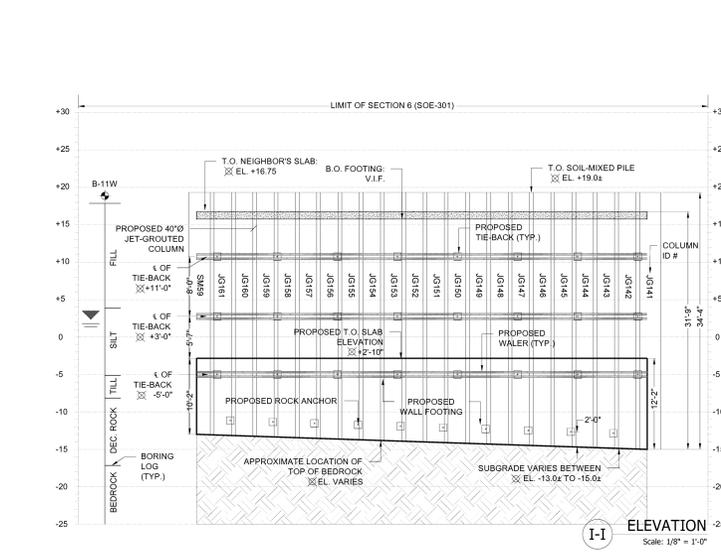
F-F ELEVATION
 Scale: 1/8" = 1'-0"



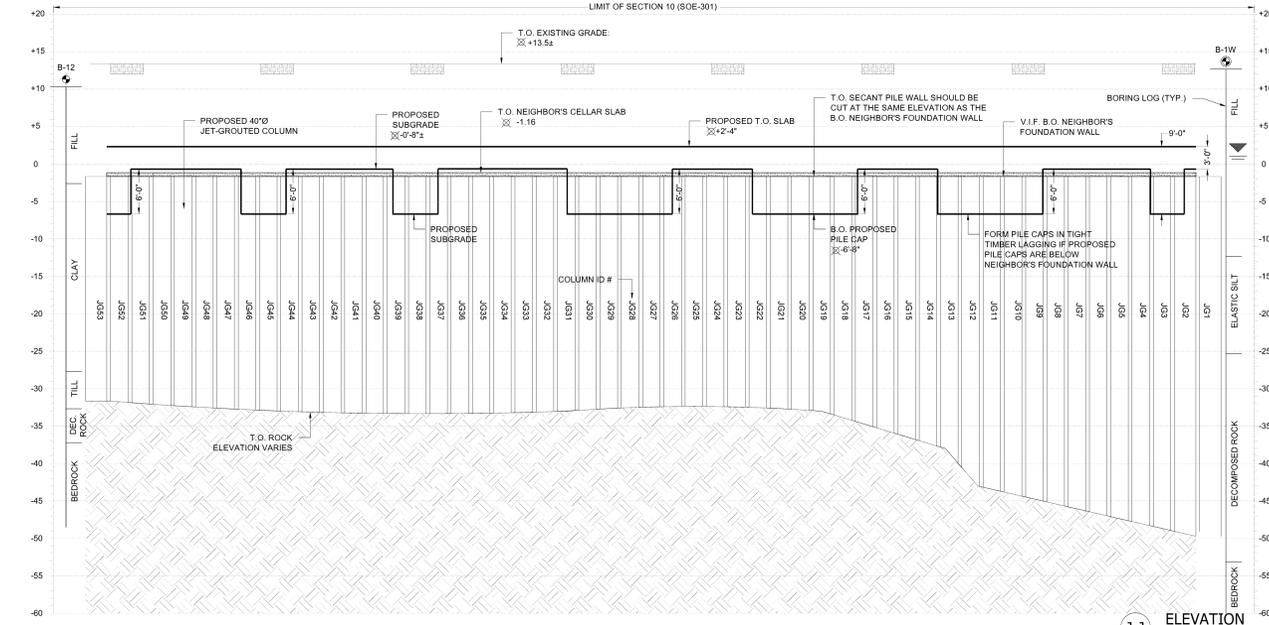
G-G ELEVATION
 Scale: 1/8" = 1'-0"



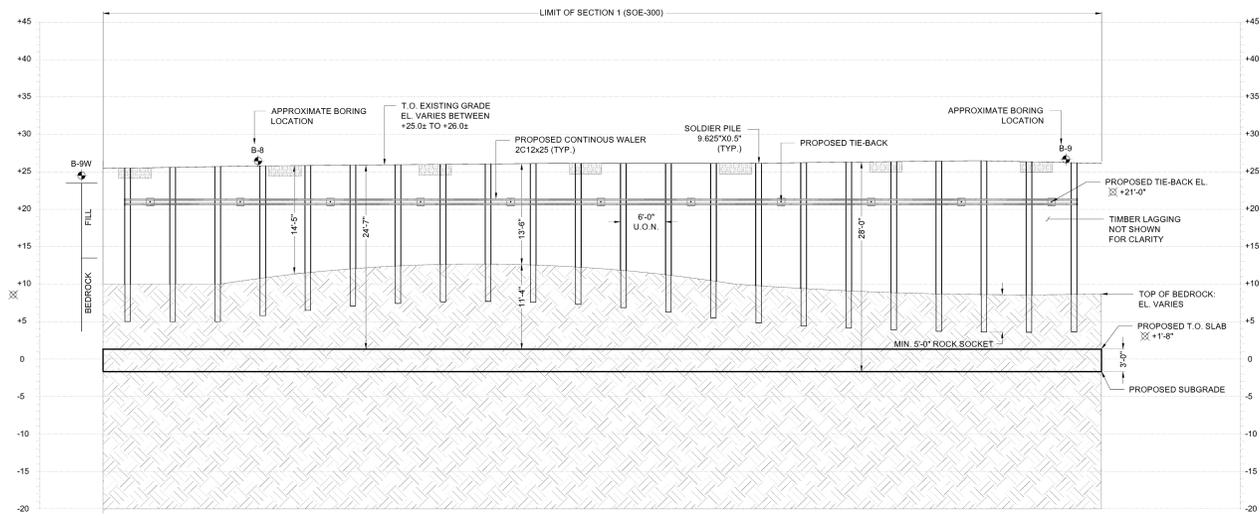
H-H ELEVATION
 Scale: 1/8" = 1'-0"



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



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



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

PROJECT:
606 WEST 57TH STREET
 RESIDENTIAL / MIXED USE
 DEVELOPMENT
 WEST 57th STREET & 11th AVENUE
 NEW YORK, NEW YORK

OWNER/DEVELOPER:
 606 WEST 57 LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000

ARCHITECT:
SLCE Architects, LLP
 1159 BROADWAY
 NEW YORK, NY 10018
 TEL: (212) 979-8400
 FAX: (212) 979-8387

DESIGN ARCHITECT:
 ARQUITECTONICA
 100 8TH AVENUE
 NEW YORK, NY 10011
 TEL: (212) 254-2700
 FAX: (212) 533-9203

STRUCTURAL ENGINEER:
 ROSENWASSER / GROSSMAN
 CONSULTING ENGINEERS, P.C.
 485 7TH AVENUE, SUITE 1510
 NEW YORK, NY 10018
 TEL: (212) 564-2424
 FAX: (212) 564-6678
 M.E.P.P. ENGINEER:

I.M. ROBBINS, P.C.
 15 WEST 44TH STREET
 NEW YORK, NY 10036
 TEL: (212) 944-5566
 FAX: (212) 944-5597

LANDSCAPE ARCHITECT:
 MATHEWS NIELSEN
 LANDSCAPE ARCHITECTS, P.C.
 120 BROADWAY SUITE 1040
 NEW YORK, NY 10021
 TEL: (212) 431-3609
 FAX: (212) 941-1513

INTERIOR DESIGNER:
 ROCKWELL GROUP
 5 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 463-0334
 FAX: (212) 463-0335

GEOTECHNICAL ENGINEERING:
 RA CONSULTANTS LLC
 512 7th Avenue, 6TH FLOOR
 NEW YORK, NY 10018
 TEL: (646) 484-3250
 FAX: (646) 484-3251

CIVIL ENGINEERING:
 The RBA GROUP
 27 UNION SQUARE WEST
 NEW YORK, NY 10003
 TEL: (212) 741-8090
 FAX: (212) 633-1205

CODE CONSULTANT
 CONSTRUCTION CONSULTING ASS.
 100 CHURCH STREET
 NEW YORK, NY 10007
 TEL: (212) 385-1818
 FAX: (212) 385-1911

ELEVATOR CONSULTANT:
 JENKINS & HUNTINGTON, INC.
 FIVE CLIMAX ROAD
 AVON, CONNECTICUT 06001
 TEL: (800) 897-4031
 FAX: (800) 897-4198

EXTERIOR WALL CONSULTANT:
 ISRAEL BERGER ASSOCIATES
 360 PARK AVENUE SOUTH
 NEW YORK, NY 10010
 TEL: (212) 689-5389
 FAX: (212) 689-6449

LIGHTING DESIGNER:
 BLISS FASMAN INC.
 23 LEONARD STREET
 NEW YORK, NY 10013
 TEL: (212) 343-8400
 FAX: (212) 343-8740

ACOUSTICAL CONSULTANT:
 SHEN, MILSOM & WILKE, INC.
 417 89TH AVENUE
 NEW YORK, NY 10014
 TEL: (212) 725-6800
 FAX: (212) 725-9504

ENVIRONMENTAL CONSULTANT:
 AKRF INC.
 440 PARK AVENUE SOUTH
 NEW YORK, NY 10016
 TEL: (212) 694-0670
 FAX: (212) 726-0942

CONSTRUCTION MANAGER:
 TFC WEST 57 GC LLC
 387 PARK AVE SOUTH
 NEW YORK, NEW YORK 10016
 TEL: (212) 672-1000
 FAX: (212) 901-8114

No.	DATE	REVISION
1	2/21/2014	D.B.B. SUBMISSION

D.B.B. NUMBER:
NB#



KEY PLAN:



DRAWING TITLE:

ELEVATION

SEAL & SIGNATURE:
 DATE: 2015-26
 DRAWN BY: PR, JG, JR
 CHECKED BY: WJP
 DWG. No.: **SOE-203.00**
 SHEET No.: **6 OF 13**

FILE No:

APPENDIX B CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and TFC West 57 GC 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, TFC West 57 GC 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, Katherine Glass, 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 in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. TFC West 57 GC LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

New York Public Library – Columbus Library
742 10th Avenue, New York, NY 10019
(212) 586-5098

Repository Hours of Operation:
Mon, Tues, Thurs – 10 am to 6 pm; Wed. - 10 am to 7 pm; Fri., Sat. 10 am to 5 pm

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

Identify Issues of Public Concern. None known.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by TFC West 57 GC LLC, reviewed and approved by OER prior to distribution and mailed by TFC West 57 GC LLC. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

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

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

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

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

APPENDIX C SUSTAINABILITY STATEMENT

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

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

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

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

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

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

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

The project has been entered in NYSERDA's Multifamily Performance Program (MPP) for New Construction (Version 5). The building will employ a variety of energy saving and energy efficient measures. Software will be used to model the building's energy use to verify the performance target of minimum 15% energy cost savings.

