March 2016

REMEDIAL ACTION WORK PLAN

OER Project Number 16EHAZ109R
Voluntary Cleanup Number: 16CVCP050R
Staten Island Mall
2655 Richmond Avenue
Staten Island, New York

Block 2400: Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210

Prepared for:

GGP STATEN ISLAND MALL, LLC
110 North Wacker Drive
Chicago, Illinois 60606
312-960-5000
kelly.webb@generalgrowth.com

Remedial Engineering, P.C.
Environmental Engineers

and ROUX ASSOCIATES, INC.

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

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

FIGURES

APPENDICES

ACRONYMS

Acronym	Definition
AWQSGV	Ambient Water Quality Standards and Guidance Values
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Contaminants of Concern
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health

Acronym	Definition
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
PPM	Parts Per Million
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

CERTIFICATION

I, David Bligh, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for designing the remedial program for the Staten Island Mall, 2655 Richmond Avenue, Staten Island, New York Site (Block 2400, Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210), OER number 16EHAZ109R and 16CVCP050R. I certify to the following:

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

David T. Bligh, P.E.
NYS Professional Engineer #090826

3/3/2016
Date

Signature

STATE OF NEW YORK
DAVID T. BLIGH
090826
LICENSED PROFESSIONAL ENGINEER

I, Frank Cherena, am a Qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the Staten Island Mall, 2655 Richmond Avenue, Staten Island, New York Site (Block 2400, Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210), site number 16EHAZ109R and 16CVCP050R. I certify to the following:

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

Frank Cherena	3/3/2016	
Qualified Environmental Professional	Date	Signature

EXECUTIVE SUMMARY

GGP Staten Island Mall, LLC (GGP) is working with the New York City Office of Environmental Remediation (NYC OER) in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 3,470,100-square foot site identified as Block 2400 and Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210 located at 2655 Richmond Avenue in Staten Island, New York (Site). Lot 80 is the subject of a separate Remedial Action Work Plan dated December 21, 2015. A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance, and conforms with applicable laws and regulations.

Site Location and Background

The Site is located at 2655 Richmond Avenue in the New Springville section in Staten Island, New York and is identified as Block 2400 and Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210 on the NYC Tax Map. Figure 1 shows the Site location. The Site is approximately 3,470,100 square feet. A map of the Site boundary is shown in Figure 2. Currently, the Site is used for commercial retail business and contains the Staten Island Mall, a retail space occupied by approximately 168 tenants (Block 2400, Lot 180). Abutting the Mall are three "anchor" stores located adjacent to the main facility: Macy's (Block 2400, Lot 118); J.C. Penney's (Block 2400, Lot 210); and Sears (Block 2400, Lot 375). Lot 375 is not considered part of the Site, and no improvements are planned as part of the redevelopment.

Summary of Redevelopment Plan

The proposed future use of the Site will consist of the expansion of the existing mall building (Lot 180). In addition, an aboveground parking deck will be constructed on Lot 80. The remedy and development of the parking deck is the subject of a RAWP dated December 21, 2015 prepared by Roux Associates. The newly constructed buildings and the expansion of the existing building will be constructed as slab on grade structures. Localized excavations will occur for footings and for utility installation ranging from 4 to 8 feet below land surface (ft bls). In addition, portions of the parking lot (Lots 7, 70, 118, 140, 190, 200, and 210) will be enhanced (e.g., upgraded lighting, landscaping, and new asphalt and striping, etc.). Additional future development (i.e., new

buildings) is proposed for Lots 20 and 30. One area of the Site (Block 2400, Lot 140) will be slightly regraded to accommodate the building expansion. Layout of the proposed Site development is presented in Figure 3. The current zoning designation is C4-1 used for commercial and office buildings. The proposed use is consistent with existing zoning for the Site.

Summary of Surrounding Property

Surrounding properties are primarily residential and commercial (retail). The Site is bounded to the north along Richmond Hill Road by residential properties; to the east across Marsh Avenue by Public School P.S. 58 and residential properties; to the south by Sears and across Platinum Avenue by a retail strip mall; and to the west across Richmond Avenue by the Fresh Kills Landfill. Nearby water bodies include the Springville Creek and Richmond Creek, located respectively to the west and south of the Site. These water bodies are interconnected and drain to the Fresh Kills.

Summary of Past Site Uses and Areas of Concern

Former Site uses include agricultural use with onsite greenhouses (1930s), an aircraft aviation school and civilian airport (1950s), a golf driving range surrounded by residential dwellings (1960s), a sewage treatment plant with a gasoline filling station and commercial retail stores (1970s), and a shopping mall (1970s to current). Nearby water bodies include the Springville Creek and Richmond Creek, located respectively to the west and south of the Site. These water bodies are interconnected and drain to the Fresh Kills.

Block 2400, Lot 180 is currently owned by GGP and was purchased in October 1980 from Thomas J. Hartigan, as a trustee of Twenty Seven Trust. According to the Ameristar Chain of Ownership Report Lot 180 was sold to Twenty Seven Trust by SIM Mall Inc. (an affiliate of GGP) in 1980. John J. Kelly sold Lot 180 to SIM Mall Inc. in February 1978. The ownership of Lot 180 has not changed since 1980. Block 2400, Lot 118 is owned by Macy's and Block 2400, Lot 210 is owned by J.C. Penney's.

The following Areas of Concern (AOCs) were anticipated at the Site:

- Potential presence of historic fill of an unknown origin;
- Potential impacts from pesticide usage, specifically insecticides, due to historic agricultural use and the presence of a greenhouse in the 1930s; and

- Potential contamination due to the historic airport runway and aviation school formerly located at the Site.

Summary of Work Performed under the Remedial Investigation

On behalf of GGP, Roux Associates, Inc. (Roux Associates), performed the following scope of work for all areas of the Site excluding Lot 80 (The Lot 80 scope of work was discussed in the RIR dated December 17, 2015 and the RAWP dated December 21, 2015):

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e., structures, buildings, etc.);

2. Installed 29 soil borings and collected 64 soil samples for chemical analysis to evaluate soil quality, as part of the 2013 Phase II Environmental Site Assessment (ESA) and 2015 RI;

3. Installed eight groundwater monitoring wells to establish groundwater flow and collected eight groundwater samples for chemical analysis to evaluate groundwater quality, including one sample from a monitoring well installed as part of Roux Associates' 2013 Phase II ESA; and

4. Installed ten soil vapor points and collected ten soil vapor samples for chemical analysis, including three samples from soil vapor points installed as part of Roux Associates' 2013 Phase II ESA.

Summary of Findings of Remedial Investigation

An RI was performed and the results are documented in a companion document titled "Remedial Investigation Report, Staten Island Mall," dated December 2015 (RIR). A summary of the findings are provided below:

1. Elevation of the Site ranges from approximately 31.52 feet above mean sea level (ft amsl) on the west side to 54.41 ft amsl on the east side.

2. Depth to groundwater ranges from 10.27 to 22.70 ft bls at the Site.

3. Groundwater flow is generally from east to west beneath the Site, toward Springville Creek and ultimately the Fresh Kill.

4. Depth to bedrock ranges from approximately 16 to 24 ft bls at the Site.

5. The stratigraphy of the Site, from the surface down, consists of 16 to 24 ft of silt and fine sand with a varying mixture of medium to coarse sand, gravel, clay, and cobble underlain by Serpentinite bedrock. Dark organic material was observed within some of the silt layers in the eastern parcel of Lot 180.

6. A total of 64 soil samples were collected for laboratory analysis from 29 soil borings during the 2013 Phase II ESA and 2015 RI, and are summarized below. Soil/fill sample results were compared to New York State Department of Environmental Conservation (NYSDEC) Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs), Track 2 Restricted Residential Use SCOs, and Track 2 Commercial Use SCOs, as presented in 6NYCRR Part 375-6.8.

   a. **Lot 20:** Soil samples were collected from three soil borings installed on Lot 20. Soil/fill results showed no volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), or pesticides detected in any of the soil samples. The metal chromium was detected at a concentration of 38.6 milligrams per kilogram [mg/kg] in sample SB-25 (4-6) above Track 1 Unrestricted Use SCOs. There were no exceedances of Track 2 Restricted Residential Use SCOs or Commercial Use SCOs in any analyte on Lot 20 during the RI.

   b. **Lot 30:** Soil samples were collected from three soil borings installed on Lot 30. Soil/fill results showed that no VOCs, SVOCs, PCBs, pesticides or metals were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 30 during the RI.

   c. **Lot 70:** Soil samples were collected from two soil borings installed on Lot 70. Soil/fill results showed that no VOCs, SVOCs, PCBs or pesticides were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Chromium and nickel were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium detections ranged from 39 to 47 mg/kg, with the maximum concentration in sample SB-3 (0-2). Nickel detections ranged from 34 to 93 mg/kg, with the maximum concentration in sample SB-2 (13-15). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 70 during the RI.

   d. **Lot 140:** Soil samples were collected from four soil borings installed on Lot 140. Soil/fill results showed that no SVOCs or PCBs were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Acetone, which is likely a laboratory contaminant, was detected in samples SB-27 (0-2) and SB-27(4-6) at a maximum concentration of 86 µg/kg. Metals including chromium and nickel were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium was detected at a concentration of 34 mg/kg in sample SB-29 (0-2). Nickel was detected at a concentration of 80 mg/kg in sample SB-29 (0-2). Pesticides including 4,4'-DDD, 4,4'-DDE and 4,4'-DDT were detected above Track 1 Unrestricted Use SCOs. 4,4'-DDD was detected at concentrations ranging from 4.4 to 1,200 micrograms per kilogram (µg/kg), with the maximum concentration in sample SB-28 (0-2). 4,4'-DDE was detected at concentrations ranging from 6.7 to 160 µg/kg, with the maximum concentration in sample SB-28 (4-6). 4,4'-DDT was detected at concentrations ranging from 3.7 to 750 µg/kg, with the maximum concentration in sample SB-28 (0-2). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 140 during the RI.

e. **Lot 180 (Western Parcel):** Soil samples were collected from 12 soil borings installed on the western parcel of Lot 180. Soil/fill results showed that no VOCs, SVOCs, PCBs or pesticides were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Metals including chromium, nickel, copper, lead, zinc, and arsenic were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium was detected at a concentration of 31 mg/kg in sample SB-6 (14-15). Nickel was detected at a concentration of 37 mg/kg in sample SB-8 (0-2). Copper was detected at a concentration of 92.6 mg/kg in sample MW-11B (8-10). Lead was detected at a concentration of 386 mg/kg in sample MW-11B (8-10). Zinc was detected at a concentration of 393 mg/kg in sample MW-11B (8-10). Arsenic was detected at a concentration of 16.2 mg/kg in sample MW-11B (8-10), slightly above Track 2 Restricted Residential Use SCOs and Track 2 Commercial Use SCOs for arsenic (i.e., 16 mg/kg). With the exception of arsenic, there were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any compound on the western parcel of Lot 180 during the RI.

f. **Lot 180 (Eastern Parcel):** Soil samples were collected from five soil borings installed on the eastern parcel of Lot 180. Soil/fill results showed that no VOCs, SVOCs, or PCBs were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Nickel was detected at concentrations above Track 1 Unrestricted Use SCOs, with a detection of 48 mg/kg in sample SB-9 (13-15) and 38 mg/kg in sample SB-10 (8-10). Pesticides including 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were detected at concentrations above Track 1 Unrestricted Use SCOs. 4,4'-DDD was detected at concentrations ranging from 4.4 to 4,800 µg/kg, with the maximum concentration in sample SB-10 (8-10). 4,4'-DDE was detected at concentrations ranging from 6.7 to 240 µg/kg, with the maximum concentration in sample SB-10 (8-10). 4,4'-DDT was detected at concentrations ranging from 3.7 to 1,200 µg/kg, with the maximum concentration in sample SB-10 (8-10). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any compound on the eastern parcel of Lot 180 during the RI.

7. Eight groundwater samples were collected from Lots 20 and 180 and were compared to the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs). The groundwater samples did not contain any exceedances of the AWQSGVs for VOCs, SVOCs, PCBs, or pesticides. The total metals magnesium and sodium (filtered and unfiltered) were detected above the AWQSGVs in groundwater samples collected from all eight monitoring well locations. The elevated detections of magnesium and sodium are likely related to salt water intrusion from the nearby surface water bodies.

   a. **Lot 20:** One groundwater sample, MW-5, was collected from Lot 20 during the 2015 investigation. Magnesium was detected at 159,000 micrograms per liter (µg/L) and sodium was detected at 97,600 µg/L in sample MW-5.

   b. **Lot 30:** No groundwater samples were collected from Lot 30 during the 2015 investigation.

   c. **Lot 180 Western Parcel:** Four groundwater samples were collected from monitoring wells MW-1 MW-8, MW-9, and MW-11B, respectively, from the western parcel of

Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 48,700 to 105,000 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-8. Sodium concentrations ranged from 165,000 to 631,000 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-9.

d. **Lot 180 Eastern Parcel:** Three groundwater samples were collected from monitoring wells MW-3, MW-6, and MW-12, respectively, from the eastern parcel of Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 60,400 to 151,000 µg/L , with the maximum concentration detected in the groundwater sample collected from MW-3. Sodium concentrations ranged from 122,000 to 416,000 µg/L , with the maximum concentration detected in the groundwater sample collected from MW-3. Iron was detected at a concentration of 5,560 µg/L in the groundwater sample collected from MW-3. Manganese concentrations ranged from 5,770 to 9,500 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-3. Selenium was detected at concentrations ranging from 10.1 to 11.9 µg/L, with the maximum concentration exhibited in sample MW-6. Thallium was detected at concentrations ranging from 4.7 to 7.4 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-6.

8. Ten soil vapor samples were collected from Lots 20, 30, and 180 during the 2015 investigation, and were analyzed and compared to the regulatory guidance on soil vapor and indoor air quality as presented in Matrix 1 and Matrix 2 from the New York State Department of Health (NYSDOH) Center for Environmental Health (CEH) Bureau of Environmental Exposure Investigation (BEEI) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.

   a. **Lot 20:** One soil vapor sample, SV-17, was collected from Lot 20 during the 2015 investigation. Tetrachloroethene (PCE) was detected with a concentration of 9.5 µg/m^3, and MTBE was detected with a concentration of 1.3 µg/m^3.

   b. **Lot 30:** One soil vapor sample, SV-5, was collected from Lot 20 during the 2015 investigation. PCE was detected with a concentration of 1.9 µg/m^3.

   c. **Lot 70:** No soil vapor samples were collected in Lot 70. The current and proposed future use of Lot 70 is an asphalt parking lot.

   d. **Lot 140:** No soil vapor samples were collected in Lot 140. The current and proposed future use of Lot 70 is an asphalt parking lot.

   e. **Lot 180 (Western Parcel):** Five soil vapor samples, SV-1, SV-11, SV-12, SV-13, and SV-14, were collected from the western parcel of Lot 180 during the 2015 investigation. 1,1,1-Trichloroethane (TCA) was detected at two sample locations, with concentrations ranging from 0.68 to 1.2 µg/m^3, with the maximum concentration in sample SV-1. Cis-1,2-Dichloroethene was detected at two sample locations, with concentrations ranging from 3.4 to 18.0 µg/m^3 with the maximum concentration in sample SV-13. PCE was detected at all five sample locations, with concentration ranging from 3.6 to 3,900 µg/m^3, with the maximum concentration in sample SV-13.

TCE was detected at all five sample locations, with concentrations ranging from 1.4 to 290 µg/m^3, with the maximum concentration in sample SV-13. MTBE was detected at two sample locations, with concentrations ranging from 0.52 to 1.1 µg/m^3, with the maximum concentration in sample SV-1.

f. **Lot 180 (Eastern Parcel):** Three soil vapor samples, SV-3, SV-7, and SV-8 were collected from the eastern parcel of Lot 180 during the 2015 investigation. MTBE was detected at two sample locations, with concentrations ranging from 71 to 680 µg/m^3, with the maximum concentration in sample SV-3. PCE was detected at sample SV-8, with a concentration of 2.1 µg/m^3. Methane was detected at two sample locations, with concentrations ranging from 0.44 % v/v to 22.0% v/v, with the maximum concentration in sample SV-7. The methane detections correlate well with, and are likely attributable to, the decay of organic material that was observed within the eastern parcel of Lot 180. The methane concentrations detected at SV-3 (0.44 %), and the concentration at SV-7 (22.0 % v/v). Methane was detected in only the eastern parcel of Lot 180, and is likely related to the decaying organic material that was observed within some silt layers during the RI.

Summary of the Remedial Action

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 New York City Voluntary Cleanup Program (NYC VCP) Citizen Participation activities according to an approved Citizen Participation Plan.

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

3. Establishment of Track 2 Restricted Residential Soil Cleanup Objectives (SCOs)

4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s).

6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID). Appropriate segregation of excavated media on-Site.

7. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.

8. Registration of tanks and reporting of any petroleum spills associated with underground storage tanks (USTs) and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.

9. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.

10. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.

11. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.

12. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.

13. Dewatering if needed, in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under a permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system.

14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

15. Demarcation of residual soil/fill in landscaped areas.

16. 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.

17. 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.

18. The property will continue to be registered with an E-Designation at the NYC Buildings Department if Track 2 Commercial Use SCOs are not achieved and/ or operation of an active SSDS is required. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls will 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.