The following energy conservation measures are being considered for the planned development:

- High efficiency glazing (low "e") windows
- High efficiency water-cooled air conditioning units
- Gas-fired condensing boilers for domestic hot water and space heating
- Heat recovery wheel and heat recovery of toilet exhaust
- Variable frequency devices (VFDs) and premium efficiency motors on fans and pumps
- Energy Star appliances
- Carbon monoxide (CO) sensor in garage to control exhaust ventilation
- High efficiency LED lights in the corridors, garage, and back of house with high efficiency fluorescents in the apartments
- High efficiency exterior lighting

- Energy Star certified light fixtures
- Occupancy sensors in corridors, public spaces, and stairs

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions. As a requirement of the Environmental Impact Statement, an Emissions Reduction Plan (ERP) will be prepared to establish the means and methods to minimize potential adverse effects related to air emissions associated with the project.

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.

Measures to limit the potential for recontamination include capping of residual fill materials with building foundations, the use of a vapor barrier to limit the migration of soil vapor contamination, and leaving groundwater cutoff elements from support of excavation and dewatering control (including interlocking sheet piling, tangent piles and concrete retention piers) in place. 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 storm-water retention capability of the redevelopment project will be included in the RAR.

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

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

Paperless Brownfield Cleanup Program. TFC West 57 GC LLC is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. TFC West 57 GC 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. No

landscaping is planned as part of on-Site development; however, trees will be planted in tree pits in the sidewalks along West 56th Street, West 57th Street, and Eleventh Avenue.

APPENDIX D

SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

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

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated contaminated soil will be stockpiled on, at minimum, double layers of 8-mil sheeting, will be kept covered overnight 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 soil 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

Personnel under the direction of the PE/QEP overseeing the remedial action will:

1. Oversee remedial work and the excavation and load-out of excavated material;
2. Ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
3. 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;
4. 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;

5. Ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site; and
6. 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 expected to be to the south on Eleventh Avenue towards the Lincoln Tunnel for trucks destined for New Jersey or other westward locations. The truck route is subject to change depending on destination, available truck routes at the time of the work, and allowable truck routes for the type of load. 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 TFC West 57 GC 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, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or TFC West 57 GC 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 RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All affected or contaminated soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed of in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The Site-specific soil cleanup objectives for on-Site reuse are listed in Section 4.2 of the RAWP. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Excavated soil proposed for reuse elsewhere on Site (e.g., for grading or backfilling excavations), will be stockpiled and tested prior to reuse with testing frequency and analytes similar to those for imported soil in accordance with Section 1.9 of this Soil/Materials Management Plan. No soil exhibiting evidence of contamination will be reused on-site. The location of any material planned for re-use will be tracked on-Site and reported in the RAR.

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 soil, pavement and associated sub-soil, 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 soil will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives will be the lower of Residential SCOs and Groundwater Protection Standard listed in 6 NYCRR Part 375-6.

The process to evaluate sources of backfill to be imported to the Site 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:

1. Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
2. Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations; and
3. 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 or QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

1.9.1 Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

1. Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
2. The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
3. Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material

meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

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

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

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

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 RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of

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

1.13 Odor, Dust and Nuisance Control

1.13.1 Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

1.13.2 Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

1.13.3 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 E
SPECIFICATIONS FOR WATERPROOFING/VAPOR BARRIER

SECTION 071326

FOUNDATION VAPOR BARRIER AND WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Provide vapor barrier/waterproofing that prevents the passage of water and vapors through the basement walls, pit walls, wall penetrations, slabs and mat. Includes furnishing and installing all surface preparations and waterproofing materials. Installation to meet manufacturer's requirements, or as stated herein, whichever is more restrictive.
- B. Where cast against permanent formwork, sheetpiles, secant pile wall, or other permanent substrate. The waterproofing at those locations will be "blind side", with appropriate substrate covering applicable to a single formed wall. Form ties penetrating the waterproofing for blind side applications WILL NOT be allowed.
- C. Where the basement wall will be double formed, a membrane waterproofing system shall be applied against the basement wall with external protection board used.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.
- B. All work shall be consistent with the Remedial Action Plan (RAP) prepared by AKRF Engineering, P.C. (AKRF)
- C. Remedial Investigation Report, prepared by AKRF.

1.3 SUMMARY

- A. This Section is for installation of below grade vapor barrier/waterproofing, including: surface preparation for waterproofing, and installation of waterproofing. The work includes below-grade foundation vapor barrier/waterproofing of horizontal (below slab), and vertical surfaces (behind foundation walls) up to street level grade.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Dewatering
 - 2. Earthwork
 - 3. Support of Excavation
 - 4. Concrete

1.4 SUBMITTALS

- A. Manufacturer's Product Data for each type of waterproofing proposed, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
- B. 12" x 12" samples of each vapor barrier/waterproofing material required for Project.
- C. 12" x 12" samples of drainage board.
- D. Shop Drawings: Typical installation details, details at flashings, penetrations, terminations, joints, tiebacks, tiedowns, and piles.
- E. Installer certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article and other specification requirements
- F. Before commencing work, submit a written statement signed by the Contractor and the Applicator stating that the Contract Documents have been reviewed with a qualified representative of the Manufacturer of the blind side and membrane vapor barrier/waterproofing systems, and that he is in agreement that the selected materials are proper, compatible with contiguous materials and adequate for the application shown. Indicate by transmittal form that a copy of the statement has been sent to the manufacturer.
- G. Submit a certified statement issued by the manufacturer of the vapor barrier/waterproofing materials, and countersigned by the Applicator, attesting that all areas and surfaces designated to receive waterproofing have been inspected and found satisfactory for the reception of the Work covered under this Section; and are not in conflict with the Warranty requirements. Application of materials will follow acceptance of substrate surfaces.
- H. Upon completion of the Work submit Certification signed by the Contractor and the Installer of the vapor barrier/waterproofing stating that the installed materials conform to the specified requirements and that the system was successfully checked prior to covering.
- I. As-Built Drawings: Provide as-built drawings giving actual locations and dimensions of completed vapor barrier/waterproofing.
- J. Upon completion of the Work submit a written statement signed by the manufacturer stating that the field supervision by the Manufacturer's representative was sufficient to insure proper application of the materials, that the Work was installed in accordance with the Contract Documents and that the installation is acceptable to the Manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who has a minimum of five years experience and has completed vapor barrier/waterproofing projects similar to that indicated for this Project and who is acceptable to vapor barrier/waterproofing manufacturer.
- B. Review requirements for vapor barrier/waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.

1.6 WARRANTY

- A. The manufacturer of the waterproofing system executed under this Section warrants the vapor barrier/waterproofing system to be vapor tight and watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract and that he, at his own expense, repair and/or replace all other work which may be damaged as a result of such defective work and which becomes defective during the warranty period.
- B. The Contractor shall provide a two (2) year workmanship warranty. Provide a written guarantee for all work of this Section stating that if within two years after the date of substantial completion of the project is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. The guarantee shall state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney fees to enforce compliance with the obligations of this Guarantee, and will replace any material or system that requires repeated maintenance or repair to function effectively. The obligation of this Guarantee shall run directly to the Owner and may be enforced by the Owner against the Contractor, shall survive the termination of the contract and shall not be limited by Conditions other than this contract.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.
- C. Protect materials during handling and installation to prevent damage. Replace any damaged materials at no cost to the Owner unless the damaged material can be repaired per the manufacturer's requirements and to the satisfaction of the Owner and such that foundation waterproofing/vapor protection is not compromised.
- D. Submit Material Safety Data Sheets with products delivered to the job site.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Apply vapor barrier/waterproofing within range of ambient and substrate temperatures recommended by vapor barrier/waterproofing manufacturer.
 - 1. Do not apply vapor barrier/waterproofing in snow, rain, fog, mist or when substrate is wet.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.
- C. The Contractor shall coordinate with all trades involved, the scheduling of excavation and backfill to ensure that all necessary components of work due to be buried are installed, thus avoiding duplication of excavation work, unless otherwise shown on the Drawings or noted in other sections of the documents. No other work should be performed in areas above an installed vapor barrier/waterproofing section until the Owner's Representative has approved it. The

Contractor shall verify that there are no interferences with other existing or proposed subsurface systems.

- D. All plumbing, electrical, mechanical and structural items to be under or passing through the vapor barrier/waterproofing shall be positively secured in their proper positions and appropriately protected prior to membrane application.
- E. Surface preparation shall be per manufacturer's specification.
- F. Protect the waterproofing against all damage and as required by the manufacturer.
- G. Repair all damaged materials or rejected work at no additional cost to the owner.

PART 2 - PRODUCTS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. For "blind side" waterproofing, single formed walls and vertical applications provide Preprufe 160R by W.R. Grace & Co., or approved equal.
 - 2. For underslab or mat or pits and all horizontal applications not immediately above the interstitial gravel bed, provide Preprufe 300R by W.R. Grace & Co., or approved equal.
 - 3. For liquid sealant applied to seal holes in membrane and around penetrations, use Bituthene liquid membrane: W.R. Grace & Co., or approved equal.
 - 4. For double formed walls, a membrane waterproofing system designed for this type of application such as Bituthene System 4000 manufactured by W. R. Grace & Company, or approved equal.
 - 5. Protection substrate for waterproofing membrane such as protection board or Hydroduct 220 drainage board or approved equal.
 - 6. Construction joint waterstop shall be "Swellseal Joint", as manufactured by DeNeef Construction Chemicals Inc., or approved equal.
 - 7. Contractor required to seal vapor barrier/waterproofing to footings, pile caps, mat foundation, bottom slabs, and grade beams and to seal all seams and penetrations as per manufacturer's instructions.
 - 8. In addition to the main waterproofing material, the Contractor shall provide product data for all necessary surface preparations, primers, bond breakers, tape, flashings, mastic and other materials or preparations as recommended by the manufacturer and required under PART 3 - EXECUTION.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which vapor barrier/waterproofing systems will be applied, with Installer present, for compliance with manufacturer requirements and recommendations. Components shall be inspected and approved by the Owner's Representative prior to completing each phase of work. Additional inspections, examinations and quality control measures may be required as per manufacturer's recommendation and are the responsibility of the Contractor. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation on double formed wall or flat surfaces until after minimum concrete curing period recommended by waterproofing manufacturer.
2. Verify substrate is visibly dry and free of moisture.
3. Notify Owner in writing of anticipated problems using vapor barrier/waterproofing over a substrate.