Additional Requirements for Lot 180 Eastern and Lot 180 Western Portion

19. Excavation and removal of soil/fill exceeding Track 2 Restricted Residential SCOs. For development purposes, eastern portion will be excavated to depths of up to 4 feet and western portion of Lot 180 will be excavated to depths of up to 8 feet. Approximately 1,750 tons of soil/fill be excavated and removed from these areas.

20. Construction of an engineered composite cover consisting of 5-inch thick concrete slab beneath all building areas.

21. Installation of a vapor barrier system beneath the building slabs for Lot 180 Eastern and Lot 180 Western Parcels. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab to mitigate soil vapor migration into the building. The vapor barrier system will consist of a Stego® Wrap below the slab throughout the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration. The vapor barrier system is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier system was designed and properly installed to mitigate soil vapor migration into the building.

22. Installation and operation of active SSDS's for Lot 180 Eastern and Western Parcels. The SSDS will consist of a network of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. A separate design document will be provided for additional details regarding the SSDS. The horizontal piping will consist of fabric wrapped, perforated schedule 40 4-inch PVC pipe connected to a 6-inch steel riser pipe that travels through the building to the roof. The gas permeable layer will consistent of a 12-inch thick layer of 3/4-inch gravel. The 6-inch steel riser pipe will be connected to the blower. On the Lot 180 Eastern Parcel, the active SSDS will be hardwired and will include an Ametek Rotron EN505AX72ML blower installed on the

roof. On the Lot 180 Western Parcel, the active SSDS will be hardwired and will include an Ametek Rotron EN858BA72WL blower installed on the roof. The active SSDS's are an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the active SSDS's were designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.

23. Installation of methane mitigation system for Lot 180 Eastern parcel.

Additional Requirements for Lot(s) 20 and Lot 30:

24. When Lots 20 and 30 are developed (i.e., new buildings), excavation and removal of soil/fill exceeding Track 2 Restricted Residential SCOs. For development purposes, these two Lots will be excavated to depths of up to 4 feet. Approximately 700 tons of soil/fill will be excavated and removed from these areas. If lots 20 and 30 are not developed, they will handled in accordance with the Soil/Materials Management Plan in Appendix D.

25. When Lots 20 and 30 are developed (i.e., new buildings), construction of an engineered composite cover consisting of 5-inch thick concrete slab beneath all building areas.

26. When Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab. The vapor barrier system would consist of a Stego® Wrap vapor barrier below the slab throughout the full building area. All welds, seams, and penetrations would be properly sealed to prevent preferential pathways for vapor migration. The vapor barrier system would be an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier systems were designed and properly installed to mitigate soil vapor migration into the buildings.

Additional Requirements for Lot(s) 7, 70, 118, 140, 190, 200 and 210:

27. Limited ground disturbance is anticipated on lots 7, 70, 118, 140, 190, 200 and 210 as a result of parking lot improvements (e.g., new asphalt, planters, lighting). Excavation, handling and disposal on these lots will be conducted in accordance with the Soil/Materials Management Plan in Appendix D. 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.

28. Construction of an engineered composite cover consisting of asphalt layer with a 6-inch clean granular sub-base, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas, and one feet of clean soil in all open space and landscaped areas for Lots 7, 20, 30, 70, 118, 140, 190, 200, and 210. A portion of Lot 140 will be slightly regraded to accommodate the adjacent building expansion.

COMMUNITY PROTECTION STATEMENT

The NYC OER provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan ("cleanup plan") describes the findings of prior environmental studies, shows the location of identified contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

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

Project Information:

- Site Name: Staten Island Mall
- Site Address: 2655 Richmond Avenue, Staten Island, New York
- NYC OER Project Number: 16EHAZ109R, 16CVCP050R

Project Contacts:

- OER Project Manager: William H. Wong, 212-341-0659
- Site Project Manager: David Bligh, 631-232-2600
- Site Safety Officer: Alex Benmerrouche, 631-232-2600
- Online Document Repository: http://www.nyc.gov/html/oer/html/repository/RStaten_Island.shtml

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

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

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

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

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

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

Community Air Monitoring Plan: Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air

Monitoring Plan or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control: This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with applicable NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document.

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

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

Hours of Operation: The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to requirements of the NYC Department of Buildings.

Signage: While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the

NYC Voluntary Cleanup Program and provides project contact names and numbers, and a link to the document repository where project documents can be viewed.

Complaint Management: The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager or the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

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

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

Soil Chemical Testing and Screening: All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

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

Trucks and Covers: Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State, and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can

leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with applicable laws and regulations.

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

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

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

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

Final Report: The results of all cleanup work will be fully documented in a final report (called the Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document.

Long-Term Site Management: If long-term protection is needed after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined either in the property's deed or established through a city environmental designation registered with the Department of Buildings. A certification of

continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

1.0 PROJECT BACKGROUND

GGP Staten Island Mall, LLC (GGP) is working with the New York City Office of Environmental Remediation (NYC OER) in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 3,470,100-square foot site identified as Block 2400 and Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210 located at 2655 Richmond Avenue in Staten Island, New York (Site). 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.

1.1 Site Location and Background

The Site is located at 2655 Richmond Avenue in the New Springville section in Staten Island, New York and is identified as Block 2400 and Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210 on the NYC Tax Map. Figure 1 shows the Site location. The Site is approximately 3,470,100-square feet. A map of the Site boundary is shown in Figure 2. Currently, the Site is used for commercial retail business and contains the Staten Island Mall (Mall), a retail space occupied by approximately 168 tenants (Block 2400, Lot 180). Abutting the Mall are three "anchor" stores located adjacent to the main facility: Macy's (Block 2400, Lot 118); J.C. Penney's (Block 2400, Lot 210); and Sears (Block 2400, Lot 375). Lot 375 is not considered part of the Site, and no improvements are planned as part of the redevelopment.

1.2 Redevelopment Plan

The proposed future use of the Site will consist of the construction of two commercial out parcel buildings (Lots 20 and 30) and an expansion of the existing mall building (Lot 180). The newly constructed buildings and the expansion of existing building will be constructed as slab on grade structures. Localized excavations will occur for footings and for utility installation ranging from 4 to 8 feet below land surface (ft bls). In addition, portions of the parking lot (Lots 7, 70, 118, 140, 190, 200, and 210) will be enhanced (e.g., upgraded lighting, landscaping, and new asphalt and striping, etc.). One area of the Site (Block 2400, Lot 140) will be slightly regraded to accommodate the building expansion. Vapor barrier systems and active sub-slab depressurization systems (SSDS) will be installed beneath the proposed building slabs for Lot 180 Eastern and

Western Parcels. Layout of the proposed Site development is presented in Figure 3. The current zoning designation is C4-1 used for commercial and office buildings. The proposed use is consistent with existing zoning for the Site.

1.3 Description of Surrounding Property

Surrounding properties are primarily residential and commercial (retail). The Site is bounded to the north along Richmond Hill Road by residential properties; to the east across Marsh Avenue by Public School P.S. 58 and residential properties; to the south by Sears and across Platinum Avenue by a retail strip mall; and to the west across Richmond Avenue by the Fresh Kills Landfill. Nearby water bodies include the Springville Creek and Richmond Creek, located respectively to the west and south of the Site. These water bodies are interconnected and drain to the Fresh Kills. Figure 2 shows the surrounding land usage.

1.4 Summary of Past Site Uses and Areas of Concern

Former Site uses include agricultural use with onsite greenhouses (1930s), an aircraft aviation school and civilian airport (1950s), a golf driving range surrounded by residential dwellings (1960s), a sewage treatment plant with a gasoline filling station and commercial retail stores (1970s), and a shopping mall (1970s to current). Nearby water bodies include the Springville Creek and Richmond Creek, located respectively to the west and south of the Site. These water bodies are interconnected and drain to the Fresh Kills.

Block 2400, Lot 180 is currently owned by GGP and was purchased in October 1980 from Thomas J. Hartigan, as a trustee of Twenty Seven Trust. According to the Ameristar Chain of Ownership Report Lot 180 was sold to Twenty Seven Trust by SIM Mall Inc. (an affiliate of GGP) in 1980. John J. Kelly sold Lot 180 to SIM Mall Inc. in February 1978. The ownership of Lot 180 has not changed since 1980. Block 2400, Lot 118 is owned by Macy's and Block 2400, Lot 210 is owned by J.C. Penney's.

The following Areas of Concern (AOCs) were anticipated at the Site:

- Potential presence of historic fill of an unknown origin;
- Potential impacts from pesticide usage, specifically insecticides, due to historic agricultural use and the presence of a greenhouse in the 1930s; and

- Potential contamination due to the historic airport runway and aviation school formerly located at the Site.

1.5 Summary of Work Performed under the Remedial Investigation

On behalf of GGP, Roux Associates, Inc. (Roux Associates), performed the following scope of work for all areas of the Site excluding Lot 80:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e., structures, buildings, etc.);

2. Installed 29 soil borings and collected 64 soil samples for chemical analysis to evaluate soil quality, as part of the 2013 Phase II Environmental Site Assessment (ESA) and 2015 RI;

3. Installed eight groundwater monitoring wells to establish groundwater flow and collected eight groundwater samples for chemical analysis to evaluate groundwater quality, including one sample from a monitoring wells installed as part of Roux Associates' 2013 Phase II ESA; and

4. Installed ten soil vapor points around the Site perimeter and collected ten soil vapor samples for chemical analysis, including three samples from soil vapor points installed as part of Roux Associates' 2013 Phase II ESA.

1.6 Summary of Findings of Remedial Investigation

An RI was performed and the results are documented in a companion document titled "Remedial Investigation Report, Staten Island Mall," dated December 2015 (RIR). A summary of the findings are provided below:

1. Elevation of the Site ranges from approximately 31.52 feet above mean sea level (ft amsl) on the west side to 54.41 ft amsl on the east side.

2. Depth to groundwater ranges from 10.27 to 22.70 ft bls at the Site.

3. Groundwater flow is generally from east to west beneath the Site, toward Springville Creek and ultimately the Fresh Kill.

4. Depth to bedrock ranges from approximately 16 to 24 ft bls at the Site.

5. The stratigraphy of the Site, from the surface down, consists of 16 to 24 ft of silt and fine sand with a varying mixture of medium to coarse sand, gravel, clay, and cobble underlain by Serpentinite bedrock. Dark organic material was observed within some of the silt layers in the eastern parcel of Lot 180.

6. A total of 64 soil samples were collected for laboratory analysis from 29 soil borings during the 2013 Phase II ESA and 2015 RI, and are summarized below. Soil/fill sample results were compared to New York State Department of Environmental Conservation (NYSDEC) Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs), Track 2 Restricted Residential Use SCOs, and Track 2 Commercial Use SCOs, as presented in 6NYCRR Part 375-6.8.

   a. **Lot 20:** Soil samples were collected from three soil borings installed on Lot 20. Soil/fill results showed no volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), or pesticides detected in any of the soil samples. The metal chromium was detected at a concentration of 38.6 milligrams per kilogram [mg/kg] in sample SB-25 (4-6) above Track 1 Unrestricted Use SCOs. There were no exceedances of Track 2 Restricted Residential Use SCOs or Commercial Use SCOs in any analyte on Lot 20 during the RI.

   b. **Lot 30:** Soil samples were collected from three soil borings installed on Lot 30. Soil/fill results showed that no VOCs, SVOCs, PCBs, pesticides or metals were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 30 during the RI.

   c. **Lot 70:** Soil samples were collected from two soil borings installed on Lot 70. Soil/fill results showed that no VOCs, SVOCs, PCBs or pesticides were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Chromium and nickel were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium detections ranged from 39 to 47 mg/kg, with the maximum concentration in sample SB-3 (0-2). Nickel detections ranged from 34 to 93 mg/kg, with the maximum concentration in sample SB-2 (13-15). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 70 during the RI.

   d. **Lot 140:** Soil samples were collected from four soil borings installed on Lot 140. Soil/fill results showed that no SVOCs or PCBs were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Acetone, which is likely a laboratory contaminant, was detected in samples SB-27 (0-2) and SB-27(4-6) at a maximum concentration of 86 µg/kg. Metals including chromium and nickel were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium was detected at a concentration of 34 mg/kg in sample SB-29 (0-2). Nickel was detected at a concentration of 80 mg/kg in sample SB-29 (0-2). Pesticides including 4,4'-DDD, 4,4'-DDE and 4,4'-DDT were detected above Track 1 Unrestricted Use SCOs. 4,4'-DDD was detected at concentrations ranging from 4.4 to 1,200 micrograms per kilogram µg/kg, with the maximum concentration in sample SB-28 (0-2). 4,4'-DDE was detected at concentrations ranging from 6.7 to 160 µg/kg, with the maximum concentration in sample SB-28 (4-6). 4,4'-DDT was detected at concentrations ranging from 3.7 to 750 µg/kg, with the maximum concentration in sample SB-28 (0-2). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any analyte on Lot 140 during the RI.

e. **Lot 180 (Western Parcel):** Soil samples were collected from 12 soil borings installed on the western parcel of Lot 180. Soil/fill results showed that no VOCs, SVOCs, PCBs or pesticides were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Metals including chromium, nickel, copper, lead, zinc, and arsenic were detected at concentrations above Track 1 Unrestricted Use SCOs. Chromium was detected at a concentration of 31 mg/kg in sample SB-6 (14-15). Nickel was detected at a concentration of 37 mg/kg in sample SB-8 (0-2). Copper was detected at a concentration of 92.6 mg/kg in sample MW-11B (8-10). Lead was detected at a concentration of 386 mg/kg in sample MW-11B (8-10). Zinc was detected at a concentration of 393 mg/kg in sample MW-11B (8-10). Arsenic was detected at a concentration of 16.2 mg/kg in sample MW-11B (8-10), slightly above Track 2 Restricted Residential Use SCOs and Track 2 Commercial Use SCOs for arsenic (i.e., 16 mg/kg). With the exception of arsenic, there were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any compound on the western parcel of Lot 180 during the RI.

f. **Lot 180 (Eastern Parcel):** Soil samples were collected from five soil borings installed on the eastern parcel of Lot 180. Soil/fill results showed that no VOCs, SVOCs, or PCBs were detected in any of the soil samples exceeding Track 1 Unrestricted Use SCOs. Nickel was detected at concentrations above Track 1 Unrestricted Use SCOs, with a detection of 48 mg/kg in sample SB-9 (13-15) and 38 mg/kg in sample SB-10 (8-10). Pesticides including 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were detected at concentrations above Track 1 Unrestricted Use SCOs. 4,4'-DDD was detected at concentrations ranging from 4.4 to 4,800 µg/kg, with the maximum concentration in sample SB-10 (8-10). 4,4'-DDE was detected at concentrations ranging from 6.7 to 240 µg/kg, with the maximum concentration in sample SB-10 (8-10). 4,4'-DDT was detected at concentrations ranging from 3.7 to 1,200 µg/kg, with the maximum concentration in sample SB-10 (8-10). There were no exceedances of Track 2 Restricted Residential Use SCOs or Track 2 Commercial Use SCOs in any compound on the eastern parcel of Lot 180 during the RI.

7. Eight groundwater samples were collected from Lots 20 and 180 and were compared to the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs). The groundwater samples did not contain any exceedances of the AWQSGVs for VOCs, SVOCs, PCBs, or pesticides. The total metals magnesium and sodium (filtered and unfiltered) were detected above the AWQSGVs in groundwater samples collected from all eight monitoring well locations. The elevated detections of magnesium and sodium are likely related to salt water intrusion from the nearby surface water bodies.

   a. Lot 20: One groundwater sample, MW-5, was collected from Lot 20 during the 2015 investigation. Magnesium was detected at 159,000 micrograms per liter (µg/L) and sodium was detected at 97,600 µg/L in sample MW-5.

   b. Lot 30: No groundwater samples were collected from Lot 30 during the 2015 investigation.

c. Lot 180 western parcel: Four groundwater samples were collected from monitoring wells MW-1 MW-8, MW-9, and MW-11B, respectively, from the western parcel of Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 48,700 to 105,000 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-8. Sodium concentrations ranged from 165,000 to 631,000 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-9.

d. Lot 180 Eastern Parcel: Three groundwater samples were collected from monitoring wells MW-3, MW-6, and MW-12, respectively, from the eastern parcel of Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 60,400 to 151,000 µg/L , with the maximum concentration detected in the groundwater sample collected from MW-3. Sodium concentrations ranged from 122,000 to 416,000 µg/L , with the maximum concentration detected in the groundwater sample collected from MW-3. Iron was detected at a concentration of 5,560 µg/L in the groundwater sample collected from MW-3. Manganese concentrations ranged from 5,770 to 9,500 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-3. Selenium was detected at concentrations ranging from 10.1 to 11.9 µg/L, with the maximum concentration exhibited in sample MW-6. Thallium was detected at concentrations ranging from 4.7 to 7.4 µg/L, with the maximum concentration detected in the groundwater sample collected from MW-6.

8. Ten soil vapor samples were collected from Lots 20, 30, and 180 during the 2015 investigation, and were analyzed and compared to the regulatory guidance on soil vapor and indoor air quality as presented in Matrix 1 and Matrix 2 from the New York State Department of Health (NYSDOH) Center for Environmental Health (CEH) Bureau of Environmental Exposure Investigation (BEEI) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.

   a. **Lot 20:** One soil vapor sample, SV-17, was collected from Lot 20 during the 2015 investigation. Tetrachloroethene (PCE) was detected with a concentration of 9.5 µg/m^3, and MTBE was detected with a concentration of 1.3 µg/m^3.

   b. **Lot 30:** One soil vapor sample, SV-5, was collected from Lot 20 during the 2015 investigation. PCE was detected with a concentration of 1.9 µg/m^3.

   c. **Lot 70:** No soil vapor samples were collected in Lot 70. The current and proposed future use of Lot 70 is an asphalt parking lot.

   d. **Lot 140:** No soil vapor samples were collected in Lot 140. The current and proposed future use of Lot 70 is an asphalt parking lot.

   e. **Lot 180 (Western Parcel):** Five soil vapor samples, SV-1, SV-11, SV-12, SV-13, and SV-14, were collected from the western parcel of Lot 180 during the 2015 investigation. 1,1,1-Trichloroethane (TCE) was detected at two sample locations, with concentrations ranging from 0.68 to 1.2 µg/m^3, with the maximum concentration in sample SV-1. Cis-1,2-Dichloroethene was detected at two sample locations, with concentrations ranging from 3.4 to 18.0 µg/m^3 with the maximum concentration in

sample SV-13. PCE was detected at all five sample locations, with concentration ranging from 3.6 to 3,900 µg/m^3, with the maximum concentration in sample SV-13. TCE was detected at all five sample locations, with concentrations ranging from 1.4 to 290 µg/m^3, with the maximum concentration in sample SV-13. MTBE was detected at two sample locations, with concentrations ranging from 0.52 to 1.1 µg/m^3, with the maximum concentration in sample SV-1.

f. **Lot 180 (Eastern Parcel):** Three soil vapor samples, SV-3, SV-7, and SV-8 were collected from the eastern parcel of Lot 180 during the 2015 investigation. MTBE was detected at two sample locations, with concentrations ranging from 71 to 680 µg/m^3, with the maximum concentration in sample SV-3. PCE was detected at sample SV-8, with a concentration of 2.1 µg/m^3. Methane was detected at two sample locations, with concentrations ranging from 0.44 % v/v to 22.0 % v/v, with the maximum concentration in sample SV-7. The methane detections correlate well with, and are likely attributable to, the decay of organic material that was observed within the eastern parcel of Lot 180. The methane concentrations detected at SV-3 (0.44 %), and the concentration at SV-7 (22.0 % v/v). Methane was detected in only the eastern parcel of Lot 180, and is likely related to the decaying organic material that was observed within some silt layers during the RI.

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

2.0 REMEDIAL ACTION OBJECTIVES

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

Soil

- Prevent direct contact with contaminated soil.

Groundwater

- Based on the results of the RI, no RAOs for groundwater are necessary for the Site.

Soil Vapor

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

3.0 REMEDIAL ALTERNATIVES ANALYSIS

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

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

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

Alternative 1:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) SCOs.
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs have been achieved with post-excavation end-point sampling. Based on the results of the RI, it is anticipated that a significant amount of excavation would be required to achieve Track 1 Unrestricted Use. No Engineering or Institutional Controls are required for a Track 1 cleanup.

Alternative 2:

- Removal of all soil/fill exceeding Track 2 Restricted Residential Use SCOs throughout the Site and confirmation that Track 2 Restricted Residential Use SCOs have been achieved with post-excavation endpoint sampling. If soil/fill containing analytes at concentrations above Restricted Residential Use SCOs is encountered at the base of the excavation after removal of all soil required for construction of the new building's slab is complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet Track 2 Restricted Residential Use SCOs.

- Installation and operation of active sub-slab depressurization systems (SSDS) for Lot 180 Eastern and Western Parcels;

- Placement of a vapor barrier beneath the proposed building slabs for Lot 180 Eastern and Western Parcels;

- When Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30.

- Placement of a composite cover system over the entire Site to prevent exposure to remaining soil/fill;

Alternative 3:

- Removal of all soil/fill exceeding Track 2 Restricted Commercial Use SCOs and confirmation that Track 2 Restricted Commercial Use SCOs have been achieved with post-excavation end point sampling. If soil/fill containing analytes at concentrations above Track 2 Restricted Commercial Use SCOs is encountered at the base of the excavation, additional excavation would be performed to meet Track 2 Restricted Commercial Use SCOs.

- Installation and operation of active SSDS for Lot 180 Eastern and Western Parcels;

- Placement of a vapor barrier beneath the proposed building slabs for Lot 180 Eastern and Western Parcels;

- When Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30.

- Placement of a composite cover system over the entire Site to prevent exposure to remaining soil/fill.

For all three alternatives, no remedial activities are planned for Lots 7, 70, 118, 140, 190, 200, or 210. Should there be a need to disturb the soil in Lots 7, 20, 30, 70, 140, 190, 200, or 210 for site civil, utilities installation, etc. activities, the work will be governed by the Soil/ Materials Management Plan (SMMP) included in Appendix D.

3.1 Threshold Criteria

Protection of Public Health and the Environment

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

Alternative 1 would be protective of human health and the environment by removing all soil/fill exceeding Track 1 Unrestricted Use SCOs and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater.

Alternatives 2 and 3 would achieve comparable protections of human health and the environment by excavation and removal of most of the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 2 Restricted Residential or Commercial Use SCOs, as well as by placement of Institutional and Engineering Controls, including a composite cover system, a vapor barrier, and SSDS. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan would ensure that the composite cover system remains intact and protective of public health. Establishment of Track 2 Restricted Residential or Commercial Use SCOs would minimize the risk of contamination leaching into groundwater.

For all Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved SMMP, and a CAMP. Potential post-remediation exposure to soil vapors would be addressed by installing a vapor barrier beneath the building and installing/operating SSDSs in the Lot 180 eastern and western parcels. In addition, when Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30.

3.2 Balancing Criteria

Compliance with Standards, Criteria and Guidance (SCGs)

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

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and Protection of Groundwater SCOs.

Alternatives 2 and 3 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to meet Track 2 Restricted Residential or Commercial Use SCO's. Compliance with SCGs for soil vapor would be achieved by installing a vapor barrier and SSDS below each new building foundation slab. 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 will be implemented during Site redevelopment under this RAWP. For all Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-Term Effectiveness and Impacts

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

Alternatives 1, 2, and 3 have similar short-term effectiveness during their implementation. All alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be higher for Alternative 1 since excavation of greater amounts of historical fill material would take place.

However, focused attention to means and methods during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

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

The potential adverse impact to the community, workers and the environment for all alternatives would be minimized through implementation of control plans including a Construction Health and Safety Plan, a and a SMMP, during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment.

All alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would provide protection from on-Site contaminants by using personal protective equipment would be worn consistent with the documented risks within the respective work zones.

Long-Term Effectiveness and Permanence

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

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use

SCOs. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternatives 2 and 3 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 2 Restricted Residential or Restricted Commercial Use SCOs; establishing engineering controls including a vapor barrier, operation of active SSDS systems in Lot 180 eastern and western parcels and installing a composite cover system across the Site; in addition, when Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30; maintaining use restrictions; and establishing an SMP to ensure long-term management of ICs and ECs; and maintaining registration as an E-designated property to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

Reduction of Toxicity, Mobility, or Volume of Contaminated Material

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

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

Alternatives 2 and 3 would remove remaining on-Site soil to meet Track 2 Restricted Residential or Restricted Commercial Use SCOs, respectively.

Implementability

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

The techniques, materials and equipment to implement Alternatives 1, 2 and 3 are readily available and have been proven to be effective in remediating the contaminants present on the Site. They use standard equipment and technologies that are well established in the industry. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost effectiveness

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

Costs associated with Alternative 1 could potentially be higher than Alternatives 2 or 3 if soil with analytes above Track 1 Unrestricted Use SCOs is encountered below the excavation depth required for development. Additional costs would include installation of additional shoring/underpinning, disposal of additional soil, and import of clean soil for backfill. However, long-term costs for Alternatives 2 higher than Alternative 1 based on implementation of a SMP as part of Alternatives 2 or 3.

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

Community Acceptance

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

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

Land use

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

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes the use as a mall with parking at Lots 118, 180 and 210; as a parking lot at Lots 770, 140, 190, and 200; and as either a parking lot or new buildings at Lots 20 and 30. Following remediation, the Site will meet either Track 1 Unrestricted Use, Track 2 Restricted Residential or Track 2 Restricted Commercial Use SCOs, all of which are protective of public health and the environment for its planned residential use. The proposed use is compliant with the property's

zoning and is consistent with recent development patterns. The areas surrounding the site consist of residential properties to the north; to the east along Marsh Avenue is Public School P.S. 58 and residential properties; to the south along Platinum Avenue is a retail strip mall and to the west along Richmond Avenue the Fresh Kills Landfill is located.

The proposed development would clean up the property and make it safer, create new employment opportunities, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs, Track 2 Restricted Residential, or Track 2 Restricted Commercial Use SCOs, all of which are protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. All alternatives are equally protective of natural resources and cultural resources. Improvements in the current environmental condition of the property achieved by all alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

Sustainability of the Remedial Action

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

use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

While Alternatives 2 and 3 would potentially result in lower energy usage based on reducing the volume of material transported off-Site, all remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan for either alternative would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program is available for reuse of any clean native soils under either alternative. A complete list of green remedial activities considered as part of the NYC VCP is included in a Sustainability Statement (Appendix C).

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required New York City Voluntary Cleanup Program (NYC VCP) Citizen Participation activities according to an approved Citizen Participation Plan.

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

3. Establishment of Track 2 Restricted Residential Soil Cleanup Objectives (SCOs)

4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s).

6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID). Appropriate segregation of excavated media on-Site.

7. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.

8. Registration of tanks and reporting of any petroleum spills associated with underground storage tanks (USTs) and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.

9. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.

10. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.

11. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.

12. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.

13. Dewatering if needed, in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under a permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system.

14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

15. Demarcation of residual soil/fill in landscaped areas.

16. 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.

17. 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.

18. The property will continue to be registered with an E-Designation at the NYC Buildings Department if Track 2 Commercial Use SCOs are not achieved and/ or operation of an active SSDS is required. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls will 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.

Additional Requirements for Lot 180 Eastern and Lot 180 Western Portion

19. Excavation and removal of soil/fill exceeding Track 2 Restricted Residential SCOs. For development purposes, eastern portion will be excavated to depths of up to 4 feet and western portion of Lot 180 will be excavated to depths of up to 8 feet. Approximately 1,750 tons of soil/fill be excavated and removed from these areas.

20. Construction of an engineered composite cover consisting of 5-inch thick concrete slab beneath all building areas.

21. Installation of a vapor barrier system beneath the building slabs for Lot 180 Eastern and Lot 180 Western Parcels. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab to mitigate soil vapor migration into the building. The vapor barrier system will consist of a Stego® Wrap below the slab throughout the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration. The vapor barrier system is an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier system was designed and properly installed to mitigate soil vapor migration into the building.

22. Installation and operation of active SSDS's for Lot 180 Eastern and Western Parcels. The SSDS will consist of a network of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building slab and vapor barrier system. A separate design document will be provided for additional details regarding the SSDS. The horizontal piping will consist of fabric wrapped, perforated schedule 40 4-inch PVC pipe connected to a 6-inch steel riser pipe that travels through the building to the roof. The gas permeable layer will consistent of a 12-inch thick layer of 3/4-inch gravel. The 6-inch steel riser pipe will be connected to the blower. On the Lot 180 Eastern Parcel, the active SSDS will be hardwired and will include an Ametek Rotron EN505AX72ML blower installed on the roof. On the Lot 180 Western Parcel, the active SSDS will be hardwired and will include an Ametek Rotron EN858BA72WL blower installed on the roof. The active SSDS's are an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the active SSDS's were designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.

23. Installation of methane mitigation system for Lot 180 Eastern parcel.

Additional Requirements for Lot(s) 20 and Lot 30:

24. When Lots 20 and 30 are developed (i.e., new buildings), excavation and removal of soil/fill exceeding Track 2 Restricted Residential SCOs. For development purposes, these two Lots will be excavated to depths of up to 4 feet. Approximately 700 tons of soil/fill will be excavated and removed from these areas. If lots 20 and 30 are not developed, they will handled in accordance with the Soil/Materials Management Plan in Appendix D.

25. When Lots 20 and 30 are developed (i.e., new buildings), construction of an engineered composite cover consisting of 5-inch thick concrete slab beneath all building areas.

26. When Lots 20 and 30 are developed (i.e., new buildings), installation of a vapor barrier system beneath the building slabs for Lots 20 and 30. Installation of a vapor barrier system consisting of vapor barrier beneath the building slab. The vapor barrier system would consist of a Stego® Wrap vapor barrier below the slab throughout the full building area. All welds, seams, and penetrations would be properly sealed to prevent preferential pathways for vapor migration. The vapor barrier system would be an Engineering Control for the remedial action. The remedial engineer will certify in the RAR that the vapor barrier systems were designed and properly installed to mitigate soil vapor migration into the buildings.

Additional Requirements for Lot(s) 7, 70, 118, 140, 190, 200 and 210:

27. Limited ground disturbance is anticipated on lots 7, 70, 118, 140, 190, 200 and 210 as a result of parking lot improvements (e.g., new asphalt, planters, lighting). Excavation, handling and disposal on these lots will be conducted in accordance with the Soil/Materials Management Plan in Appendix D. 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.

28. Construction of an engineered composite cover consisting of asphalt layer with a 6-inch clean granular sub-base, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas, and one feet of clean soil in all open space and landscaped areas for Lots 7, 20, 30, 70, 118, 140, 190, 200, and 210. A portion of Lot 140 will be slightly regraded to accommodate the adjacent building expansion.

4.2 Soil Cleanup Objectives and Soil/ Fill Management

Track 2 Restricted Residential SCOs are proposed for this project and SCOs are defined in 6 NYCRR Part 375, Table 6.8 Track 2 Restricted Residential Use. If these Track 2 SCOs are not achieved, Track 2 Commercial, or Track 4 Site Specific SCOs will be utilized.

The following Track 4 Site-Specific SCOs will be utilized for this project:

Contaminant	Site-Specific SCOs
Total SVOCs	250 ppm
Lead	800 ppm
Mercury	1.0 ppm
Chromium	1,500 ppm
Arsenic	16 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. 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 RAR.

Soil/Fill Excavation and Removal

The location of planned excavations is shown in Figure 3. The total quantity of soil/fill expected to be excavated and disposed off-Site is 1,750 tons (For Lot 180 Western Parcel only). For each disposal facility to be used in the remedial action, a letter from the developer/QEP to the receiving facility requesting approval for disposal and a letter back to the developer/QEP providing approval for disposal will be submitted to OER prior to any transport and disposal of soil at a facility. Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-point Sampling

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

- VOCs by EPA Method 8260;
- SVOCs by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

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

Confirmation End-point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation end-point soil sampling. Seven (7) confirmation samples will be collected from the base of the excavation for Lot 180 Western Parcel and three (3) confirmation samples will be collected from the base of excavation for Lot 180 Eastern Parcel at locations to be determined by OER. When Lots 20 and 30 are developed (i.e., new buildings), two (2) confirmation samples will be collected from the base of the excavation for Lot 20 and two (2) confirmation samples will be collected from the base of the excavation for Lot 30. To evaluate attainment of Track 2

Restricted Residential Use or Commercial Use SCOs, analytes will include those for which SCOs have been developed according to analytical methods described above. If Track 1 Unrestricted Use SCOs are pursued, samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals according to analytical methods described above.

Hotspot End-point Sampling

End-point samples will be collected from the sidewalls and base of excavation at each of the 1 hotspot location identified in the Remedial Investigation, according to the procedure listed below. Hotspots include MW-11B for arsenic. End-point samples will be analyzed for SCO trigger parameters.

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

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

2. For excavations 20 to 300 feet in perimeter:

   - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

   - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

   For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

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

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

Quality Assurance/Quality Control

Quality Assurance/ Quality Control (QA/QC) procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used to document that samples are representative of actual conditions at the Site and identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples including field blanks, and trip blanks, and duplicates, will be collected and analyzed at rates in accordance with DER-10.

Import of Soils

A significant volume of imported soils is not anticipated with the exception of topsoil for planters, and recycled concrete aggregate (RCA) or asphalt road base, which will be imported in accordance with the Soil/Materials Management Plan. If required, import of other soils onto the property will be performed in conformance with the Soil/Materials Management Plan in Appendix D. Imported soil will meet the lower of:

- Track 1 Unrestricted Use or Track 2 Restricted Residential SCO's, and
- Groundwater Protection Standards in Part 375-6.8.

Soil is not anticipated to be imported to the Site for backfill or cover.

Reuse of Onsite Soils

Reuse of onsite soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix D. Reuse soils will meet the SCOs established for this project.

4.3 Engineering Controls

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

1. Composite Cover System
2. Vapor Barrier Systems
3. Active Sub-Slab Depressurization Systems
4. Methane Mitigation System for Lot 180 Eastern parcel.

Composite Cover System

Exposure to soil will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system will be comprised of 4 inches of concrete underlain by 6 inches of clean sub-based material in sidewalk areas, and 1 feet of clean soil in open space areas.

The composite cover system will be a permanent engineering control. If necessary, the system will be inspected and its performance certified at specified intervals as required by this RAWP and the Site Management Plan. A Soil and Materials Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the Remedial Action Report.