3.2 "BLIND SIDE" WATER PROOFING SURFACE PREPARATION

- A. Contractor shall be responsible for preparing the substrate to receive the waterproofing material in accordance with the manufacturer's recommendations. The installer or Engineer may require a concrete facing on vertical and horizontal "blind side" waterproofing. Provide a sufficiently smooth substrate.
- B. Form ties penetrating the waterproofing will not be allowed.
- C. Filling of indentations shall be performed where the indentations are sufficiently deep and shaped to prevent the drainage mat and membrane from properly molding to the surface.
- D. Bond breaker is required for all single formed walls. Drainage mat will be by approval only within four feet of ground surface.
- E. Apply liquid membrane material compatible with waterproofing membrane at wall penetrations, over tieback, tiedown or any protrusions and where recommended by manufacturer. Follow manufacturer details for application at joints, laps and where irregularities exist. Provide top seal termination bar as recommended by manufacturer.

3.3 MEMBRANE WATERPROOFING SURFACE PREPARATION

- A. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete.
- B. Removes ridges, fins, mortar, and other projections and fill honeycomb, aggregate pockets, holes and other voids as required.
- C. Apply liquid membrane material compatible with waterproofing membrane at wall penetrations, over tieback heads or any protrusions or penetrations and where recommended by manufacturer. Follow manufacturer details for application at joints, laps and where irregularities exist.

- D. Where support of excavation and existing structures are set back from the excavation, that space will be filled with approved material to prevent the new wall from overpouring beyond the building line or where abrupt changes in the surface to be waterproofed occurs a suitable bond breaker transition detail to provide a smooth "non-interlocking" wall shall be developed by the Contractor and approved by the Owner.

3.4 "BLIND SIDE" SHEET APPLICATION

- A. Prepare surface, install drainage mat or bond breaker (as applicable to approved waterproofing system). Where drainage mat covers indentations, mold and secure drainage mat to follow indentations.
- B. Install sheet membrane as recommended by the Manufacturer. Apply seaming tape, overlap and roll seams as recommended to ensure watertight and vapor-tight installation.
- C. Securely fasten top termination of wall mounted sheet membrane with continuous metal termination bar anchored into substrate, and in accordance with manufacturer's instructions.
- D. Seal penetrations through membrane to provide watertight and vapor-tight seal with penetration seal patches or membrane wrappings and liquid membrane fillet.
- E. Install waterproofing and auxiliary materials so that waterproofing may be lapped to sections of wall that are double formed.
- F. Repair tears, voids, and lapped seams in waterproofing not meeting requirements or damaged during construction. Repair area to extend a minimum of 6 inches beyond damages or non-conformity areas in all directions.

3.5 MEMBRANE WATERPROOFING FOR DOUBLE FORMED WALLS

- A. Prepare surface of basement wall to receive membrane, in accordance with manufacturer's instructions and recommendations.
- B. Apply membrane in accordance with manufacture's recommendation, except where more stringent conditions are cited in the Contract Documents. Meet all manufacturer recommendations for temperature, corners, joints, horizontal application, vertical application, rolling, protrusions, protection, etc.
- C. Apply waterproofing details for pipe penetrations using pre-fabricated boots designed for this purpose.
- D. Meet and lap seal to blind side waterproofing.

3.6 CONSTRUCTION JOINT WATERSTOP

- A. The waterstops shall be installed continuous along all construction joints in accordance with manufacturers specifications.
- B. Contractor shall thoroughly clean all joints and surfaces prior to installation of waterstops. Waterstops shall be firmly attached to the concrete.

- C. Contractor shall protect and maintain waterstops dry prior to placement of concrete. All damaged and dislocated waterstops shall be repaired and replaced as per manufacturers requirements or the direction of the Engineer.

3.7 ENVIRONMENTAL REQUIREMENTS

- A. Vapor barrier/waterproofing shall be installed and extended to include all subgrade sidewalls up to street level grade to prevent intrusion of vapors in accordance with environmental requirements for the project.
- B. Contractor shall refer to notes on FO-022 regarding installation of vapor barrier/waterproofing for full extent of subgrade walls and resulting coordination with architect.

3.8 FIELD QUALITY CONTROL

- A. Correct deficiencies, or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.9 PROTECTING AND CLEANING

- A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions. Protect during backfill operation to prevent damage.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 071616 - CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Perform the work of this Section in accordance with the General Conditions, AIA Document A201/Current Edition, Supplementary Conditions, and all other requirements of the Contract Documents.

1.2 SUMMARY

- A. This Section includes, but is not limited to, the following applications of crystalline waterproofing:
 - 1. Elevator pits, elevator sump pits, and house trap pits.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for formwork, waterstops, and finishing concrete walls and slabs to receive waterproofing.
 - 2. Division 7 Section "Joint Sealants" for elastomeric and preformed sealants in concrete and masonry walls and floors.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Shop Drawings: Show locations and details of waterproofing preparation and application. Show expansion joint details and waterproofing application at obstructions and penetrations.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: An experienced applicator who has completed crystalline waterproofing similar in material, design, and extent to that indicated for this Project and whose work has resulted in application with a record of successful in-service performance.

1.5 JOB CONDITIONS

- A. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after concrete and masonry substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
- B. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F (4.4 deg C) or above during work and cure period and space is well ventilated and kept free of water.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by Applicator and countersigned by Contractor agreeing to repair or replace waterproofing that does not comply with requirements or that fails to perform as required, and to maintain watertight conditions within specified warranty period. Warranty includes responsibility for removing and replacing other work that conceals crystalline waterproofing. During warranty period, repairs and replacements required because of unusual weather phenomena and other events beyond Contractor's or Applicator's control shall be completed by Contractor or Applicator and paid for by Owner at prevailing rates.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Vandex Super; Vandex Sales & Services, Inc.
 - 2. Xypex; Xypex Chemical Corporation.

2.2 MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Slurry-Coat Aggregate: ASTM C 144, sand.
- C. Trowel-Coat Aggregate: ASTM C 33, fine aggregate.
- D. Water: Potable.
- E. Crystalline Waterproofing: A blend of portland cement, specially treated sand, and active chemicals formulated to penetrate by capillary action into concrete or masonry and to chemically react with free lime in the presence of water to develop crystalline growth within concrete or masonry capillaries. This produces impervious, dense, waterproof concrete or masonry with properties meeting or exceeding the following criteria:
 - 1. Permeability: 30 feet (9 m) when tested according to CE CRDC 48.
 - 2. Compressive Strength: 9000 psi (62.1 MPa) at 28 days when tested according to ASTM C 109/C 109M.

3. Flexural Strength: 6000 psi (41.4 MPa) at 28 days when tested according to ASTM C 348.
 4. Bond Strength: 690 psi (4.8 MPa) at 14 days when tested according to ASTM C 321.
- F. Patching Compound: Ready-mixed cementitious waterproofing and repair mortar for filling and patching tie holes, honeycombs, reveals, and other imperfections with properties meeting or exceeding the following:
1. Compressive Strength: 7600 psi (52.44 MPa) at 28 days when tested according to ASTM C 109/C 109M.
 2. Flexural Strength: 710 psi (4895 kPa) at 28 days when tested according to ASTM C 348.
 3. Shrinkage: Minus 0.093 percent at 28 days and plus 0.073 percent at 90 days when tested according to ASTM C 596.
- G. Plugging Compound: Cementitious, ready-mixed, efflorescence-free, surface waterproofing compound with hydrophobic properties that requires only the addition of water, and is resistant to water and moisture but is vapor permeable for all standard applications (vertical, overhead and horizontal surfaces not exposed to vehicular traffic); with properties meeting or exceeding the following criteria:
1. Permeability: 30 feet (9 m) when tested according to CE CRDC 48.
 2. Compressive Strength: 6000 psi (41.4 MPa) at 28 days when tested according to ASTM C 109/C 109M.
 3. Flexural Strength: 1000 psi (6.9 MPa) at 28 days when tested according to ASTM C 348.
 4. Bond Strength: 300 psi (2.1 MPa) at 14 days when tested according to ASTM C 321.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and other surfaces where waterproofing is to be applied with Applicator present, for compliance with requirements for surface preparation, cleaning, and other conditions affecting waterproofing performance.
1. Proceed with application only after unsatisfactory conditions have been corrected.
 2. Begin waterproofing application only after unsatisfactory conditions have been corrected.
 3. Application of waterproofing indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect other work from dripping or splatter from crystalline waterproofing during application. Provide temporary enclosure to confine operation, to prevent polluting the air, and to ensure adequate ambient temperatures and ventilation conditions for application.

- B. Stop active water leaks with plugging and patching compounds according to waterproofing manufacturer's written instructions.
- C. Schedule cleaning and surface preparation so dust and other contaminants from the cleaning and preparation process will not fall on wet, newly coated surfaces.
- D. Surface Preparation of Concrete: Comply with waterproofing manufacturer's written instructions and requirements indicated below to ensure that waterproofing bonds to concrete surfaces. Clean concrete surfaces according to ASTM D 4258 by using one or a combination of procedures as needed to effectively remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, curing compounds, and form-release agents.
 - 1. Prepare scratch- and float-finished concrete by etching with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
 - 2. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
 - 3. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.
- E. Mask-off surfaces adjoining areas to receive waterproofing treatment where surface damage or discoloration might result from application of waterproofing. Do not allow crystalline waterproofing or crystalline compound to migrate into reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves, unless indicated to be filled with calking.
- F. At cracks in concrete, remove loosened chips and cut square reveal approximately 1 inch (25 mm) deep.

3.3 APPLICATION

- A. General: Comply with waterproofing manufacturer's written instructions, unless more stringent requirements are indicated.
- B. Mix waterproofing components according to waterproofing manufacturer's written instructions.
- C. Protect all adjacent surfaces. Dampen wall surface with water before applying waterproofing.
- D. Apply waterproofing coating evenly and fill voids and pores of substrate with waterproofing slurry. Keep tools clean and free from build-up.
- E. Apply the number of coats at the rates recommended by the manufacturer for each coat. After allowing previous coat to cure, dampen the wall before applying additional coats.
- F. Mist-cure waterproofing for two to three days immediately after application as recommended by the manufacturer.

- G. Waterproofing Treatment Extensions: Apply treatment to columns that are integral with walls to be treated, and extend treatment onto interior, nontreated walls that intersect exterior, treated walls, for a distance of 24 inches (600 mm) for cast-in-place concrete and 48 inches (1200 mm) for masonry. Where floors (but not walls) are treated, extend treatment 12 inches (300 mm) high onto exterior walls and onto both exterior and interior columns. Unless otherwise indicated, extend treatment to every surface of substrate in area indicated for treatment, including stair treads and risers, pipe trenches, pipe chases, pits, sumps, and similar offsets and features.

3.4 PROTECTION

- A. Protect applied crystalline waterproofing from rapid drying, severe weather exposure, and water accumulation. Maintain completed Work in moist condition for not less than seven days by covering with impervious sheeting or by other curing procedures recommended by waterproofing manufacturer.

END OF SECTION 071616

November 20th, 2014

Kathleen Brunner
Senior Technical Director
AKRF, Inc.
440 Park Ave South, 7th Floor
New York, NY 10016
646.388.9525

RE: 606 West 57th Street, New York, NY

Dear Kathleen,

I have reviewed the following information prepared by AKRF, Inc. for the above referenced project.