Vapor Barrier System

Migration of soil vapor from onsite or offsite sources into the proposed buildings for Lot 180 Eastern and Western Parcels will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will consist of a vapor membrane or its equivalent will be installed beneath the building slab according to manufacturer specifications. All penetrations (including the sub-slab depressurization solid 4-inch diameter pipe and soil vapor monitoring points) will be sealed with manufacturer supplied material (i.e., tape). The RAR will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty. A detailed description including

manufacturer's specifications will be submitted as part of the building design, and can be found in Appendix E.

Sub-Slab Depressurization System

Migration of soil vapor into the proposed buildings on Lot 180 (Eastern and Western Parcels) will be mitigated with the construction of active Sub-Slab Depressurization Systems (SSDS). The SSDS proposed for both buildings will consist of a network of trenches (i.e., legs) installed in the existing Site soil and/or imported material (i.e., RCA) utilizing 10-ounce geotextile fabric (to prevent entry of fines in to the piping) wrapped ¾-inch gravel with 4-inch diameter schedule 40 perforated PVC pipes aligned horizontally beneath the building slab and attached to a common headers and then a 6-inch diameter steel vertical riser pipe that traverses the building slab, with vapors conveyed via a chase and vented above the roof of the building. The following blowers are proposed for the active SSDS systems:

- For Lot 180 Eastern Parcel: Ametek Rotron™ 2-Hp regenerative blower Model No. EN505AX72ML capable of 150 cubic feet per minute (cfm) and 70 inches of water (in. of w.c.); and

- For Lot 180 Western Parcel: Ametek Rotron™ 7.5-Hp regenerative blower Model No. EN858BA72WL capable of 380 cfm and 95 in. of w.c.

The manufacturer's specifications for the proposed blowers can be found in Appendix F. The blowers will be located on each of the proposed buildings' roofs and will be connected to the vertical riser pipes. Each regenerative blower will have a low vacuum switch, knock-out tank with high level alarm and an in-line air filter on the inlet. A warning light will be provided for each building and will be located to allow for the notification of each building superintendent, if the blowers are not operating. The SSDS will be incorporated into the design of the each new building and will be installed during construction. The design is based on each new building that will occupy Lot 180 (Eastern and Western Parcels). Modifications may be made to the SSDS layouts when each new building design is finalized. Two soil vapor monitoring points are proposed to be installed within the both the Eastern and Western Parcels of Lot 180. Before substantial completion, the solid SSDS vertical riser pipes will be pressure tested before they are concealed or furred-in. Start up and system performance verification procedures would be provided in the Site Management Plan as necessary. The SSDS is a permanent engineering control. The systems will be inspected and their performance certified at specified intervals as

required by this RAWP and the Site Management Plan. Maintenance of this SSDS will be described in the Site Management Plan in the Remedial Action Report. The location and layouts of the SSDS will be provided in a design document.

Methane Mitigation System

The SSDS for the Lot 180 Eastern Parcel will be designed to address methane detected in soil vapor. The Lot 180 Eastern Parcel SSDS design will be submitted to the New York City Fire Department (FDNY) for review and approval.

4.4 Institutional Controls

A Track 2 Restricted Residential Use remedial action is proposed and Institutional Controls are not required, however, if a Track 2 Restricted Residential Use remedial action is not attainable, a Track 2 Commercial Use remedial action will be used, Site management will be required if a Track 2 Commercial Use remedial action is not achieved. If a Track 2 Commercial Use remedial action is not achieved, Institutional Controls (ICs) will be incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. These ICs define the program to operate, maintain, inspect and certify the performance of Engineering Controls and Institutional Controls on this property. Institutional Controls would be implemented in accordance with a Site Management Plan included in the final RAR. If a Track 2 Restricted Residential Use remedial action is not attainable, a Track 2 Commercial Use remedial action will be used, with Site management required if a Track 2 Commercial Use remedial action is not achieved. If a Track 2 Commercial Use remedial action is not achieved, Institutional Controls would be:

- Continued registration of the E-Designation for the property if Track 2 Restricted Commercial Use SCOs are not achieved and/or operation of an active SSDS is required. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the SMP which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;

- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and ICs. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply

with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(l)(3).

- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for commercial 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 RAR and issuance of the Notice of Completion (NOC) for the Remedial Action. The SMP describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The SMP is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

Track 2 Restricted Residential Use or Track 2 Restricted Commercial Use remedial action is proposed and a Site management will be provided. If a Track 2 Commercial Use remedial action is not achieved, Site Management will be required and will be the last phase of remediation. Site Management will begin with the approval of the RAR and issuance of the NOC for the Remedial Action. The SMP describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The SMP is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the SMP are implemented.

If required, the SMP would 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 ICs and ECs.

Site management activities and EC/IC certification will be scheduled by OER on a periodic basis to be established in the RAR and the SMP and will be subject to review and modification by OER. The SMP would be based on a calendar year and certification reports would be due for submission to OER by July 30 of the year following the reporting period.

4.6 Qualitative Human Health Exposure Assessment

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

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

Known and Potential Contaminant Sources

Based on the results of the RIR, the COCs are:

Soil:

Lot 180 (Western Parcel): Soil sample MW-11B, collected from 8 to 10 ft bls, contained the only exceedance of Commercial Use SCOs, with an arsenic detection of 16.2 mg/kg, compared to the SCO of 16 mg/kg. There were no other exceedances of Restricted Residential Use SCOs or Commercial Use SCOs in the western parcel of Lot 180 during the RI.

Lot 180 (Eastern Parcel): There were no exceedances of Restricted Residential Use SCOs or Commercial Use SCOs in the eastern parcel of Lot 180 during the RI. Based on these soil data, the odors and elevated PID readings observed at soil boring MW-12 from the 12 to 13 ft bls sampling interval appear to be attributed to the presence of organic material.

All Other Lots: There were no exceedances of Restricted Residential Use SCOs or Commercial Use SCOs

Groundwater:

Lot 20: One groundwater sample collected from monitoring well MW-5 in Lot 20 exceeded the AWQSGVs for sodium and magnesium with concentrations of 159,000 µg/L for magnesium and 97,600 µg/L for sodium. The elevated detections of magnesium and sodium are likely related to salt water intrusion from the nearby surface water bodies. No groundwater samples collected from Lot 20 contain any exceedances of AWQSGVs for VOCs, SVOCs, PCBs, or pesticides.

Lot 30: No groundwater samples were collected in Lot 30.

Lot 70: No groundwater samples were collected in Lot 70.

Lot 140: No groundwater samples were collect in Lot 140.

Lot 180 (Western Parcel): Four groundwater samples were collected from monitoring wells MW-1 MW-8, MW-9, and MW-11B, respectively, from the western parcel of Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 48,700 to 105,000 µg/L, with the maximum concentration in sample MW-8. Sodium concentrations ranged from 165,000 to 631,000 µg/L, with the maximum concentration in sample MW-9. No groundwater samples collected from the western parcel of Lot 180 contain any exceedances of AWQSGVs for VOCs, SVOCs, PCBs, and pesticides.

Lot 180 (Eastern Parcel): Three groundwater samples were collected from monitoring wells MW-3, MW-6, and MW-12, respectively, from the eastern parcel of Lot 180 during the 2015 investigation. Magnesium concentrations ranged from 60,400 to 151,000 µg/L , with the

maximum concentration in sample MW-3. Sodium concentrations ranged from 122,000 to 416,000 µg/L , with the maximum concentration in sample MW-3. Iron was detected at a concentration of 5,560 µg/L in sample MW-3. Manganese was detected at concentrations ranging from 5,770 to 9,500 µg/L, with the maximum concentration in sample MW-3. Selenium was detected at concentrations ranging from 10.1 to 11.9 µg/L, with the maximum concentration in sample MW-6. Thallium was detected at concentrations ranging from 4.7 to 7.4 µg/L, with the maximum concentration in sample MW-6. The analytical results indicated the presence of iron and selenium at levels exceeding AWQSGVs at monitoring well MW-3 and MW-6; however, neither iron nor selenium exceeded AWQSGVs in the filtered samples. This indicates that the exceedances are due to sediment suspended in the groundwater and not reflective of groundwater quality at the Site. No groundwater samples collected from the eastern parcel of Lot 180 contain any exceedances of AWQSGVs for VOCs, SVOCs, PCBs, or pesticides.

Soil Vapor:

While the matrices are designed for evaluation of sub-slab and indoor samples and not for pre-development soil vapor sampling, soil vapor concentrations can be compared to the matrices to develop a relative understanding of concentrations.

Lot 180 (western parcel):

Five soil vapor samples, SV-1, SV-11, SV-12, SV-13, and SV-14, were collected from the western parcel of Lot 180 during the 2015 investigation. 1,1,1-Trichloroethane was detected at two sample locations, with concentrations ranging from 0.68 to 1.2 µg/m^3, with the maximum concentration in sample SV-1. Cis-1,2-Dichloroethene was detected at two sample locations, with concentrations ranging from 3.4 to 18.0 µg/m^3 with the maximum concentration in sample SV-13. PCE was detected at all five sample locations, with concentration ranging from 3.6 to 3,900 µg/m^3, with the maximum concentration in sample SV-13. TCE was detected at all five sample locations, with concentrations ranging from 1.4 to 290 µg/m^3, with the maximum concentration in sample SV-13.

Lot 180 (eastern parcel):

Three soil vapor samples, SV-3, SV-7, and SV-8 were collected from the eastern parcel of Lot 180 during the 2015 investigation. MTBE was detected at two sample locations, with concentrations ranging from 71 to 680 µg/m^3, with the maximum concentration in sample SV-3. PCE was

detected at sample SV-8, with a concentration of 2.1 µg/m^3. Methane was detected at two sample locations, with concentrations ranging from 0.44 % v/v to 22.0 % v/v, with the maximum concentration in sample SV-7.

The methane detections correlate well with, and are likely attributable to, the decay of organic material that was observed within the eastern parcel of Lot 180. Although a guidance value does not exist for methane, it should be noted that the lowest concentration (percentage) of a gas in air capable of producing a flash of fire in presence of an ignition source is referred to as the LEL. The LEL for methane is 5 percent by volume. The highest concentration of a gas in air capable of producing a flash of fire in presence of an ignition source (flame, heat) is referred to as the Upper Explosive Limit (UEL). The UEL for methane is 15 percent by volume. The methane concentrations detected at SV-3 is below the LEL and the concentration at SV-7 is significantly higher than the UEL of 15 percent by volume.

Compounds not included in the NYSDOH Guidance Soil Vapor/Indoor Air Matrices that were detected include dichlorodifluoromethane and MTBE. Dichlorodifluoromethane was detected at eight sample locations throughout the Site, with concentrations ranging from 2.7 to 5,700 µg/m^3 in sample SV-13 in the western parcel of Lot 180. MTBE was detected at five sample locations throughout the Site, with concentrations ranging from 0.52 to 680 µg/m^3, with the maximum concentration in sample SV-3 in the eastern parcel of Lot 180.

Nature, Extent, Fate, and Transport of Contaminants

Soil: The soil investigation detected only one soil sample exceeding the Restricted Residential Use SCOs and Commercial Use SCOs at MW-11B at 8 to 10 ft bls, located in Lot 180, for arsenic. Based on the nature of this contaminant, these compounds will not volatilize into soil vapor. In addition, based on the proposed construction for the future development (i.e., presence of asphalt pavement and aboveground parking deck), migration of these compounds into groundwater is unlikely.

Groundwater: Analytical results showed the presence of iron, magnesium, manganese, selenium, sodium, and thallium exceeding AWQSGVs. The elevated detections of magnesium and sodium

are likely related to salt water intrusion from the nearby surface water bodies. No other detections above AWQSGVs were indicated by the groundwater analytical results.

Soil Vapor: 1,1,1-Trichloroethane was detected in soil vapor ranging from 0.68 to 1.2 µg/m^3. PCE was detected in soil vapor ranging in concentration from 0.74 to 3,900 µg/m^3. Carbon tetrachloride was detected in soil vapor at 0.26 µg/m^3. Cis-1,2-dichloroethene was detected in soil vapor ranging from 3.4 to 18 µg/m^3. PCE was detected in soil vapor with concentrations ranging from 0.74 to 3,900 µg/m^3. TCE was detected in soil vapor with concentrations ranging from 1.4 to 290 µg/m^3. 1,1,-dichloroethene and vinyl chloride were not detected at the Site. Chlorinated solvents were not detected in any soil or groundwater samples at the Site. The RI did not identify a specific source of the PCE.

Receptor Populations

On-Site Receptors: The Site is currently used as a parking lot and is capped with asphalt underlain with a sub-base. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include mall workers and visitors.

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

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

Potential Routes of Exposure

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

- Ingestion of groundwater or fill/ soil;

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

Potential Exposure Points

Current Conditions: The Site is currently capped with asphalt there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. Groundwater is not exposed at the Site. The Site is served by the public water supply and groundwater is not used at the site for potable supply and there is no potential for exposure. Because the Site is currently an open air parking lot, there is no potential for soil vapor to accumulate on-Site.

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

Proposed Future Conditions: Under proposed future remediated conditions, all soils in excess of Track 2 Residential SCOs will be removed. The Site will be fully capped, preventing potential direct exposure to soil and groundwater remaining in place. The Site is served by the public water supply, and groundwater is not used at the Site. With the installation of a vapor barrier/SSDS and composite cover, there are no plausible off-Site pathways for oral, inhalation, or dermal exposure to contaminants derived from the Site.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways that require mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the Site is developed. This assessment takes into consideration the reasonably anticipated use of the Site, which includes a site-wide surface cover and new buildings. During remedial construction, on-

Site and off-Site exposures to contaminated dust will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Frank Cherena (QEP) and David Bligh (Professional Engineer and Project Manager).

5.2 Site Security

Site access will be controlled by gated entrances to the fenced property. Site access will be controlled by DOB approved construction fence. For work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

5.3 Work Hours

The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. The hours of operation will be conveyed to OER during the pre-construction meeting.

5.4 Construction Health and Safety Plan

The CHASP is included in Appendix G. The Site Safety Coordinator is to be determined. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 Code of Federal Regulations (CFR) 1910.120, such as 40-hour hazardous waste operations 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 CHASP and will comply with all requirements of 29 CFR 1910.120. Site-specific training will be provided to field

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

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

5.5 Community Air Monitoring Plan

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

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

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background

conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

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

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

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

5.6 Agency Approvals

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

5.7 Site Preparation

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

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

Utility Marker Layouts, Easement Layouts

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

also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

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

Dewatering

Limited dewatering may be required during construction to allow for the installation of foundation elements. All required permits will be obtained from NYSDEC and NYCDEP prior to any discharge of groundwater into the sewer system. If required, dewatering may consist of well point or pump systems, with water routed through settling tanks prior to discharge into the city storm sewer system depending on requirements set forth in the pending NYSDEC State Pollutant Discharge Elimination (SPDES) jurisdictional determination request..

Equipment and Material Staging

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

Stabilized Construction Entrance

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

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed.

Brooms, shovels, and clean water will be utilized for the removal of soil from vehicles and equipment, as necessary.

Extreme Storm Preparedness and Response Contingency Plan

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

Storm Preparedness

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

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the Site, a complete inspection of the Site 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 NYSDEC 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 off-Site areas may require characterization based on Site conditions, at the discretion of OER. If onsite petroleum spills are identified, a QEP will determine the nature and extent of the spill and report to NYSDEC's spill hotline at 800-457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

Storm Response Reporting

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

damage to the support of excavation; presence of onsite or off-Site exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 Traffic Control

Drivers of trucks leaving the Site with soil will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the Site is shown on Figure 4.

5.9 Demobilization

Demobilization will include:

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

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

5.10 Reporting and Record Keeping

Daily reports

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

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

- Quantities of material imported and exported from the Site;
- Status of on-Site soil stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP results noting all excursions. CAMP data may be reported;
- Photograph of notable Site conditions and activities.

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

Record Keeping and Photo Documentation

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

5.11 Complaint Management

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

5.12 Deviations from the Remedial Action Work Plan

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

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

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

6.0 REMEDIAL ACTION REPORT

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

- Information required by this RAWP;
- Text description with thorough detail of all engineering and institutional controls (if Track 1 remedial action is not achieved)
- As-built drawings for all constructed remedial elements;
- Manifests for al soil or fill disposal;
- Photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 remedial action is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results (including all soil test results from the RI for soil that will remain on site) and all soil/fill waste characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all soil or fill material removed from the Site including a map showing the location of these excavations and hotspots, tanks or other contaminant source areas;
- Full accounting of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material;
- Account of the origin and required chemical quality testing for material imported onto the Site;
- Continue registration of the property with an E-Designation by the NYC Department of Buildings (if Track 2 Commercial Use remedial action is not achieved and/ or operation of an active SSDS is required);
- The RAWP and RIR will be included as appendices to the RAR; and
- Reports and supporting material will be submitted in digital form and final PDFs will include bookmarks for each appendix.

Remedial Action Report Certification

I, David Bligh, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for the Staten Island Mall 2655 Richmond Avenue, Staten Island, New York Site (Block 2400, Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210), site number 16EHAZ109R. I certify to the following:

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

David T. Bligh, P.E.		
NYS Professional Engineer #090826	Date	Signature

I, Frank Cherena, am a Qualified Environmental Professional. I had primary direct responsibility for implementation of the remedial program for the Staten Island Mall 2655 Richmond Avenue, Staten Island, New York Site (Block 2400, Lots 7, 20, 30, 70, 118, 140, 180, 190, 200, and 210), site number 16EHAZ109R. I certify to the following:

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

Frank Cherena		
Qualified Environmental Professional	Date	Signature

7.0 SCHEDULE

The tables below present 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 10 month remediation period is anticipated.