- Tables 2-8 - Soil Analytical Results
- Tables 9-14 - Groundwater Analytical Results
- Table 15 - Soil Vapor Analytical Results

The identified contaminants at the levels reported will not have an adverse effect on the waterproofing or vapor barrier properties of Preprufe[®] 300R, Preprufe[®] 160R and Bituthene[®] 3000/4000 systems along with all system accessories, provided standard design and application procedures are followed.

Standard installation instructions and details can be found on our website at www.graceconstruction.com.

Mark Franciosi



Technical Service Manager

cc: J. Ridgeway

PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

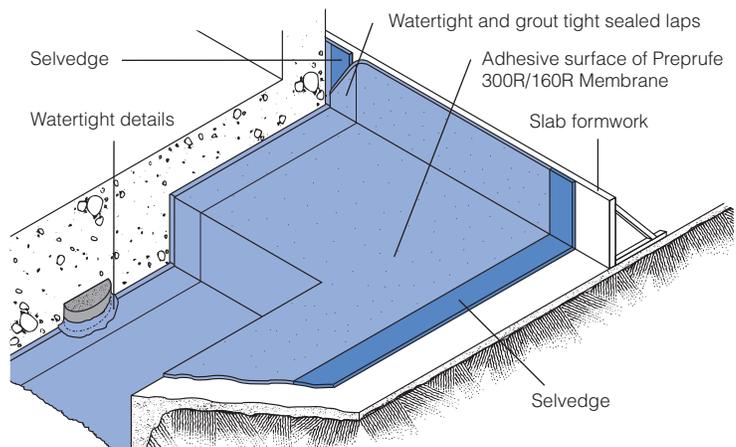
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners**—preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered watertight laps** and detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **BBA Certified** for basement Grades 2, 3, & 4 to BS 8102:1990
- **Zero permeance** to moisture
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement
- **Unaffected by wet conditions**—cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
 - not reliant on confining pressures or hydration
 - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

Installation

The most current application instructions, detail drawings and technical letters can be viewed at graceconstruction.com. For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

All surfaces—It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

Horizontal—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

Vertical—Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe LT data sheet for more information.

Horizontal substrates—Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letter 15 for information on suitable rebar chairs for Preprufe.

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to

overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit graceconstruction.com. This manual gives comprehensive guidance and standard details.

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 1500 psi (10 N/mm²) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe.

Figure 1



Figure 2

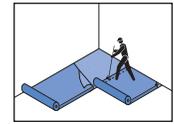
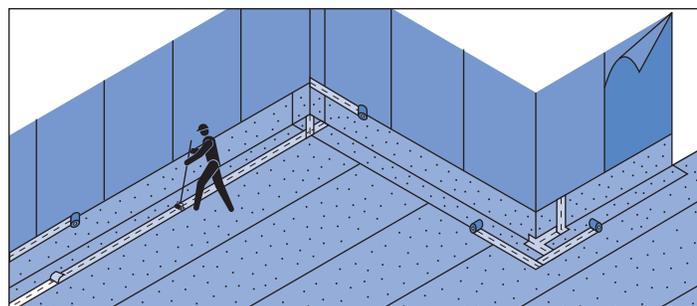
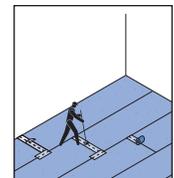


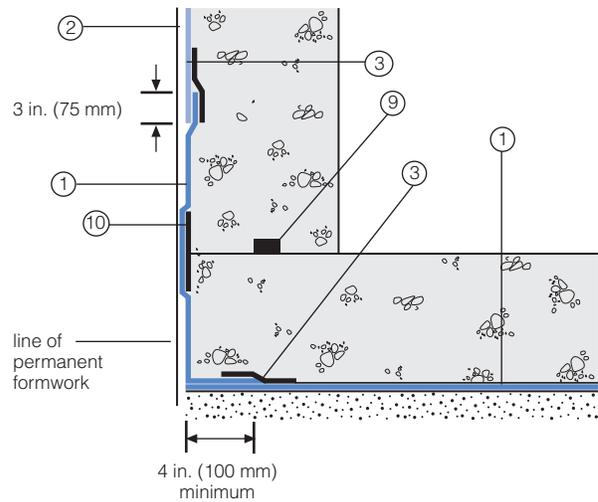
Figure 3



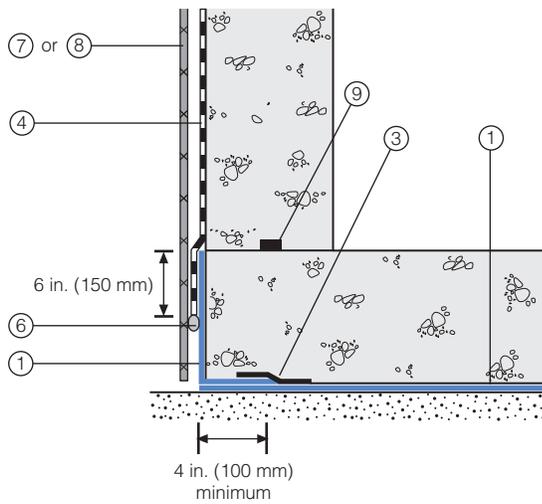
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

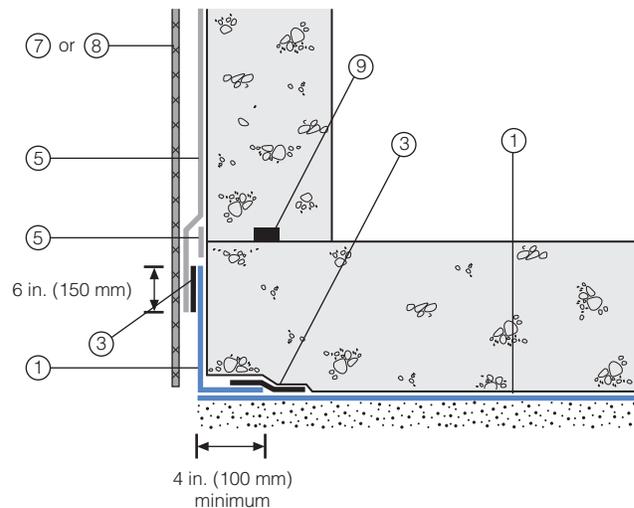
Wall base detail against permanent shutter



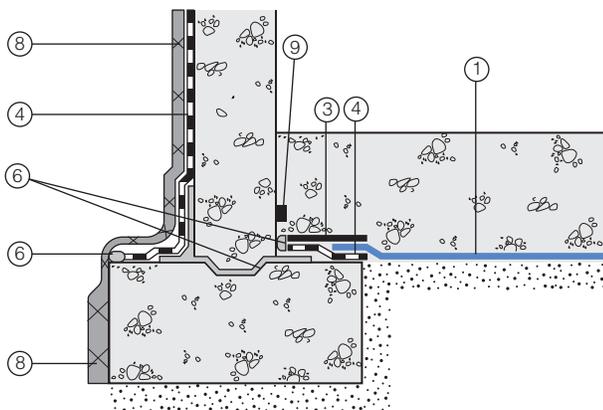
Bituthene wall base detail (Option 1)



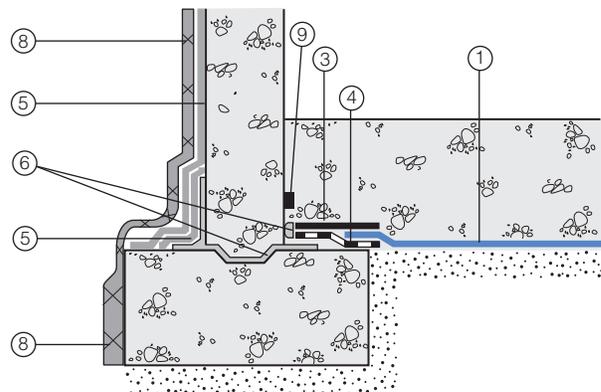
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



- 1 Preprufe 300R
- 2 Preprufe 160R
- 3 Preprufe Tape
- 4 Bituthene

- 5 Procor
- 6 Bituthene Liquid Membrane
- 7 Protection

- 8 Hydroduct®
- 9 Adcor ES
- 10 Preprufe CJ Tape

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft ² (36 m ²)	460 ft ² (42 m ²)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
Ancillary Products			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified ¹
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified ²
Elongation	500%	500%	ASTM D412, modified ³
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified ⁴
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified ⁵
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa × s × m ²))	0.01 perms (0.6 ng/(Pa × s × m ²))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

Adcor is a trademark and Preprufe, Bituthene and Hydroduct are registered trademarks of W. R. Grace & Co.—Conn. Procor is a U.S. registered trademark of W. R. Grace & Co.—Conn., and is used in Canada under license from PROCOR LIMITED.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.—Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

This product may be covered by patents or patents pending.
PF-111H Printed in U.S.A. 07/12

Copyright 2012. W. R. Grace & Co.—Conn.
FA/PDF

GRACE

Bituthene® 4000

Self-adhesive HDPE waterproofing membrane with enhanced bonding characteristics for use with B2 moisture tolerant primer.

Advantages

- Cold applied - simple application to substrates especially at low temperatures.
- Suitable for application to "green" concrete - reduces programme schedules
- Moisture tolerant primer system - allows application in damp or marginal weather conditions.
- Wide application temperature range - excellent bond to self and substrate from -10°C to +35°C.
- Overlap security - enhanced-bond provides additional security.
- Cross laminated high density polyethylene carrier film - provides high tear strength, puncture and impact resistance.
- Flexible - accommodates concrete shrinkage cracks.
- Gas resistant - methane, carbon dioxide and radon gas protection in excess of the standard membrane requirements in BRE Reports 211 (radon) and 212 (methane and carbon dioxide).

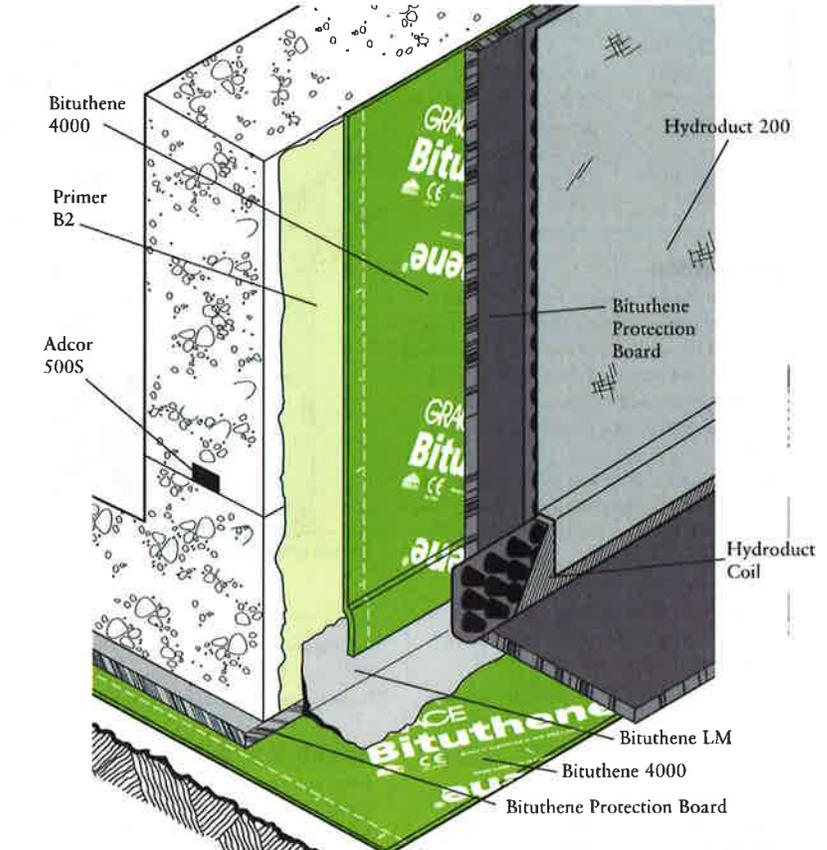
Description

Bituthene® 4000 is a flexible preformed waterproof membrane combining a high performance cross laminated, HDPE carrier film with a unique super sticky self-adhesive rubber bitumen compound.

Ancillary Products

Primer B2

Primer B2 is used to prepare vertical and sloping surfaces and suspended slabs. It is moisture tolerant and can be used on "green" concrete or damp to touch substrates.



Bituthene® LM

Waterproof continuity at angles and at penetrations is provided by Bituthene LM two component chemically curing liquid applied waterproof membrane.

Bituthene® Protection Boards

Damage from following trades and backfill is prevented by Bituthene® Protection Boards. Located with Bitustik™ 4000 double sided tape.

Details shown are typical illustrations only and not working drawings. For assistance with working drawings and additional technical advice please contact Grace Technical Services



Supply	
Bituthene® 4000	1 m x 20 m roll (20 sq m) Weight 32 kg
Palletisation	15 rolls per pallet
Storage	Store upright in dry conditions below +30°C.
Primer B2	5, 25 litre drums
Coverage	10 - 12 sq m per litre depending upon method of application, surface porosity and ambient temperature
Ancillary Products	
Bituthene® LM	5.7 litre packs
Bituthene®	3 mm x 1 m x 2 m
Protection Boards	
Adcor® 500S	6 x 5 m rolls
Hydroduct®	In lieu of drainage stone
Waterstops	See separate data sheet for details
Bitustik™ 4000	150 mm x 12 m roll
Lap Roller	Unit

Physical Properties

Property	Typical Results	Test Method
Elongation at max load	Long 244% Trans 185%	BS 2782 320 A
Tear Resistance	Long 77N Trans 92N	MOAT 27:5.4.1
Peel Strength	76.5 N/mm ²	MOAT 27:5.1.3
Tensile Strength of joints	117N	MOAT 27:5.2.2
Moisture Vapour Permeability	0.31 g/m ² /24 hours	BS 3177: 1959 (75% RH/25°C)
Puncture Resistance	220 N 65mm	ASTM E154
Water Resistance (6m head)	No penetration	MOAT 27:5.1.4
Environmental Resistance	Conforms	ASTM D543

Installation

At air temperatures below +4°C measures should be taken to ensure that all surfaces are free from ice or frost. All surfaces except those below ground bearing slabs and Preprufe® R membranes should be primed with one coat of Primer B2 applied at a rate of approx. 10m² per litre.

Bituthene 4000 shall be laid by peeling back the protective release paper and applying the adhesive face onto the prepared surface, free from ice, frost, condensation or any contaminants which could adversely effect adhesion.

Bituthene LM to be applied at all internal and external corners, penetrations etc. prior to applying the overall membrane.

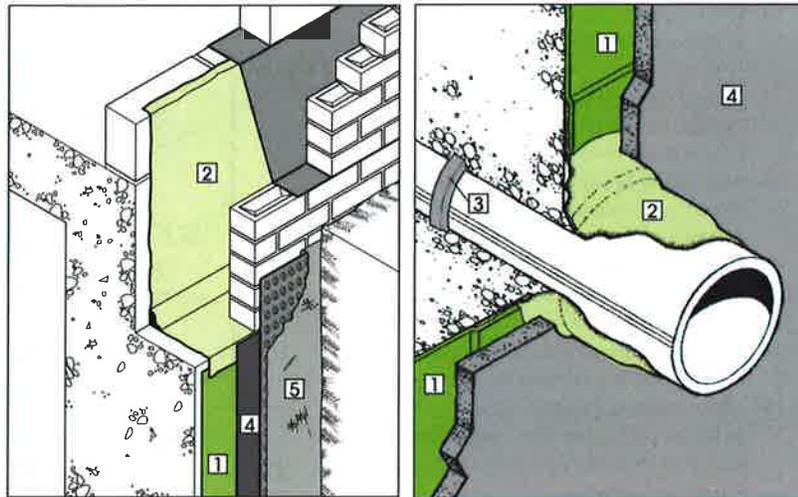
Bituthene 4000 should be brushed onto the surface to ensure good initial bond and exclude air. Adjacent rolls are aligned and overlapped 50mm minimum at side and ends and well rolled with a firm pressure, using a lap roller to ensure complete adhesion and continuity between the layers. On high walls it may be necessary to batten fix the membrane to prevent slippage.

Repairs

Damaged areas to be repaired by patching with an oversize patch applied to a clean dry surface and firmly rolled.

Performance

Bituthene 4000 complies with the relevant section of the following national standards: BS 8102:1990, Building Regulations (England and



Typical ground level termination detail

Pipe through wall detail

Key to diagrams:

- 1 Bituthene 4000 on Primer B2
- 2 Bituthene LM
- 3 Adcor 500S
- 4 Bituthene Protection Board
- 5 Hydroduct 220

Wales) 1991 (amended 1994) clause C4. Building Regulations (Northern Ireland) 1994 (amended 1995) clause B2. Building Standard (Scotland) Regulations 1990, Regulation B2.1, G2.6.

Health and Safety

There is no legal requirement for a Material Safety Data Sheet for Bituthene 4000, Bituthene Protection Boards, Bitustik, Lap Roller, Hydroduct or waterstops. For health and safety questions on these products please contact Grace Construction Products Limited.

For Primer B2, and Bituthene LM read the product label and Material Safety Data Sheet (MSDS) before use. Users must comply with all risk and safety phrases. MSDS's can be obtained from Grace Construction Products or from our web site at www.graceconstruction.com.

NBS Specification Clause

Refer to Clause 180 and 190.

Web Visit our web site at www.graceconstruction.com

Grace Construction Products Ltd, Ajax Avenue, Slough, Berkshire SL1 4BEI United Kingdom Tel +44 (0)1753 692929 Fax +44 (0)1753 691623

Adcor, Acrofil, BETEC, Bituthene, Hydroduct, Insupak, Korkpak, Paraflex, Paraseal, Preprufe, Procor, Servicised, Servidek, Servigard, Servijoint, Servimastic, Servipak, Servirufe, Serviseal, Servistrip, Servitite, Vertigard and Vertiseal are registered trademarks of W R Grace & Co.-Conn. Adprufe, Armourtape, Bitushield, Bitustik, Bitutape, Hydropaste, Pak Adhesive, PVC Edgetie, Serviband, Serviflex, Servitape, Slipstrip, and Solarshield are trademarks of W R Grace & Co.-Conn.

The information given is based on data and knowledge considered to be true and accurate and is offered for the user's consideration, investigation and verification. Since the conditions of use are beyond our control we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale including those limiting warranties and remedies which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would violate or infringe statutory obligations or any rights belonging to a third party.

Copyright 2006. Grace Construction Products Limited.

Printed in England - 05.06- Ref. WM004C

GRACE
Construction Products

APPENDIX F
CONSTRUCTION HEALTH AND SAFETY PLAN

606 West 57th Street
Block 1104, Lot 31
MANHATTAN, NEW YORK

Construction Health and Safety Plan

OER Project Number 14EHAN423M

AKRF Project Number 11402

Prepared for:

TFC West 57 GC LLC
387 Park Avenue South
New York, NY 10016

Prepared by:



AKRF Engineering, P.C.
440 Park Avenue South, 7th Floor
New York, NY 10016
212-696-0670

OCTOBER 2014

TABLE OF CONTENTS

1.0 PURPOSE..... 1

2.0 APPLICABILITY..... 1

3.0 SITE DESCRIPTION 1

 3.1 General Information 1

 3.2 Hazard Potential 1

 3.3 Hazard Evaluation 3

 3.3.1 Hazards of Concern..... 3

 3.3.2 Physical Characteristics..... 3

 3.3.3 Hazardous Materials..... 3

 3.3.4 Known and Suspect Chemicals of Concern 4

4.0 HEALTH AND SAFETY OFFICER 5

5.0 TRAINING 5

 5.1 General Construction Work Zones 5

 5.2 Contaminated Work Zones 5

6.0 GENERAL WORK PRACTICES 6

7.0 PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING..... 6

 7.1 Personal Protective Equipment..... 6

 7.2 Work Zone Air Monitoring 7

8.0 DECONTAMINATION PROCEDURES 8

 8.1 Personnel Decontamination..... 8

 8.2 Sampling Equipment Decontamination..... 9

 8.3 Heavy Equipment Decontamination..... 9

9.0 EMERGENCY RESPONSE..... 9

 9.1 Emergency Procedures 9

 9.1.1 Chemical Exposure 9

 9.1.2 Personal Injury 10

 9.1.3 Evacuation Procedures 10

 9.1.4 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency 10

 9.1.5 Spill Response..... 11

 9.2 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN..... 11

 9.3 HOSPITAL INFORMATION AND DIRECTIONS..... 11

 9.4 CHASP CONTACT INFORMATION 12

10.0 APPROVAL & ACKNOWLEDGMENTS OF CHASP 13

FIGURES

Figure 1 - Hospital Location Map

APPENDICES

- Appendix A - Potential Health Effects from On-site Contaminants
- Appendix B - Report Forms
- Appendix C - Emergency Hand Signals

1.0 PURPOSE

The purpose of this Construction Phase Environmental Health and Safety Plan (CHASP) is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during construction at the project Site. The CHASP is intended to minimize health and safety risks resulting from the known and potential presence of hazardous materials on the Site.

This plan is not designed to address potential geotechnical, mechanical, or structural safety concerns, nor to supersede or replace any OSHA regulation and/or local and state construction codes or regulations.

2.0 APPLICABILITY

Work subject to this CHASP includes activities that disturb the existing soil or groundwater on-site. The contractors and their subcontractors involved in the construction project will provide a copy of this CHASP to their employees whose work involves any potential exposure to the on-site chemical hazards, and will complete all work in accordance with this CHASP. All work outlined within the CHASP is subject to the Remedial Action Work Plan (RAWP) developed for the Site.