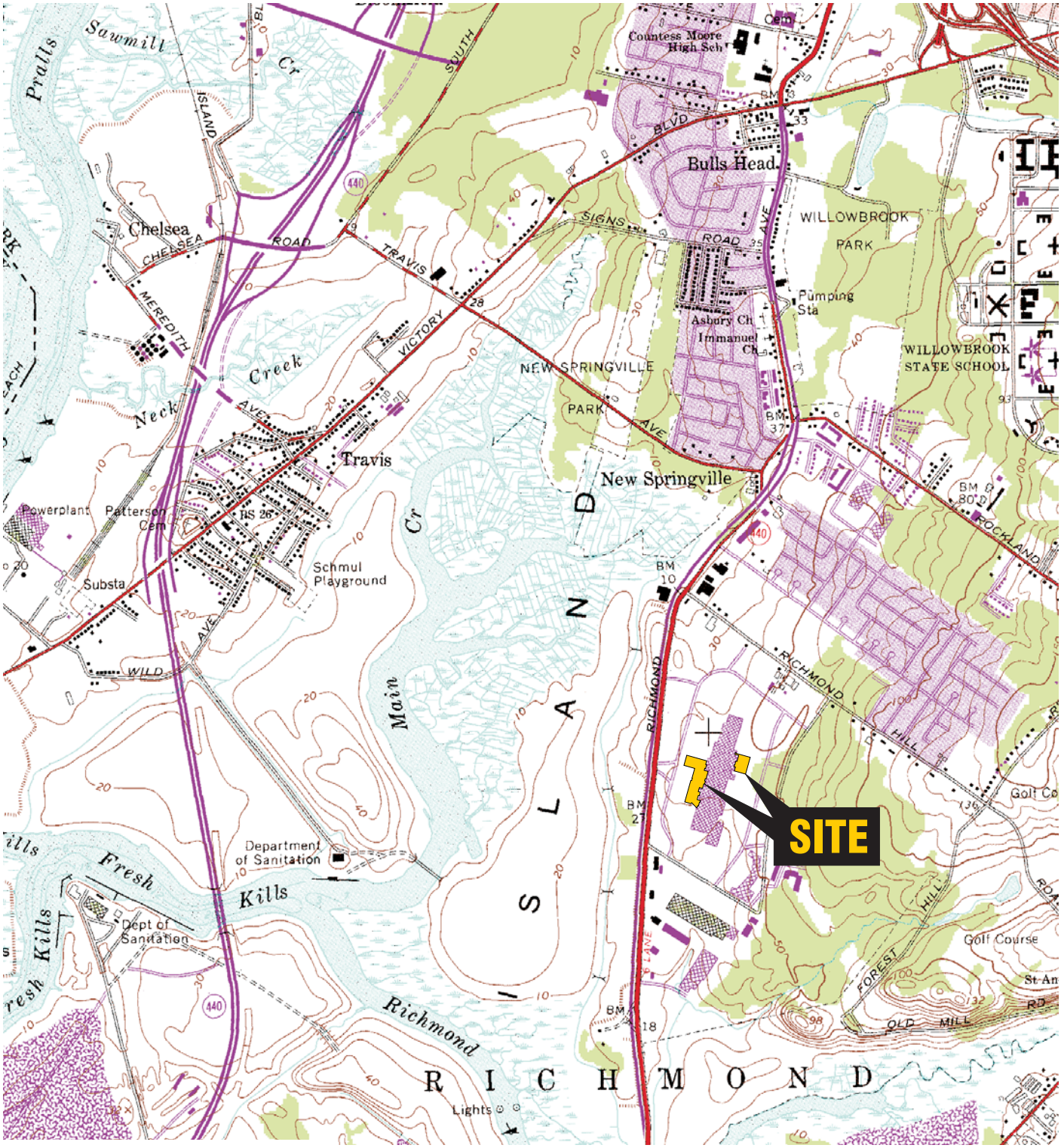
LOT 180 WESTERN PARCEL		
Schedule Milestone	**Weeks from Remedial Action Start**	**Duration (Weeks)**
OER Approval of RAWP	0	0
Fact Sheet 2 announcing start of remedy	1	1
Mobilization	2	5
Lot 180 Western Parcel Remedial Excavation	5	5
Construct Active Sub-Slab Depressurization Systems and Install Vapor Barrier for Lot 180 Western Parcel	10	2
Demobilization	13	3
Submit Remedial Action Report	40	4

LOT 180 EASTERN PARCEL		
Schedule Milestone	**Weeks from Remedial Action Start**	**Duration (Weeks)**
OER Approval of RAWP	0	0
Fact Sheet 2 announcing start of remedy	1	1
Mobilization	16	2
Lot 180 Eastern Parcel Remedial Excavation	18	3
Construct Active Sub-Slab Depressurization Systems and Install Vapor Barrier for Lot 180 Eastern Parcel	21	2
Demobilization	23	3
Submit Remedial Action Report	40	4

SITE WORK (REMAINING LOTS ON SITE)		
Schedule Milestone	**Weeks from Remedial Action Start**	**Duration (Weeks)**
OER Approval of RAWP	0	0
Fact Sheet 2 announcing start of remedy	1	1
Mobilization	24	1
Construct Composite Cover System/Utility Installation	25	10
Demobilization	35	1
Submit Remedial Action Report	40	4

FIGURES

1. Site Location Map
2. Surrounding Land Usage
3. Redevelopment Plan and End-Point Soil Sample Locations
4. Outbound Truck Route



QUADRANGLE LOCATION

SOURCE:
USGS; 1981, Arthur Kill, N.Y.-N.J.
7.5 Minute Topographic Quadrangle

N

0 2000'

Title:

SITE LOCATION MAP

STATEN ISLAND MALL EXPANSION
REMEDIAL ACTION WORK PLAN

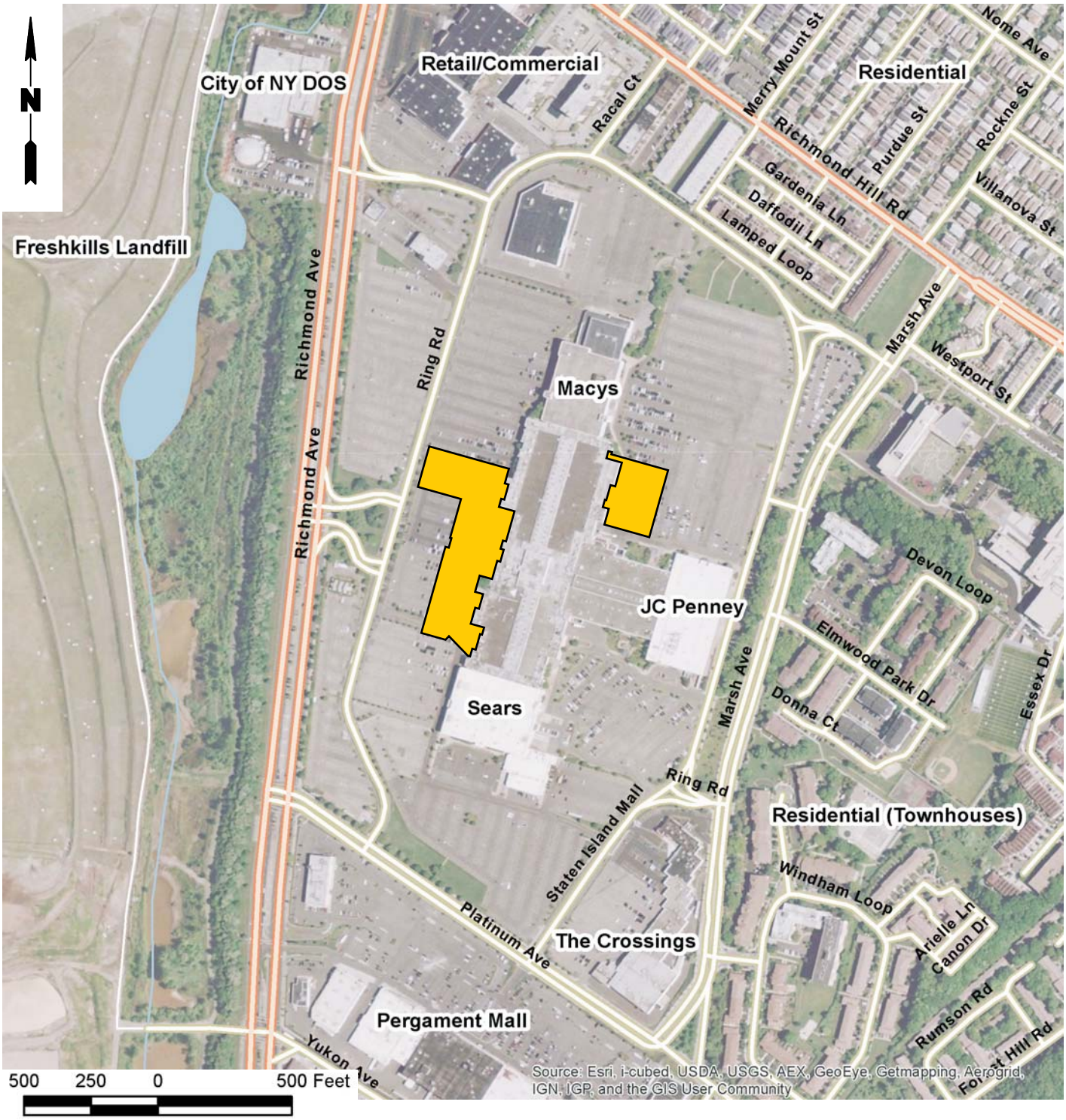
Prepared for:

GGP STATEN ISLAND MALL, LLC

Remedial
REMEDIAL ENGINEERING, P.C.
ENVIRONMENTAL ENGINEERS

Compiled by: G.N.	Date: 28JAN16	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	1
Project Mgr.: D.B.	Project No.: 1287.0007Y000	
File: 1287.0007Y128.01.CDR		

\1287Y\0007Y\128\1287.0007Y128.01.CDR



QUADRANGLE LOCATION

LEGEND

SITE AREAS

Title:

SURROUNDING LAND USE

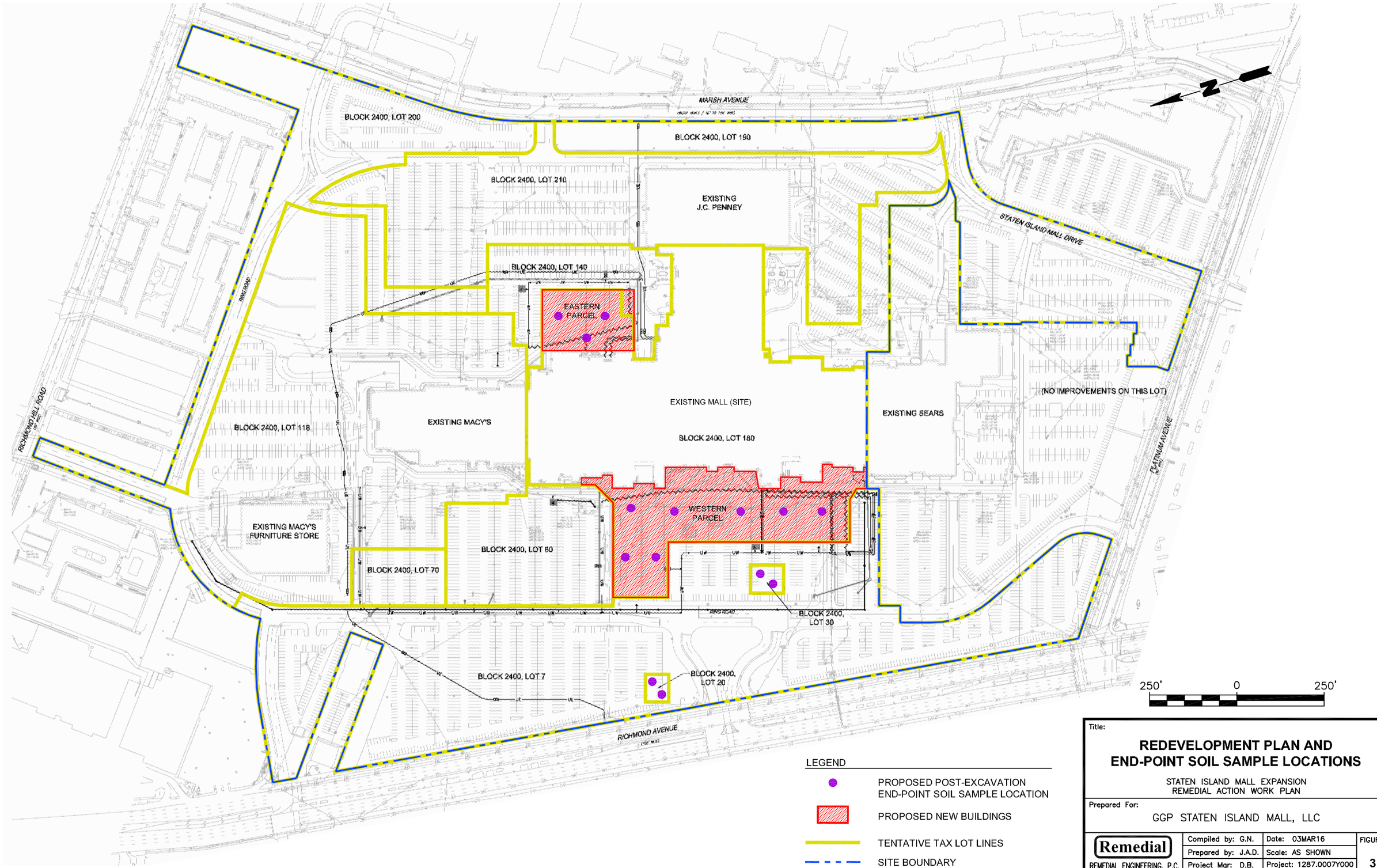
STATEN ISLAND MALL EXPANSION
REMEDIAL ACTION WORK PLAN

Prepared for:

GGP STATEN ISLAND MALL, LLC

Remedial REMEDIAL ENGINEERING, P.C. *ENVIRONMENTAL ENGINEERS*	Compiled by: G.N.	Date: 28JAN16	FIGURE 2
	Prepared by: G.M.	Scale: AS SHOWN	
	Project Mgr.: D.B.	Project No.: 1287.0007Y000	
	File: 1287.0007Y128.02.CDR		

\1287Y\0007Y\128\1287.0007Y128.02.CDR



LEGEND

- PROPOSED POST-EXCAVATION END-POINT SOIL SAMPLE LOCATION
- PROPOSED NEW BUILDINGS
- TENTATIVE TAX LOT LINES
- SITE BOUNDARY

Title:

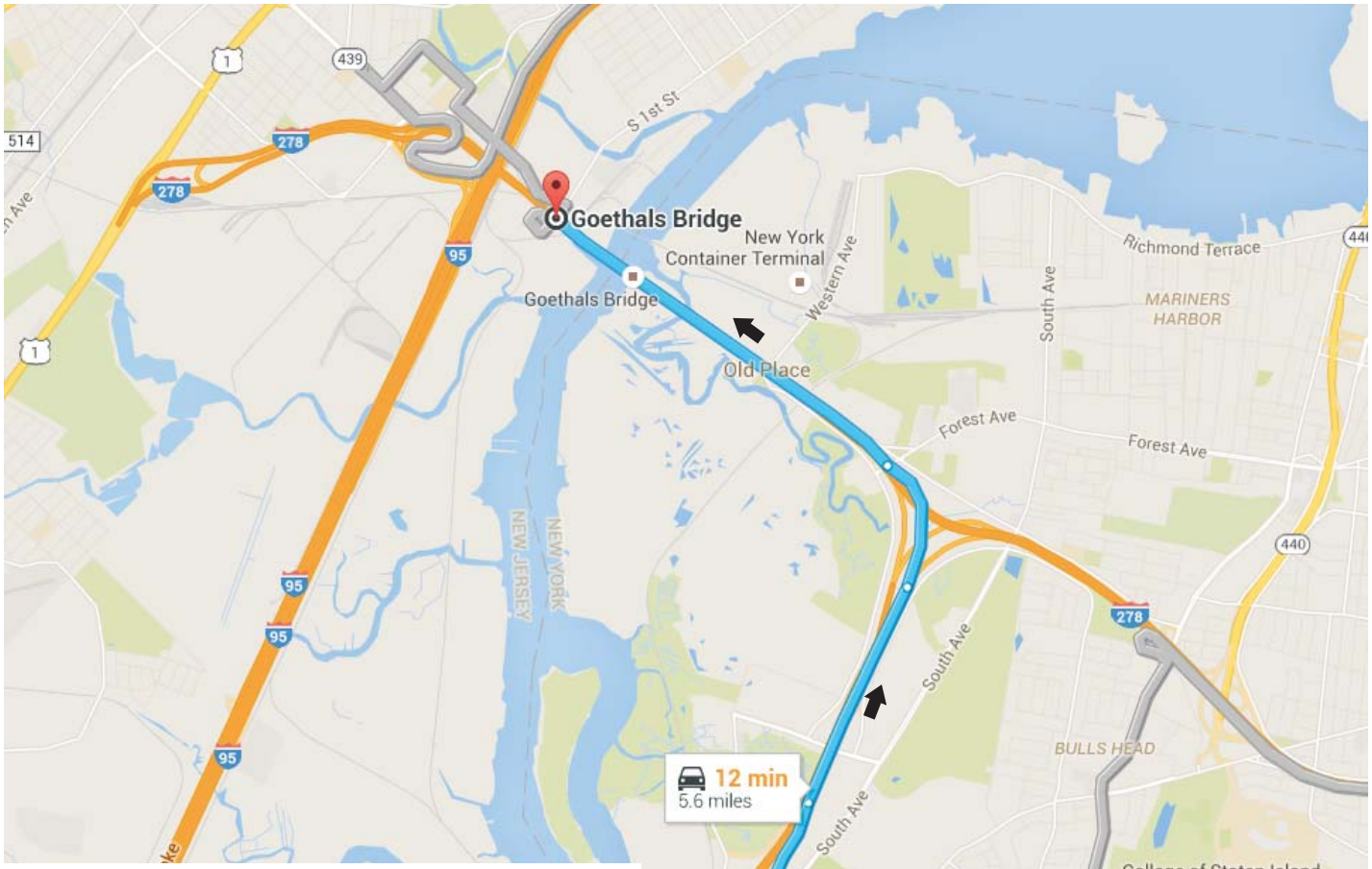
REDEVELOPMENT PLAN AND END-POINT SOIL SAMPLE LOCATIONS

STATEN ISLAND MALL EXPANSION
REMEDIAL ACTION WORK PLAN

Prepared For:
GGP STATEN ISLAND MALL, LLC

Remedial REMEDIAL ENGINEERING, P.C. *ENVIRONMENTAL ENGINEERS*	Compiled by: G.N.	Date: 03MAR16	FIGURE 3
	Prepared by: J.A.D.	Scale: AS SHOWN	
	Project Mgr: D.B.	Project: 1287.0007Y000	
	File: 1287.0007Y128.03.DWG		