3.0 SITE DESCRIPTION

3.1 General Information

This CHASP has been prepared by AKRF Engineering, P.C. (AKRF) on behalf of TFC West 57 GC LLC, for the project site located at 606 West 57th Street in New York, New York (the Site). The Site is legally defined as Tax Block 1104, Lot 31. Note that Lots 31, 40, 44, and 55 were merged into Lot 31 in July 2014 in preparation for redevelopment. Currently, the Site is in the process of being vacated; however, recent land use consisted of automotive sales, service, and parking. Proposed development of the Site includes construction of a new 42-story residential building with ground floor retail use and two full basement levels. The Site location is shown on Figure 1.

Development plans consist of the anticipated excavation generally to elevation 0 to -12 feet (which is below the water table) with numerous pile caps throughout the Site extending to elevations -7 to -16.5 feet. It is anticipated that there will be three deeper elevator pits on the central portion of the Site extending to elevation -18 to elevation -22 feet. Site elevation is referenced to North American Vertical Datum of 1988 (NAVD88).

3.2 Hazard Potential

Previous investigations, including a Phase I Environmental Site Assessment, spill investigation and remedial documentation, and a Remedial Investigation (RI) conducted at the Site identified potential sources of contamination, including on- and off-site historic uses including manufacturing and industrial use and auto-related facilities, some of which contained buried gasoline tanks and fuel oil tanks.

A Remedial Investigation comprising soil, groundwater and soil vapor sampling identified the following:

1. The results of soil/fill samples collected during the RI showed one VOC detected at a concentration exceeding the NYSDEC Restricted Residential Use Soil Cleanup Objectives

- (SCOs) listed in 6 NYCRR Subpart 375 [1,2,4-trimethylbenzene, concentration 79,000 parts per billion (ppb)]. Seven SVOCs were detected at concentrations exceeding their respective Restricted Residential SCOs: benzo(a)pyrene (maximum of 15,000 ppb), benzo(a)anthracene (maximum of 19,000 ppb), benzo(b)fluoranthene (maximum of 16,000 ppb), benzo(k)fluoranthene (maximum of 6,700 ppb), chrysene (maximum of 19,000 ppb), indeno(1,2,3-cd)pyrene (maximum of 12,000 ppb), and naphthalene (maximum of 35,000 ppb). With the exception of naphthalene, the SVOC concentrations were polycyclic aromatic hydrocarbons (PAHs), which are typical of urban fill material. Seven metals were detected in soil samples at concentrations exceeding their respective Restricted Residential SCOs: arsenic in 4 of 35 samples (maximum of 41.5 parts per million (ppm)), barium (maximum of 3,020 ppm), cadmium (maximum of 18.5 ppm), copper (maximum of 1,550 ppm), lead in 13 of 35 samples (maximum of 11,800 ppm), mercury in 14 of 35 samples (maximum of 54.2 ppm), and zinc (maximum of 14,000 ppm).. PCBs and pesticides were not detected above Restricted Residential SCOs in any of the soil samples.
2. The results of groundwater samples collected during the RI showed nine VOCs detected above the Class GA Groundwater Quality Standards: 1,2,4-trimethylbenzene (maximum of 7.4 ppb), benzene (maximum of 12 ppb), isopropylbenzene (maximum of 8.7 ppb), m/p xylene (maximum of 14 ppb), naphthalene (maximum of 1,100 ppb), n-propylbenzene (maximum of 16 ppb), o-xylene (maximum of 10 ppb), sec-butylbenzene (maximum of 7.1 ppb), and toluene (maximum of 14 ppb). Twelve SVOCs were detected above their respective Class GA Standards, including: acenaphthene (maximum of 110 ppb), naphthalene (maximum of 550 ppb), fluorene (maximum of 57 ppb), phenanthrene (maximum 61 ppb), and phenol (maximum 1.1 ppb). The remaining SVOCs, as follows, are most likely attributable to suspended soil particles in the groundwater and are typical of urban fill: benzo(a)pyrene (maximum of 1.1 ppb), benzo(a)anthracene (maximum of 3.3 ppb), benzo(b)fluoranthene (maximum of 1.2 ppb), benzo(k)fluoranthene (maximum of 0.63 ppb), chrysene (maximum of 2.7 ppb), indeno(1,2,3-cd)pyrene (maximum of 0.65 ppb), and bis(2-ethylhexyl)phthalate (maximum of 7.4 ppb). Four metals were detected above Class GA Standards in the filtered metals analyses: arsenic (maximum of 33 ppb), manganese, sodium, and selenium. No PCBs or pesticides were detected above Class GA Standards.
 3. Soil vapor results 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 samples collected during the RI showed low levels of petroleum-related and low levels of chlorinated VOCs in all soil vapor samples. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, cyclohexane, heptane, hexane, and 2,2,4-trimethylpentane] were detected at concentrations up to 193 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). All compounds were detected at low levels except for acetone (maximum of 1850 $\mu\text{g}/\text{m}^3$). The following chlorinated VOCs were detected in soil vapor: tetrachloroethene (PCE) at a maximum concentration of 30.5 $\mu\text{g}/\text{m}^3$, trichloroethene (TCE) in one soil vapor sample at 2.18 $\mu\text{g}/\text{m}^3$, carbon tetrachloride in one soil vapor sample at 1.69 $\mu\text{g}/\text{m}^3$, and 1,1,1-trichloroethane (TCA) in one soil vapor sample at 32.5 $\mu\text{g}/\text{m}^3$. No VOC concentrations were above the monitoring or mitigation level ranges established within the NYSDOH soil vapor guidance matrix. One PCE concentration slightly exceeded the NYSDOH Air Guideline Value (AGV) for indoor air of 30 $\mu\text{g}/\text{m}^3$.

3.3 Hazard Evaluation

The most likely routes of exposure are breathing of volatile and semivolatile compounds or particulate-laden air released during soil disturbing activities, dermal contact, and accidental ingestion. Appendix A includes specific health effects from the known on-site chemicals. The remaining sections of this CHASP address procedures (including training, air monitoring, work practices and emergency response) to reduce the potential for unnecessary and unacceptable exposure to these contaminants.

The potential adverse health effects from these detected contaminants are diverse. Many of these compounds are known or suspected to result in chronic illness from long-term exposures. However, due to the limited nature of the proposed construction, only acute effects are a potential concern.

This CHASP addresses potential environmental hazards from the presence of hazardous materials. It is not intended to address the normal hazards of construction work, which are separately covered by OSHA regulations and/or local and state construction codes and regulations. Although some of the chemicals of concern listed in the sections below were not detected during the RI conducted, they are included here as a precaution.

3.3.1 Hazards of Concern

Check all that apply		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm.
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Other
Comments: No personnel are permitted to enter permit confined spaces		

3.3.2 Physical Characteristics

Check all that apply		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge (from USTs)
<input checked="" type="checkbox"/> Vapors	<input type="checkbox"/> Unknown	<input type="checkbox"/> Other

3.3.3 Hazardous Materials

Check all that apply					
Chemicals	Solids	Sludges	Solvents	Oils	Other
<input type="checkbox"/> Acids	<input type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input type="checkbox"/> Halogens	<input checked="" type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input checked="" type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm.
<input type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input type="checkbox"/> Other	<input checked="" type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input checked="" type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other: Fill Material	<input type="checkbox"/> Other:		<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad.
<input type="checkbox"/> Inks				<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input type="checkbox"/> PCBs					<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input type="checkbox"/> Other:					

3.3.4 Known and Suspect Chemicals of Concern

Soil analytical data from the remedial investigation identified VOCS, SVOCs, and metals detected at concentrations greater than the RRSCOs. No PCBs or pesticides were detected at concentrations greater than the RRSCOs. Potential chemicals of concern, including those typical of historic fill, are included below for reference.

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Arsenic	REL = 0.002 mg/m ³ PEL = 0.01 mg/m ³	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin; potential occupational carcinogen.
Barium	REL = 0.5 mg/m ³ PEL = 0.5 mg/m ³	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia.
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Benzo(a)pyrene	PEL = 0.1 mg/m ³ REL = 0.2 mg/m ³	Dermatitis, bronchitis, potential occupational carcinogen.
Copper	REL = 1 mg/m ³ PEL = 1 mg/m ³	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia
DDT/DDE (pesticides)	REL = 0.5 mg/m ³ PEL = 1 mg/m ³ [skin]	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; potential carcinogen.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Fuel Oil	REL = 350 mg/m ³ PEL = 400 ppm	Nausea, irritation – eyes, hypertension, headache, light-headedness, loss of appetite, poor coordination; long-term exposure – kidney damage, blood clotting problems; potential carcinogen.
Lead	REL = 0.05 mg/m ³ PEL = 0.05 mg/m ³	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Mercury	REL = 0.1 mg/m ³ PEL = 0.05 mg/m ³	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Methyl Tert Butyl Ether (MTBE)	REL = 40 ppm	Headaches, nausea, dizziness, mental confusion, gastrointestinal irritation, liver and kidney damage, and nervous system effects.
Naphthalene	REL = 10 ppm PEL = 10 ppm	Irritation eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage.
Polychlorinated Biphenyls (PCBs)	REL = 0.001 mg/m ³ PEL = 0.5 mg/m ³ (skin)	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen].
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m ³	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; potential carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
		vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Comments: REL = National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

4.0 HEALTH AND SAFETY OFFICER

The AKRF Site Safety Officer (SSO) is expected to be Robert Panczer. The SSO will be a competent person responsible for the implementation of this plan. The SSO will have completed a 40-hour training course (up-dated by an annual refresher) that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. The SSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the SSO must be absent from the Site, he/she will designate a suitably qualified replacement that is familiar with the CHASP. If work is stopped for any reason, the OER would be notified immediately.

5.0 TRAINING

5.1 General Construction Work Zones

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All construction personnel upon entering the Site must attend a brief training meeting, its purpose being to:

- Make workers aware of the potential hazards they may encounter;
- Instruct workers on how to identify potential hazards,
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- Make workers aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the construction crew will be instructed in these objectives before he/she goes onto the Site. Construction personnel will be responsible for identifying potential hazards in the work zone. The SSO or other suitably trained individual will be responsible for conducting the training program. Others who enter the Site must be accompanied by a suitably-trained construction worker.

5.2 Contaminated Work Zones

In accordance with 29 CFR 1910.120, Site workers with potential for direct contact with gross contamination or hazardous waste shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste Site operations (HAZWOPER). Annual eight-hour refresher training will be required of all hazardous waste Site field personnel in order to maintain their qualifications for fieldwork. Proof of training shall be submitted to the SSO prior to the start of field activities. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures. At a minimum, the

training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any Site activities during which they may be exposed to hazards (chemical or physical).

6.0 GENERAL WORK PRACTICES

To protect the health and safety of the field personnel, all field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance in grossly contaminated or hazardous waste work zones.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the Site. These areas will be designated by the SSO.
- Workers must wash their hands and face thoroughly on leaving the work area and before eating, drinking, or any other such activity. The workers should shower as soon as possible after leaving the Site.
- Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat stress.