V:\CAD\PROJECTS\1287Y\0007Y\128\1287.0007Y128.03.DWG



DIRECTIONS

Staten Island Mall

2655 Richmond Avenue, Staten Island, NY 10314

Get on NY-440 N/W Shore Expy from Richmond Ave and Travis Ave

8 min (2.6 mi)

1. Head northwest — 0.2 mi
2. Turn right toward Richmond Ave — 0.1 mi
3. Slight right onto Richmond Ave — 0.5 mi
4. Turn left onto Draper Pl — 331 ft
5. Slight left onto Travis Ave — 1.3 mi
6. Turn left onto South Ave — 479 ft
7. Use the right lane to merge onto NY-440 N/W Shore Expy via the ramp to I-278 — 0.4 mi

Continue on NY-440 N/W Shore Expy. Drive to I-278 W

3 min (2.6 mi)

8. Merge onto NY-440 N/W Shore Expy — 0.9 mi
9. Use the left lane to take the Interstate 278 W/Staten Island Expwy W exit toward Goethals Br — 0.5 mi
10. Merge onto I-278 W — 1.2 mi

Goethals Bridge

Goethals Road North, Staten Island, NY 10303

N

Title:

OUTBOUND TRUCK ROUTE

STATEN ISLAND MALL EXPANSION
REMEDIAL ACTION WORK PLAN

Prepared for:

GGP STATEN ISLAND MALL, LLC

Remedial REMEDIAL ENGINEERING, P.C. *ENVIRONMENTAL ENGINEERS*	Compiled by: G.N.	Date: 28JAN16	FIGURE 4
	Prepared by: G.M.	Scale: AS SHOWN	
	Project Mgr.: D.B.	Project No.: 1287.0007Y000	
	File: 1287.0007Y128.03.CDR		

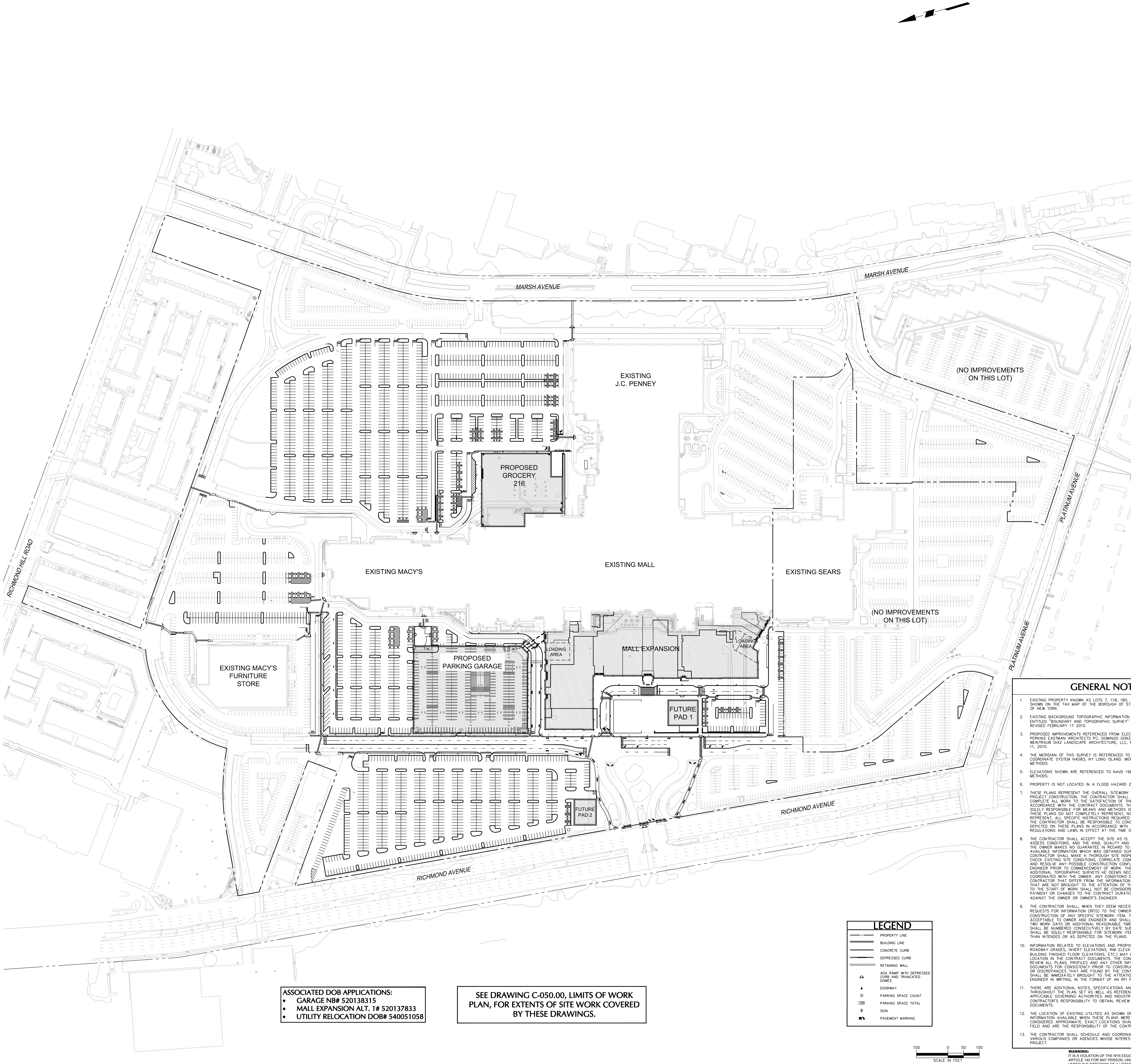
\1287Y\0007Y\117\1287.0007Y117.03.CDR

APPENDICES

A. Proposed Development Plans
B. Citizen Participation Plan
C. Sustainability Statement
D. Soil/Materials Management Plan
E. Manufacturer Specification for Vapor Barrier
F. Manufacturer Specification for Blowers
G. Construction Health and Safety Plan

APPENDIX A

Proposed Development Plans



GENERAL NOTES

1. EXISTING PROPERTY KNOWN AS LOTS 7, 118, 180, 210, 220, BLOCK 2400, AS SHOWN ON THE TAX MAP OF THE BOROUGH OF STATEN ISLAND, CITY AND STATE OF NEW YORK.
2. EXISTING BACKGROUND TOPOGRAPHIC INFORMATION OBTAINED FROM PLANS ENTITLED "BOUNDARY AND TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, LAST REVISED FEBRUARY 17 2015.
3. PROPOSED IMPROVEMENTS REFERENCED FROM ELECTRONIC FILES PROVIDED BY PERKINS EASTMAN ARCHITECTS PC, DOMINGO GONZALEZ ASSOCIATES AND LEE WEINTRAUB DIAZ LANDSCAPE ARCHITECTURE, LLC, RECEIVED THROUGH NOVEMBER 11, 2015.
4. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO NEW YORK STATE PLANE COORDINATE SYSTEM NAD83, NY LONG ISLAND. MERIDIAN ESTABLISHED USING GPS METHODS.
5. ELEVATIONS SHOWN ARE REFERENCED TO NAVD 1988, AS ESTABLISHED USING GPS METHODS.
6. PROPERTY IS NOT LOCATED IN A FLOOD HAZARD ZONE.
7. THESE PLANS REPRESENT THE OVERALL SITEWORK IMPROVEMENTS REQUIRED FOR PROJECT CONSTRUCTION. THE CONTRACTOR SHALL FURNISH, INSTALL, TEST AND COMPLETE ALL WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION; AS SUCH, THESE PLANS DO NOT COMPLETELY REPRESENT, NOR ARE THEY INTENDED TO REPRESENT, ALL SPECIFIC INSTRUCTIONS REQUIRED FOR SITEWORK CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONSTRUCT ALL IMPROVEMENTS DEPICTED ON THESE PLANS IN ACCORDANCE WITH ALL APPLICABLE RULES, REGULATIONS AND LAWS IN EFFECT AT THE TIME OF CONSTRUCTION.
8. THE CONTRACTOR SHALL ACCEPT THE SITE AS IS. THE CONTRACTOR SHALL ASSESS CONDITIONS, AND THE KIND, QUALITY AND QUANTITY OF WORK REQUIRED. THE OWNER MAKES NO GUARANTEE IN REGARD TO THE ACCURACY OF ANY AVAILABLE INFORMATION WHICH WAS OBTAINED DURING INVESTIGATIONS. THE CONTRACTOR SHALL MAKE A THOROUGH SITE INSPECTION IN ORDER TO FIELD CHECK EXISTING SITE CONDITIONS, CORRELATE CONDITIONS WITH THE DRAWINGS AND RESOLVE ANY POSSIBLE CONSTRUCTION CONFLICTS WITH THE OWNER AND ENGINEER PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL MAKE ADDITIONAL TOPOGRAPHIC SURVEYS HE DEEMS NECESSARY, PROVIDED THEY ARE COORDINATED WITH THE OWNER. ANY CONDITIONS DETERMINED BY THE CONTRACTOR THAT DIFFER FROM THE INFORMATION SHOWN ON THE DRAWINGS THAT ARE NOT BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER PRIOR TO THE START OF WORK SHALL NOT BE CONSIDERED GROUNDS FOR ADDITIONAL PAYMENT OR CHANGES TO THE CONTRACT DURATION, OR ANY OTHER CLAIMS AGAINST THE OWNER OR OWNER'S ENGINEER.
9. THE CONTRACTOR SHALL, WHEN THEY DEEM NECESSARY, PROVIDE WRITTEN REQUESTS FOR INFORMATION (RFIS) TO THE OWNER AND ENGINEER PRIOR TO THE CONSTRUCTION OF ANY SPECIFIC SITEWORK ITEM. THE (RFI) SHALL BE IN A FORM ACCEPTABLE TO OWNER AND ENGINEER AND SHALL ALLOW FOR A MINIMUM OF TWO WORK DAYS OR ADDITIONAL REASONABLE TIME FOR A WRITTEN REPLY. RFIS SHALL BE NUMBERED CONSECUTIVELY BY DATE SUBMITTED. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SITEWORK ITEMS CONSTRUCTED DIFFERENTLY THAN INTENDED OR AS DEPICTED ON THE PLANS.
10. INFORMATION RELATED TO ELEVATIONS AND PROPOSED UTILITIES (SUCH AS ROADWAY GRADES, INVERT ELEVATIONS, RIM ELEVATIONS, GRATE ELEVATIONS, BUILDING FINISHED FLOOR ELEVATIONS, ETC.) MAY BE FOUND IN MORE THAN ONE LOCATION IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUFFICIENTLY REVIEW ALL PLANS, PROFILES AND ANY OTHER INFORMATION IN THE CONTRACT DOCUMENTS FOR CONSISTENCY PRIOR TO CONSTRUCTION. ANY INCONSISTENCIES OR DISCREPANCIES THAT ARE FOUND BY THE CONTRACTOR OR HIS ASSIGNS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER IN WRITING, IN THE FORMAT OF AN RFI PRIOR TO CONSTRUCTION.
11. THERE ARE ADDITIONAL NOTES, SPECIFICATIONS AND REQUIREMENTS CONTAINED THROUGHOUT THE PLAN SET AS WELL AS REFERENCES TO SPECIFICATIONS FROM APPLICABLE GOVERNING AUTHORITIES AND INDUSTRY STANDARDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN, REVIEW AND ADHERE TO ALL THESE DOCUMENTS.
12. THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THE PLANS IS BASED ON INFORMATION AVAILABLE WHEN THESE PLANS WERE PREPARED AND SHOULD BE CONSIDERED APPROXIMATE. EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR.
13. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE HIS OPERATIONS WITH THE VARIOUS COMPANIES OR AGENCIES WHOSE INTERESTS ARE AFFECTED BY THIS PROJECT.

LEGEND

- PROPERTY LINE
- BUILDING LINE
- CONCRETE CURB
- DEPRESSED CURB
- RETAINING WALL
- ADA RAMP WITH DEPRESSED CURB AND TRUNCATED DOMES
- DOORWAY
- PARKING SPACE COUNT
- PARKING SPACE TOTAL
- SIGN
- PAVEMENT MARKING

100 0 50 100
SCALE IN FEET

ASSOCIATED DOB APPLICATIONS:

- GARAGE NB# 520138315
- MALL EXPANSION ALT. 1# 520137833
- UTILITY RELOCATION DOB# 540051058

SEE DRAWING C-050.00, LIMITS OF WORK PLAN, FOR EXTENTS OF SITE WORK COVERED BY THESE DRAWINGS.

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

NO.	DATE	REVISION
10	2015.11.11	90% BID SET
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.07.23	30% CONSTRUCTION DOCUMENTS
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN

KEY PLAN

LANGAN
River Drive Center 1, 619 River Drive, Elmwood Park, NJ 07407
T: 201.794.6900 F: 201.794.0366 www.langan.com
NEW JERSEY NEW YORK VIRGINIA CALIFORNIA
PENNSYLVANIA CONNECTICUT FLORIDA
ABU DHABI ATHENS DOHA
DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

ARCHITECT
S9 an affiliate of PERKINS EASTMAN ARCHITECTS, PC
115 Fifth Avenue
New York, NY 10003
Tel: 212.353.7200
Fax: 212.353.7676

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th Fl.
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T.
F. 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1654

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-687-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:
STATEN ISLAND MALL

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9

DOB NO.: XXXXX

DRAWING TITLE:

OVERALL SITE PLAN

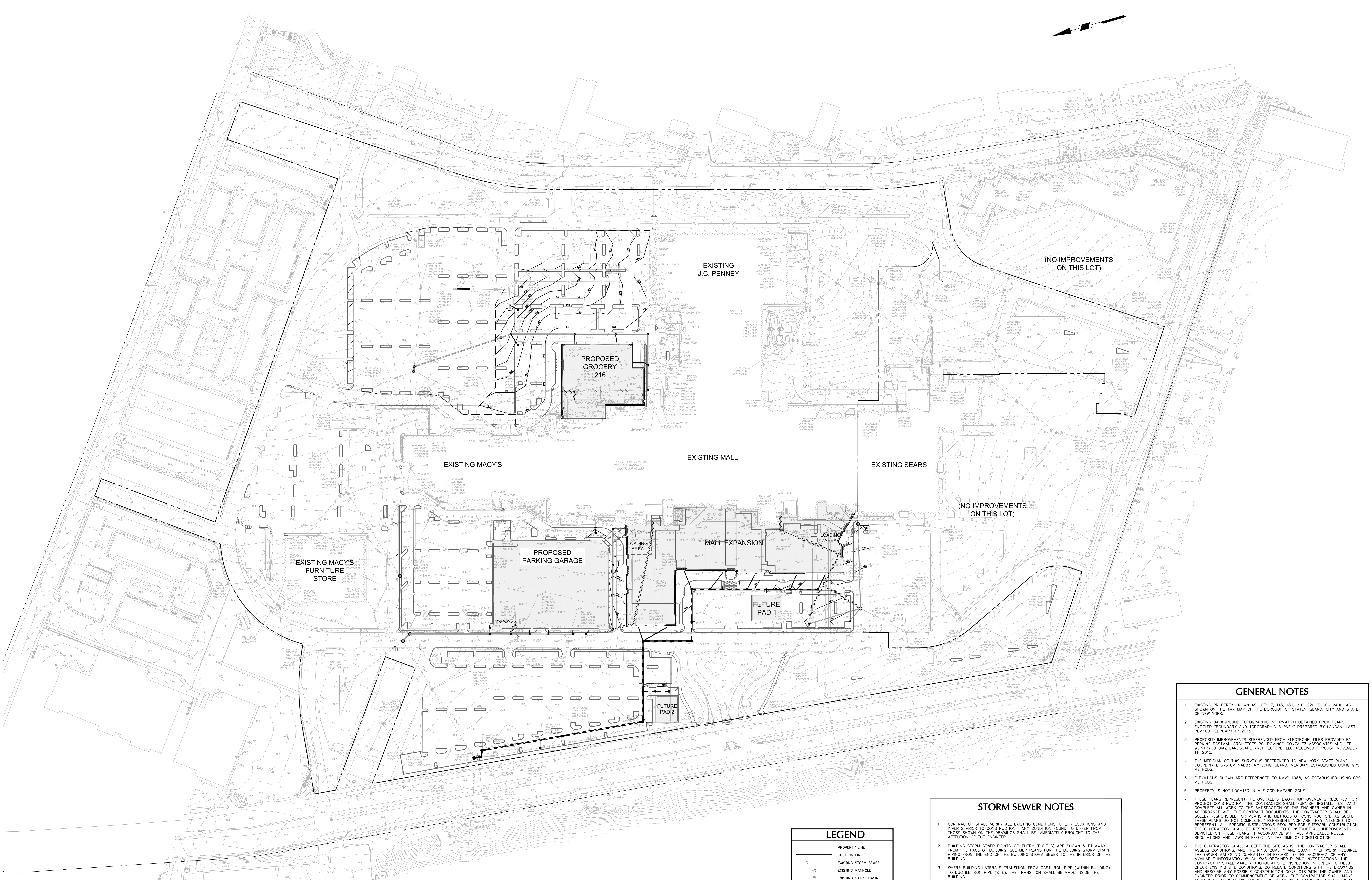
SCALE: PAGE: OF XXXX

C-100.00

DOB BSCAN STICKER

SEAL

Filename: \\langan.com\data\EP\data9\100320901\Cadd Data - 100320901\SheetFiles\10032



CONTRACTOR TO CONFIRM ALL ADA WORK IS PERFORMED IN ACCORDANCE WITH THE LATEST STANDARDS AND REGULATIONS PER APPLICABLE NYS, NYC AND FEDERAL CODES.