7.0 PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING

7.1 Personal Protective Equipment

The personal protection equipment required for various kinds of Site investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, “General Description and Discussion of the Levels of Protection and Protective Gear.”

AKRF field personnel and other Site personnel will wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 7.2.

Level of Protection Summary

LEVEL OF PROTECTION & PPE	Excavation Other Earth Moving Activities
Level D (x) Steel Toe Shoes (x) Hard Hat (within 25 ft of excavator) (x) Work Gloves (as needed) <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> Face Shield <input checked="" type="checkbox"/> Ear Plugs (within 25 ft of excavator) <input type="checkbox"/> Latex Gloves	Yes
Level D – Modified (in addition to Level D) (x) Tyvek Coveralls <input checked="" type="checkbox"/> Nitrile Gloves <input type="checkbox"/> Overboots <input type="checkbox"/> Saranex Coveralls	As necessary, if direct contact with gross contamination or hazardous waste
Level C (in addition to Level D – Modified) <input type="checkbox"/> Half-Face Respirator <input checked="" type="checkbox"/> Full Face Respirator <input type="checkbox"/> Full-Face PAPR <input type="checkbox"/> Particulate Cartridge <input type="checkbox"/> Organic Cartridge <input checked="" type="checkbox"/> Dual Organic/Particulate Cartridge	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).	

7.2 Work Zone Air Monitoring

As outlined in the RAWP prepared for Site development, real time air monitoring will be performed at the downwind perimeter of the immediate work area with a photoionization detector (PID) and with a particulate air monitor during excavation work. Community air monitoring will also be conducted at the work zone perimeter in accordance with Section 5.5 of the RAWP.

The air monitoring action levels and required responses are listed in the following table:

Action Levels and Required Safety Response Actions

Instrument	Task to be Monitored	Action Level	Response Action
PID (OVM 580B, Minirae 2000, or equivalent)	All Soil Movement Activities	Less than 10 ppm in breathing zone.	Level D or D-Modified
		Between 10 and 50 ppm	Level C
		More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm.
Particulate monitor (Dustrak, MIE 1000 Personal DataRam or equivalent)	All Soil Movement Activities	Less than 5 mg/m ³	Level D
		Between 5 mg/m ³ and 125 mg/m ³	Level C. Apply dust suppression measures. If < 2.5 mg/m ³ , resume work using Level D. Otherwise, use Level C.
		Above 125 mg/m ³	Stop work. Apply additional dust suppression measures. Resume work when less than 125 mg/m ³ .

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance and calibration procedures.

The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

8.0 DECONTAMINATION PROCEDURES

8.1 Personnel Decontamination

Personnel decontamination (decon), if deemed necessary by the SSO, will take place in a designated decontamination area. This area will be delineated during each stage of work. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Coverall removal (if applicable);
- Glove removal;
- Disposable clothing removal; and
- Field washing of hands and face.

8.2 Sampling Equipment Decontamination

Any non-disposable sampling equipment for confirmatory sampling or other equipment that is in contact with contaminated materials will be decontaminated in accordance with the following procedure:

- Double wash with solution of Simple Green[®] and clean tap water;
- Double rinse with clean tap water;
- Rinse with clean distilled water; and
- Allow equipment to air dry.

8.3 Heavy Equipment Decontamination

If heavy equipment comes in contact with grossly contaminated materials, it will be decontaminated prior to being relocated to a clean area or leaving the Site. A designated decontamination pad will be constructed, where soil, dust, or oil will be washed off the exterior, undercarriage, and wheels or tracks of the equipment. Wash water will be collected for treatment and/or disposal.

9.0 EMERGENCY RESPONSE

9.1 Emergency Procedures

In the event that an emergency develops on-Site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-Site; and
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- A spill of oil or other hazardous materials.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below. In the event of an accident or emergency, an Incident Report form should be filled out and placed in the project file. An example Weekly Safety Report Form and Incident Report Form are provided in Appendix B. Information on emergency hand signals is provided in Appendix C.

9.1.1 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the SSO (via voice and hand signals) of the chemical exposure. The SSO should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- All chemical exposure incidents must be reported in writing to the SSO. The SSO is responsible for completing the Incident Report Form.

9.1.2 Personal Injury

In case of personal injury at the Site, the following procedures should be followed:

- Another team member (buddy) should signal the SSO that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The SSO is responsible for making certain that an Incident Report Form is completed. This form is to be submitted to the SSO. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit, eye-wash, and blood-borne pathogens kit will be kept on-Site during the field activities.

9.1.3 Evacuation Procedures

- The SSO will initiate evacuation procedures by signaling to leave the Site or containment structure;
- All personnel in the work area should evacuate the area and meet in the common designated area;
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately; and
- The SSO will then give further instruction.

9.1.4 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;
- Keep the area surrounding the problem source clear after the incident occurs; and
- Complete accident report for and distribute to appropriate personnel.

9.1.5 Spill Response

All personnel must take every precaution to minimize the potential for spills during Site operations. Any spill will be reported immediately to the SSO. The SSO will immediately report any spills to the NYSDEC Spill Hotline. The OER will be provided with the spill numbers assigned by the NYSDEC.

Spill control apparatus (sorberent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes. The SSO, in consultation with AKRF's Project Manager, will determine if additional spill response measures are required.

9.2 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment including a first aid kit. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be driven to a hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is attached as Figure 1. An emergency/injury report is provided in Appendix B.

9.3 HOSPITAL INFORMATION AND DIRECTIONS

Hospital Name:	St. Luke's Roosevelt Hospital
Phone Number:	(212) 842-0907
Address/Location:	1000 10 th Avenue (515 West 59 th Street) New York, New York
Directions:	<ol style="list-style-type: none"> 1. Head south on 11th Avenue 2. Turn left on West 56th Street 3. Turn left on 9th Avenue 4. Turn left on 59th Street 5. St. Luke's Roosevelt Hospital will be on the left side.

9.4 CHASP CONTACT INFORMATION

AKRF Project Director – Marc Godick	(914) 922-2356 (office)
AKRF Project Manager – Kate Brunner	(646) 388-9525 (office)
	(917) 612-3990 (cell)
Site Safety Officer (SSO) – Robert Panczer	(484) 547-5664 (cell)
Client Representatives – Brian Mills – Project Manager	(212) 984-1743 (office)
Christopher Steinmann – Construction Superintendent	(917) 295-0948 (cell)
St. Luke’s Roosevelt Hospital	(212) 842-0907
Ambulance, Fire and Police Departments	911
Local Poison Control	(212) 764-7667
	pm/weekend (212) 340-4494
NYSDEC Spill Response Team	(800) 457-7362

10.0 APPROVAL & ACKNOWLEDGMENTS OF CHASP

APPROVAL

Signed: _____ Date: _____
Project Manager

Signed: _____ Date: _____
Health and Safety Officer

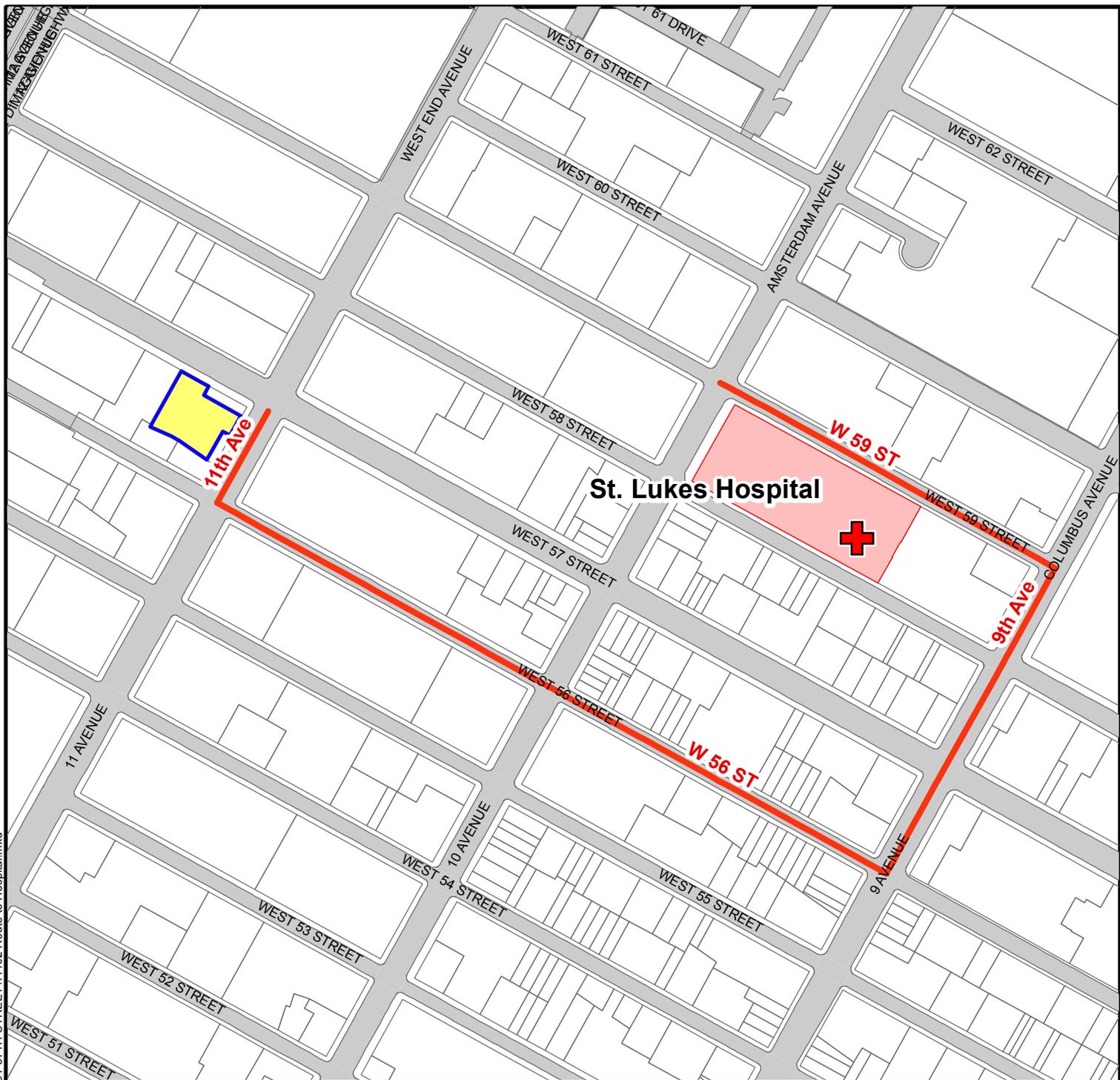
Below is an affidavit that must be signed by all workers who enter the Site during soil disturbance work. A copy of the CHASP must be on-site at all times and will be kept by the SSO.

AFFIDAVIT

I, _____ (name), of _____ (company name), have read the Construction Health and Safety Plan (CHASP) for 606 West 57th Street, New York, New York. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the Site.

Signed: _____ Company: _____ Date: _____

FIGURES



Legend

-  Route to Hospital
-  Project Site Location
-  Hospital Location



St. Luke's Hospital
 1111 Amsterdam Ave
 New York, NY 10025
 212-523-4000

© 2013 AKRF, Inc. Environmental Consultants O:\Projects\11402 - WEST 57TH STREET\11402 Route to Hospital.mxd

835 11th AVENUE
 New York, New York



DATE
2/11/2013

PROJECT No.
11201

HOSPITAL LOCATION MAP

Environmental Consultants
 440 Park Avenue South, New York, N.Y. 10016

FIGURE
1

APPENDIX A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

- Arsenic cannot be destroyed in the environment. It can only change its form.
- Arsenic in air will settle to the ground or is washed out of the air by rain.
- Many arsenic compounds can dissolve in water.
- Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

- Eating food, drinking water, or breathing air containing arsenic.
- Breathing contaminated workplace air.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living near uncontrolled hazardous waste sites containing arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

appearance of small “corns” or “warts” on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

It is likely that health effects seen in children exposed to high amounts of arsenic will be similar to the effects seen in adults.

How can families reduce the risk of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 µg arsenic per cubic meter of workplace air (10 µg/m³) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about barium and barium compounds. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.

Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).

Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risks of exposure to barium?

The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

Is there a medical test to determine whether I've been exposed to barium?

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m³) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m³ of total dust and 5 mg/m³ for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m³ for soluble barium compounds. The NIOSH has set RELs of 10 mg/m³ (total dust) for barium sulfate and 5 mg/m³ (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn'zĕn')

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.

- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mg/L). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ĕth' əl bĕn' zĕn')

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classified as to human carcinogenicity.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and

some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about fuel oils. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Fuel oils are liquid mixtures produced from petroleum, and their use mostly involves burning them as fuels. Drinking or breathing fuel oils may cause nausea or nervous system effects. However, exposure under normal use conditions is not likely to be harmful. Fuel oils have been found in at least 26 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fuel oils?

(Pronounced fyoo'el oilz)

Fuel oils are a variety of yellowish to light brown liquid mixtures that come from crude petroleum. Some chemicals found in fuel oils may evaporate easily, while others may more easily dissolve in water.

Fuel oils are produced by different petroleum refining processes, depending on their intended uses. Fuel oils may be used as fuel for engines, lamps, heaters, furnaces, and stoves, or as solvents.

Some commonly found fuel oils include kerosene, diesel fuel, jet fuel, range oil, and home heating oil. These fuel oils differ from one another by their hydrocarbon compositions, boiling point ranges, chemical additives, and uses.

What happens to fuel oils when they enter the environment?

- Some chemicals found in fuel oils may evaporate into the air from open containers or contaminated soil or water.
- Some chemicals found in fuel oils may dissolve in water after spills to surface waters or leaks from underground storage tanks.

- Some chemicals found in fuel oils may stick to particles in water, which will eventually cause them to settle to the bottom sediment.
- Some of the chemicals found in fuel oils may be broken down slowly in air, water, and soil by sunlight or small organisms.
- Some of the chemicals found in fuel oils may build up significantly in plants and animals.

How might I be exposed to fuel oils?

- Using a home kerosene heater or stove, or using fuel oils at work.
- Breathing air in home or building basements that has been contaminated with fuel oil vapors entering from the soil.
- Drinking or swimming in water that has been contaminated with fuel oils from a spill or a leaking underground storage tank.
- Touching soil contaminated with fuel oils.
- Using fuel oils to wash paint or grease from skin or equipment.

How can fuel oils affect my health?

Little information is available about the health effects that may be caused by fuel oils. People who use kerosene

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

stoves for cooking do not seem to have any health problems related to their exposure.

Breathing some fuel oils for short periods may cause nausea, eye irritation, increased blood pressure, headache, lightheadedness, loss of appetite, poor coordination, and difficulty concentrating. Breathing diesel fuel vapors for long periods may cause kidney damage and lower your blood's ability to clot.

Drinking small amounts of kerosene may cause vomiting, diarrhea, coughing, stomach swelling and cramps, drowsiness, restlessness, painful breathing, irritability, and unconsciousness. Drinking large amounts of kerosene may cause convulsions, coma, or death. Skin contact with kerosene for short periods may cause itchy, red, sore, or peeling skin.

How likely are fuel oils to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that some fuel oils (heavy) may possibly cause cancer in humans, but for other fuel oils (light) there is not enough information to make a determination. IARC has also determined that occupational exposures to fuel oils during petroleum refining are probably carcinogenic in humans.

Some studies with mice have suggested that repeated contact with fuel oils may cause liver or skin cancer. However, other mouse studies have found this not to be the case. No studies are available in other animals or in people on the carcinogenic effects of fuel oils.

Is there a medical test to show whether I've been exposed to fuel oils?

There is no medical test that shows if you have been exposed to fuel oils. Tests are available to determine if some of

the chemicals commonly found in fuel oils are in your blood. However, the presence of these chemicals in blood may not necessarily mean that you have been exposed to fuel oils.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) and the Air Force Office of Safety and Health (AFOSH) have set a permissible exposure level (PEL) of 400 parts of petroleum distillates per million parts of air (400 ppm) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that average workplace air levels not exceed 350 milligrams of petroleum distillates per cubic meter of air (350 mg/m³) for a 40-hour workweek.

The Department of Transportation (DOT) lists fuel oils as hazardous materials and, therefore, regulates their transportation.

Glossary

Carcinogenic: Able to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or a gas.

Hydrocarbon: Any compound made up of hydrogen and carbon.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for fuel oils. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- Avoid exposure to sources of lead.
- Do not allow children to chew on mouth surfaces that may have been painted with lead-based paint.
- If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces

often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter ($\mu\text{g}/\text{dL}$). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 $\mu\text{g}/\text{dL}$ to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mŭr/kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m³) and 0.05 mg/m³ of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has caused cancer in animals. Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene have been found in at least 687, 36, and 412, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

1-Methylnaphthalene and 2-methylnaphthalene are naphthalene-related compounds. 1-Methylnaphthalene is a clear liquid and 2-methylnaphthalene is a solid; both can be smelled in air and in water at very low concentrations.

1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-Methylnaphthalene is also used to make vitamin K.

What happens to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene when they enter the environment?

- Naphthalene enters the environment from industrial and domestic sources, and from accidental spills.
- Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills.
- Naphthalene can become weakly attached to soil or pass through soil into underground water.
- In air, moisture and sunlight break it down within 1 day. In water, bacteria break it down or it evaporates into the air.
- Naphthalene does not accumulate in the flesh of animals or fish that you might eat.

- 1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

How might I be exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels.
- Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air.
- Drinking water from contaminated wells.
- Touching fabrics that are treated with moth repellents containing naphthalene.
- Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely.

How can naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

causes reproductive effects in animals; most evidence says it does not.

There are no studies of humans exposed to 1-methylnaphthalene or 2-methylnaphthalene.

Mice fed food containing 1-methylnaphthalene and 2-methylnaphthalene for most of their lives had part of their lungs filled with an abnormal material.

How likely are naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene to cause cancer?

There is no direct evidence in humans that naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene cause cancer.

However, cancer from naphthalene exposure has been seen in animal studies. Some female mice that breathed naphthalene vapors daily for a lifetime developed lung tumors. Some male and female rats exposed to naphthalene in a similar manner also developed nose tumors.

Based on the results from animal studies, the Department of Health and Human Services (DHHS) concluded that naphthalene is reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) concluded that naphthalene is possibly carcinogenic to humans. The EPA determined that naphthalene is a possible human carcinogen (Group C) and that the data are inadequate to assess the human carcinogenic potential of 2-methylnaphthalene.

How can naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene affect children?

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs. Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.

There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy.

We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

How can families reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using

fireplaces or heating appliances in their homes.

If families use naphthalene-containing moth repellents, the material should be enclosed in containers that prevent vapors from escaping, and kept out of the reach from children.

Blankets and clothing stored with naphthalene moth repellents should be aired outdoors to remove naphthalene odors and washed before they are used.

Families should inform themselves of the contents of air deodorizers that are used in their homes and refrain from using deodorizers with naphthalene.

Is there a medical test to determine whether I've been exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Tests are available that measure levels of these chemicals and their breakdown products in samples of urine, feces, blood, maternal milk, or body fat. These tests are not routinely available in a doctor's office because they require special equipment, but samples can be sent to special testing laboratories. These tests cannot determine exactly how much naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene you were exposed to or predict whether harmful effects will occur. If the samples are collected within a day or two of exposure, then the tests can show if you were exposed to a large or small amount of naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for the level of naphthalene in workplace air during an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) considers more than 500 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to impair a worker's ability to leave a contaminate area and therefore, results in permanent health problems or death.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m³). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m³ averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m³ for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these

aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breastfeeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances,

electrical equipment, or transformers, since they may contain PCBs.

- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.

- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



APPENDIX B
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

Summary of any job related injuries, illnesses, or near misses that week:

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

Comments:

Name: _____ Company: _____

Signature: _____ Title: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

CLASSIFICATION OF INJURY:

- | | | |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions | _____ Dislocations | _____ Punctures |
| ___ Bites | _____ Faint/Dizziness | _____ Radiation Burns |
| ___ Blisters | _____ Fractures | _____ Respiratory Allergy |
| ___ Bruises | _____ Frostbite | _____ Sprains |
| ___ Chemical Burns | _____ Heat Burns | _____ Toxic Resp. Exposure |
| ___ Cold Exposure | _____ Heat Exhaustion | _____ Toxic Ingestion |
| ___ Concussion | _____ Heat Stroke | _____ Dermal Allergy |
| ___ Lacerations | | |

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident
(Object, substance, material, machinery, equipment, conditions)

Was weather a factor?: _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

If not, how did actual equipment use differ from plan?:

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____

Follow-up performed by:

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

Summary of any job related injuries, illnesses, or near misses that week:

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

Comments:

Name: _____ Company: _____

Signature: _____ Title: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

CLASSIFICATION OF INJURY:

- | | | |
|--------------------|-----------------------|----------------------------|
| ___ Abrasions | _____ Dislocations | _____ Punctures |
| ___ Bites | _____ Faint/Dizziness | _____ Radiation Burns |
| ___ Blisters | _____ Fractures | _____ Respiratory Allergy |
| ___ Bruises | _____ Frostbite | _____ Sprains |
| ___ Chemical Burns | _____ Heat Burns | _____ Toxic Resp. Exposure |
| ___ Cold Exposure | _____ Heat Exhaustion | _____ Toxic Ingestion |
| ___ Concussion | _____ Heat Stroke | _____ Dermal Allergy |
| ___ Lacerations | | |

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

Was weather a factor?: _____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

If not, how did actual equipment use differ from plan?:

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____
Follow-up performed by: _____

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX C
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

**LEAVE AREA IMMEDIATELY,
NO DEBATE!**

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!



Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!



Thumbs up

NO! - NEGATIVE!



Thumbs down