SEE DRAWING C-050.00, LIMITS OF WORK PLAN, FOR EXTENTS OF SITE WORK COVERED BY THESE DRAWINGS.

ASSOCIATED DOB APPLICATIONS:
- GARAGE NB# 520138315
- MALL EXPANSION ALT. 1# 520137833
- UTILITY RELOCATION DOB# 540051058

LEGEND

- PROPERTY LINE
- BUILDING LINE
- EXISTING STORM SEWER
- EXISTING MANHOLE
- EXISTING CATCH BASIN
- PHASE 1 STORM SEWER
- PHASE 1 MANHOLE
- PHASE 1 CATCH BASIN
- PROPOSED STORM SEWER
- PROPOSED MANHOLE
- PROPOSED CATCH BASIN
- 358 EXISTING CONTOUR
- × 358.3 EXISTING SPOT ELEVATION
- 360 PROPOSED CONTOUR
- × 360.3 PROPOSED SPOT ELEVATION
- EXISTING TO BE REMOVED
- 2% MAX SLOPE AREAS FOR ADA

STORM SEWER NOTES

1. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, UTILITY LOCATIONS AND INVERTS PRIOR TO CONSTRUCTION. ANY CONDITION FOUND TO DIFFER FROM THOSE SHOWN ON THE DRAWINGS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.
2. BUILDING STORM SEWER POINTS-OF-ENTRY (P.O.E.'S) ARE SHOWN 5-FT AWAY FROM THE FACE OF BUILDING. SEE MEP PLANS FOR THE BUILDING STORM DRAIN PIPING FROM THE END OF THE BUILDING STORM SEWER TO THE INTERIOR OF THE BUILDING.
3. WHERE BUILDING LATERALS TRANSITION FROM CAST IRON PIPE (WITHIN BUILDING) TO DUCTILE IRON PIPE (SITE), THE TRANSITION SHALL BE MADE INSIDE THE BUILDING.
4. CONTRACTOR MUST PROVIDE PROPER NOTICE IN ADVANCE OF WORK TO THE CITY OF NEW YORK DEPARTMENT OF BUILDINGS SEWER DEPARTMENT, IN ORDER TO ALLOW INSPECTION OF ALL STORM SEWER LINE WORK PRIOR TO BACKFILLING IF REQUIRED BY THE NYCDOB.
5. LENGTHS OF STORM DRAINAGE PIPES SHOWN HEREON ARE APPROXIMATE AND MEASURED CENTER TO CENTER OF STRUCTURE.
6. THE CONTRACTOR SHALL SUPPLY SHOP DRAWINGS DETAILING INTERFACE OF NEW STRUCTURES AND/OR CASTING WITH EXISTING STRUCTURES.
7. ALL SITE STORM SEWERS AND STRUCTURES SHALL BE CLEANED OF SOIL AND DEBRIS TO BE FULLY FUNCTIONAL BEFORE COMPLETION OF PROJECT.
8. SITE UTILITIES ARE NOT SHOWN ON THIS SHEET. REFER TO C-400 SERIES DRAWINGS FOR SITE UTILITY INFORMATION.
9. CONTRACTOR TO ADD RINGS MATCHING EXISTING DRAINAGE STRUCTURE SIZE IN ONE-FOOT INCREMENTS AS NECESSARY TO RESET GRATE OR COVER TO PROPOSED GRADES WITH A MAXIMUM BRICK COURSE OF 12".
10. CONTRACTOR TO REPLACE/REPAIR SITE FEATURES (INCLUDING, BUT NOT LIMITED TO CURB, PAVEMENT, STRIPING, LANDSCAPING, ETC.) TO EXISTING CONDITION, OR BETTER, AFTER COMPLETION OF THE UTILITY CONSTRUCTION.
11. CONTRACTOR TO VERIFY LOCATIONS OF ALL EXISTING BUILDING ROOF CONNECTIONS TO THE EXISTING STORM SEWER SYSTEM AND MAINTAIN DRAINAGE SERVICE THROUGHOUT CONSTRUCTION.
12. IF ANY EXISTING DRAINAGE STRUCTURES TO BE MODIFIED ARE IN POOR CONDITION, THE CONTRACTOR SHALL REPLACE THE STRUCTURE IN KIND.
13. MATERIALS ABBREVIATION:

    HDPE = HIGH DENSITY POLYETHYLENE PIPE
    DIP = DUCTILE IRON PIPE
    MH = MANHOLE
    CB = CATCH BASIN
    WQ = WATER QUALITY UNIT

GENERAL NOTES

1. EXISTING PROPERTY KNOWN AS LOTS 7, 118, 180, 210, 220, BLOCK 2400, AS SHOWN ON THE TAX MAP OF THE BOROUGH OF STATEN ISLAND, CITY AND STATE OF NEW YORK.
2. EXISTING BACKGROUND TOPOGRAPHIC INFORMATION OBTAINED FROM PLANS ENTITLED "BOUNDARY AND TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, LAST REVISED FEBRUARY 17 2015.
3. PROPOSED IMPROVEMENTS REFERENCED FROM ELECTRONIC FILES PROVIDED BY PERKINS EASTMAN ARCHITECTS PC, DOMINGO GONZALEZ ASSOCIATES AND LEE WEINTRAUB DIAZ LANDSCAPE ARCHITECTURE, LLC, RECEIVED THROUGH NOVEMBER 11, 2015.
4. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO NEW YORK STATE PLANE COORDINATE SYSTEM NAD83, NY LONG ISLAND. MERIDIAN ESTABLISHED USING GPS METHODS.
5. ELEVATIONS SHOWN ARE REFERENCED TO NAVD 1988, AS ESTABLISHED USING GPS METHODS.
6. PROPERTY IS NOT LOCATED IN A FLOOD HAZARD ZONE.
7. THESE PLANS REPRESENT THE OVERALL SITEWORK IMPROVEMENTS REQUIRED FOR PROJECT CONSTRUCTION. THE CONTRACTOR SHALL FURNISH, INSTALL, TEST AND COMPLETE ALL WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION; AS SUCH, THESE PLANS DO NOT COMPLETELY REPRESENT, NOR ARE THEY INTENDED TO REPRESENT, ALL SPECIFIC INSTRUCTIONS REQUIRED FOR SITEWORK CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONSTRUCT ALL IMPROVEMENTS DEPICTED ON THESE PLANS IN ACCORDANCE WITH ALL APPLICABLE RULES, REGULATIONS AND LAWS IN EFFECT AT THE TIME OF CONSTRUCTION.
8. THE CONTRACTOR SHALL ACCEPT THE SITE AS IS. THE CONTRACTOR SHALL ASSESS CONDITIONS, AND THE KIND, QUALITY AND QUANTITY OF WORK REQUIRED. THE OWNER MAKES NO GUARANTEE IN REGARD TO THE ACCURACY OF ANY AVAILABLE INFORMATION WHICH WAS OBTAINED DURING INVESTIGATIONS. THE CONTRACTOR SHALL MAKE A THOROUGH SITE INSPECTION IN ORDER TO FIELD CHECK EXISTING SITE CONDITIONS, CORRELATE CONDITIONS WITH THE DRAWINGS AND RESOLVE ANY POSSIBLE CONSTRUCTION CONFLICTS WITH THE OWNER AND ENGINEER PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL MAKE ADDITIONAL TOPOGRAPHIC SURVEYS HE DEEMS NECESSARY, PROVIDED THEY ARE COORDINATED WITH THE OWNER. ANY CONDITIONS DETERMINED BY THE CONTRACTOR THAT DIFFER FROM THE INFORMATION SHOWN ON THE DRAWINGS THAT ARE NOT BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER PRIOR TO THE START OF WORK SHALL NOT BE CONSIDERED GROUNDS FOR ADDITIONAL PAYMENT OR CHANGES TO THE CONTRACT DURATION, OR ANY OTHER CLAIMS AGAINST THE OWNER OR OWNER'S ENGINEER.
9. THE CONTRACTOR SHALL, WHEN THEY DEEM NECESSARY, PROVIDE WRITTEN REQUESTS FOR INFORMATION (RFIS) TO THE OWNER AND ENGINEER PRIOR TO THE CONSTRUCTION OF ANY SPECIFIC SITEWORK ITEM. THE (RFI) SHALL BE IN A FORM ACCEPTABLE TO OWNER AND ENGINEER AND SHALL ALLOW FOR A MINIMUM OF TWO WORK DAYS OR ADDITIONAL REASONABLE TIME FOR A WRITTEN REPLY. RFIS SHALL BE NUMBERED CONSECUTIVELY BY DATE SUBMITTED. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SITEWORK ITEMS CONSTRUCTED DIFFERENTLY THAN INTENDED OR AS DEPICTED ON THE PLANS.
10. INFORMATION RELATED TO ELEVATIONS AND PROPOSED UTILITIES (SUCH AS ROADWAY GRADES, INVERT ELEVATIONS, RIM ELEVATIONS, GRATE ELEVATIONS, BUILDING FINISHED FLOOR ELEVATIONS, ETC.) MAY BE FOUND IN MORE THAN ONE LOCATION IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUFFICIENTLY REVIEW ALL PLANS, PROFILES AND ANY OTHER INFORMATION IN THE CONTRACT DOCUMENTS FOR CONSISTENCY PRIOR TO CONSTRUCTION. ANY INCONSISTENCIES OR DISCREPANCIES THAT ARE FOUND BY THE CONTRACTOR OR HIS ASSIGNS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER IN WRITING, IN THE FORMAT OF AN RFI PRIOR TO CONSTRUCTION.
11. THERE ARE ADDITIONAL NOTES, SPECIFICATIONS AND REQUIREMENTS CONTAINED THROUGHOUT THE PLAN SET AS WELL AS REFERENCES TO SPECIFICATIONS FROM APPLICABLE GOVERNING AUTHORITIES AND INDUSTRY STANDARDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN, REVIEW AND ADHERE TO ALL THESE DOCUMENTS.
12. THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THE PLANS IS BASED ON INFORMATION AVAILABLE WHEN THESE PLANS WERE PREPARED AND SHOULD BE CONSIDERED APPROXIMATE. EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR.
13. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE HIS OPERATIONS WITH THE VARIOUS COMPANIES OR AGENCIES WHOSE INTERESTS ARE AFFECTED BY THIS PROJECT.

100 0 50 100
SCALE IN FEET

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

NO.	DATE	REVISION
10	2015.11.11	90% BID SET
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.07.23	30% CONSTRUCTION DOCUMENTS
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN

KEY PLAN

LANGAN
River Drive Center 1, 619 River Drive, Elmwood Park, NJ 07407
T: 201.794.6900 F: 201.794.0366 www.langan.com
NEW JERSEY NEW YORK VIRGINIA CALIFORNIA PENNSYLVANIA CONNECTICUT FLORIDA
ABU DHABI ATHENS DOHA DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

ARCHITECT
S9 an affiliate of PERKINS EASTMAN ARCHITECTS, PC
115 Fifth Avenue
New York, NY 10003
Tel: 212.353.7200
Fax: 212.353.7676

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th Fl.
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T.
F. 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1654

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-687-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:
STATEN ISLAND MALL

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9

DOB NO.: XXXXX

DRAWING TITLE:

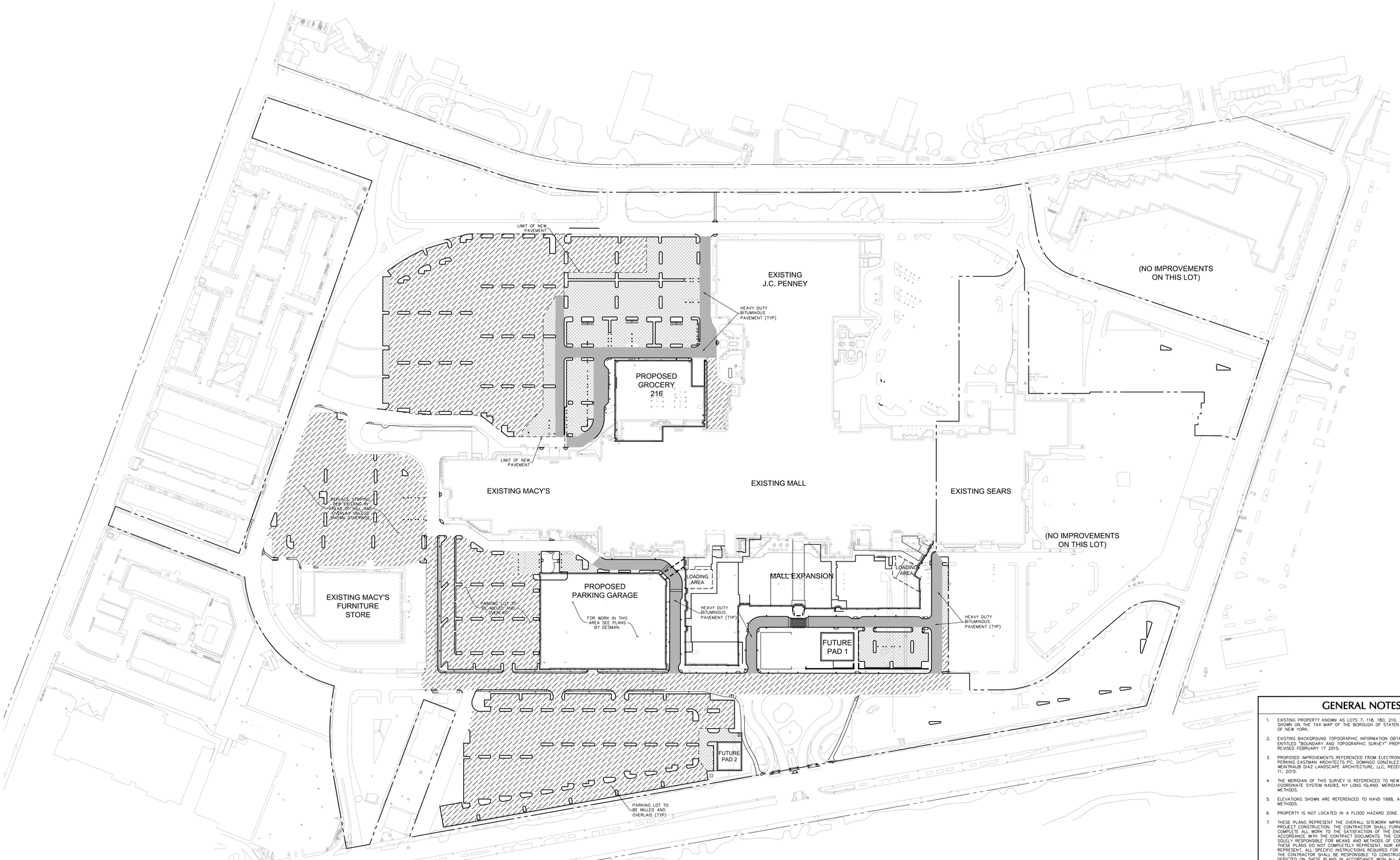
OVERALL GRADING AND DRAINAGE PLAN

SCALE: PAGE: OF XXXX

C-200.00

DOB BSCAN STICKER

SEAL



ASSOCIATED DOB APPLICATIONS:
- GARAGE NB# 520138315
- MALL EXPANSION ALT. 1# 520137833
- UTILITY RELOCATION DOB# 540051058

CONTRACTOR TO CONFIRM ALL ADA WORK IS PERFORMED IN ACCORDANCE WITH THE LATEST STANDARDS AND REGULATIONS PER APPLICABLE NYS, NYC AND FEDERAL CODES.

SEE DRAWING C-050.00, LIMITS OF WORK PLAN, FOR EXTENTS OF SITE WORK COVERED BY THESE DRAWINGS.

SEE UTILITY RELOCATION DRAWINGS FOR PAVEMENT RESTORATION REQUIRED FOR UTILITY INSTALLATION.

100 0 50 100
SCALE IN FEET

LEGEND

- PROPERTY LINE
- BUILDING LINE
- CONCRETE CURB
- DEPRESSED CURB
- RETAINING WALL
- ADA RAMP WITH DEPRESSED CURB AND TRUNCATED DOMES
- DOORWAY
- PARKING SPACE COUNT
- PARKING SPACE TOTAL
- SIGN
- PAVEMENT MARKING
- CONCRETE SIDEWALK ON GRADE
- MILL AND OVERLAY
- STANDARD DUTY BITUMINOUS PAVEMENT
- HEAVY DUTY BITUMINOUS PAVEMENT

GENERAL NOTES

1. EXISTING PROPERTY KNOWN AS LOTS 7, 118, 180, 210, 220, BLOCK 2400, AS SHOWN ON THE TAX MAP OF THE BOROUGH OF STATEN ISLAND, CITY AND STATE OF NEW YORK.
2. EXISTING BACKGROUND TOPOGRAPHIC INFORMATION OBTAINED FROM PLANS ENTITLED "BOUNDARY AND TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, LAST REVISED FEBRUARY 17 2015.
3. PROPOSED IMPROVEMENTS REFERENCED FROM ELECTRONIC FILES PROVIDED BY PERKINS EASTMAN ARCHITECTS PC, DOMINGO GONZALEZ ASSOCIATES AND LEE WEINTRAUB DIAZ LANDSCAPE ARCHITECTURE, LLC, RECEIVED THROUGH NOVEMBER 11, 2015.
4. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO NEW YORK STATE PLANE, COORDINATE SYSTEM NAD83, NY LONG ISLAND. MERIDIAN ESTABLISHED USING GPS METHODS.
5. ELEVATIONS SHOWN ARE REFERENCED TO NAVD 1988, AS ESTABLISHED USING GPS METHODS.
6. PROPERTY IS NOT LOCATED IN A FLOOD HAZARD ZONE.
7. THESE PLANS REPRESENT THE OVERALL SITEWORK IMPROVEMENTS REQUIRED FOR PROJECT CONSTRUCTION. THE CONTRACTOR SHALL FURNISH, INSTALL, TEST AND COMPLETE ALL WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION; AS SUCH, THESE PLANS DO NOT COMPLETELY REPRESENT, NOR ARE THEY INTENDED TO REPRESENT, ALL SPECIFIC INSTRUCTIONS REQUIRED FOR SITEWORK CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE TO CONSTRUCT ALL IMPROVEMENTS DEPICTED ON THESE PLANS IN ACCORDANCE WITH ALL APPLICABLE RULES, REGULATIONS AND LAWS IN EFFECT AT THE TIME OF CONSTRUCTION.
8. THE CONTRACTOR SHALL ACCEPT THE SITE AS IS. THE CONTRACTOR SHALL ASSESS CONDITIONS, AND THE KIND, QUALITY AND QUANTITY OF WORK REQUIRED. THE OWNER MAKES NO GUARANTEE IN REGARD TO THE ACCURACY OF ANY AVAILABLE INFORMATION WHICH WAS OBTAINED DURING INVESTIGATIONS. THE CONTRACTOR SHALL MAKE A THOROUGH SITE INSPECTION IN ORDER TO FIELD CHECK EXISTING SITE CONDITIONS, CORRELATE CONDITIONS WITH THE DRAWINGS AND RESOLVE ANY POSSIBLE CONSTRUCTION CONFLICTS WITH THE OWNER AND ENGINEER PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR SHALL MAKE ADDITIONAL TOPOGRAPHIC SURVEYS HE DEEMS NECESSARY, PROVIDED THEY ARE COORDINATED WITH THE OWNER. ANY CONDITIONS DETERMINED BY THE CONTRACTOR THAT DIFFER FROM THE INFORMATION SHOWN ON THE DRAWINGS THAT ARE NOT BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER PRIOR TO THE START OF WORK SHALL NOT BE CONSIDERED GROUNDS FOR ADDITIONAL PAYMENT OR CHANGES TO THE CONTRACT DURATION, OR ANY OTHER CLAIMS AGAINST THE OWNER OR OWNER'S ENGINEER.
9. THE CONTRACTOR SHALL, WHEN THEY DEEM NECESSARY, PROVIDE WRITTEN REQUESTS FOR INFORMATION (RFIS) TO THE OWNER AND ENGINEER PRIOR TO THE CONSTRUCTION OF ANY SPECIFIC SITEWORK ITEM. THE (RFI) SHALL BE IN A FORM ACCEPTABLE TO OWNER AND ENGINEER AND SHALL ALLOW FOR A MINIMUM OF TWO WORK DAYS OR ADDITIONAL REASONABLE TIME FOR A WRITTEN REPLY. RFIS SHALL BE NUMBERED CONSECUTIVELY BY DATE SUBMITTED. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SITEWORK ITEMS CONSTRUCTED DIFFERENTLY THAN INTENDED OR AS DEPICTED ON THE PLANS.
10. INFORMATION RELATED TO ELEVATIONS AND PROPOSED UTILITIES (SUCH AS ROADWAY GRADES, INVERT ELEVATIONS, RIM ELEVATIONS, GRATE ELEVATIONS, BUILDING FINISHED FLOOR ELEVATIONS, ETC.) MAY BE FOUND IN MORE THAN ONE LOCATION IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUFFICIENTLY REVIEW ALL PLANS, PROFILES AND ANY OTHER INFORMATION IN THE CONTRACT DOCUMENTS FOR CONSISTENCY PRIOR TO CONSTRUCTION. ANY INCONSISTENCIES OR DISCREPANCIES THAT ARE FOUND BY THE CONTRACTOR OR HIS ASSIGNS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND ENGINEER IN WRITING, IN THE FORMAT OF AN RFI PRIOR TO CONSTRUCTION.
11. THERE ARE ADDITIONAL NOTES, SPECIFICATIONS AND REQUIREMENTS CONTAINED THROUGHOUT THE PLAN SET AS WELL AS REFERENCES TO SPECIFICATIONS FROM APPLICABLE GOVERNING AUTHORITIES AND INDUSTRY STANDARDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN, REVIEW AND ADHERE TO ALL THESE DOCUMENTS.
12. THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THE PLANS IS BASED ON INFORMATION AVAILABLE WHEN THESE PLANS WERE PREPARED AND SHOULD BE CONSIDERED APPROXIMATE. EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR.
13. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE HIS OPERATIONS WITH THE VARIOUS COMPANIES OR AGENCIES WHOSE INTERESTS ARE AFFECTED BY THIS PROJECT.

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

NO.	DATE	REVISION
10	2015.11.11	90% BID SET
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.07.23	30% CONSTRUCTION DOCUMENTS
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN

KEY PLAN

LANGAN
River Drive Center 1, 619 River Drive, Elmwood Park, NJ 07407
T: 201.794.6900 F: 201.794.0366 www.langan.com
NEW JERSEY NEW YORK VIRGINIA CALIFORNIA
PENNSYLVANIA CONNECTICUT FLORIDA
ABU DHABI ATHENS DOHA
DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying, Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan Virginia LLC
Licensed Landscape Architect

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

ARCHITECT
SO as affiliate of PERKINS EASTMAN ARCHITECTS, PC
115 Fifth Avenue
New York, NY 10003
Tel: 212.353.7200
Fax: 212.353.7676

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th FL
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T:
F, 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1664

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-457-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:
STATEN ISLAND MALL

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9

DOB NO.: XXXXX

DRAWING TITLE:
PAVING PLAN

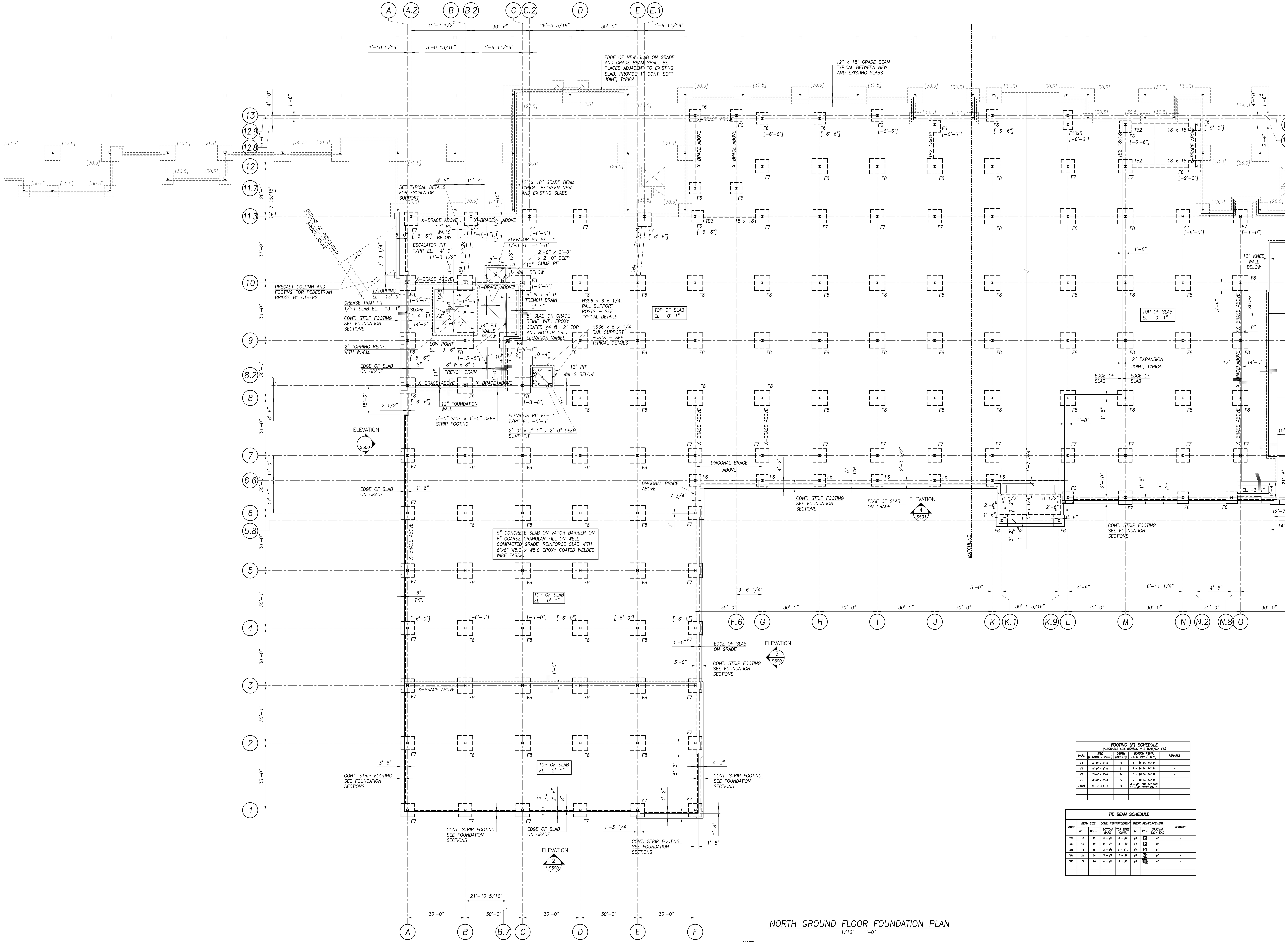
SCALE: PAGE: OF XXXX

C-105.00

DOB BSCAN STICKER

SEAL

F:\langan.com\data\EP\data\51\69000901\Cad Data - 100320901\Sheet Files\100320901C-105_Signage Striping and Paving Plan.dwg, Date: 11/13/2015 Time: 15:43 User: jflint Style Table: Langan.stb Layout: C-105



NORTH GROUND FLOOR FOUNDATION PLAN

1/16" = 1'-0"

NOTE:

1. ALL FOOTINGS SHALL BEAR ON 2 TSF SOIL AND SHALL BE FIELD VERIFIED BY GEOTECHNICAL INSPECTOR PRIOR TO PLACING FOUNDATION CONCRETE.
2. ALL BOTTOM OF FOOTINGS SHALL BE 4'-0" BELOW TOP OF SLAB UNLESS OTHERWISE NOTED ON PLAN THUS [±. . .] INDICATING THE ELEVATION OF THE BOTTOM OF FOOTING FROM TOP OF SLAB ABOVE.
3. ALL CONCRETE FOR FOUNDATIONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
4. DATUM ELEVATION IS SET AT 0'-0" (CORRESPONDING TO NAVD 88 EL. +37'-0"). TOP OF SLAB IS AT DATUM UNLESS OTHERWISE NOTED ON PLAN THUS ± . . . RELATIVE TO DATUM.
5. FOR SLAB CONSTRUCTION SEE PLAN.
6. TOP OF TIE BEAM ELEVATIONS SHALL MATCH TOP OF FOOTING BEING CONNECTED. IF FOOTINGS ARE AT DIFFERENT ELEVATIONS, TIE BEAMS SHALL BE SLOPED.
7. FOR FOOTING SCHEDULE, SEE FO-104
8. TOP OF TIE BEAM ELEVATIONS SHALL MATCH THE TOP OF FOOTINGS BEING CONNECTED. IF THE FOOTINGS ARE AT DIFFERENT ELEVATIONS, THE TIE BEAMS SHALL BE SLOPED.
9. FOR TIE BEAM SCHEDULE, SEE FO-104

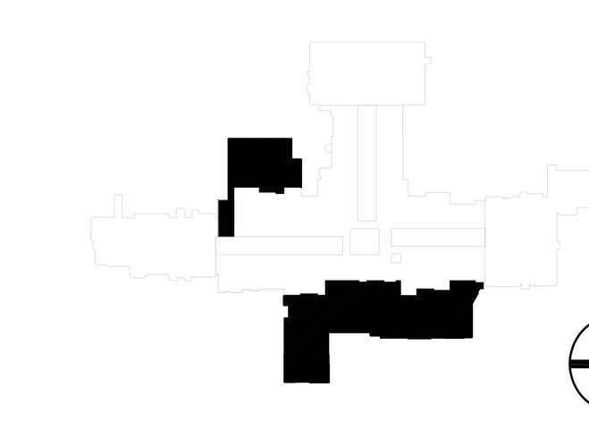
FOOTING (F) SCHEDULE
(ALLOWABLE SOIL BEARING = 2 TONS/SQ. FT.)

MARK	SIZE (LENGTH x WIDTH)	DEPTH (INCHES)	BOTTOM REINF. EACH WAY (U.O.N.)	REMARKS
F5	5'-0" x 5'-0	18	6 - #6 EA. WAY B.	-
F6	6'-0" x 6'-0	21	7 - #6 EA. WAY B.	-
F7	7'-0" x 7'-0	24	8 - #6 EA. WAY B.	-
F8	8'-0" x 8'-0	27	9 - #6 EA. WAY B.	-
F10x5	10'-0" x 5'-0	18	6 - #6 LONG WAY T&B 11 - #6 SHORT WAY B.	-

TIE BEAM SCHEDULE

MARK	BEAM SIZE		CONT. REINFORCEMENT		SHEAR REINFORCEMENT			REMARKS
	WIDTH	DEPTH	BOTTOM BARS	TOP BARS CONT.	SIZE	TYPE	SPACING EACH END	
TB1	18	18	3 - #7	3 - #7	#4		6"	-
TB2	18	18	2 - #7	3 - #9	#4		6"	-
TB3	18	18	2 - #8	3 - #10	#4		6"	-
TB4	24	24	3 - #7	5 - #9	#4		9"	-
TB5	24	24	4 - #7	4 - #9	#4		9"	-

NO.	DATE	REVISION
11	2015.10.01	STEEL AND FOUNDATION BID SET
10	2015.10.01	DEPARTMENT OF BUILDINGS SUBMISSION
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.08.24	ISSUED FOR PROGRESS
8	2015.07.23	30% CDs
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN



KEY PLAN

S9 an affiliate of Perkins Eastman Architects, PC
115 FIFTH AVENUE
NEW YORK, NY 10003
T. 212.353.7200
F. 212.353.7676

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

CIVIL / SITE
LANGAN
River Drive Center 1, 619 River Drive
Elmwood Park, NJ 07407
Tel: 201.794.6900
Fax:

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th Fl.
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T.
F. 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1654

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-687-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:
STATEN ISLAND MALL ENLARGEMENT

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9/14893

DOB NO.: XXXXX

DRAWING TITLE:

NORTH GROUND FLOOR FOUNDATION PLAN

SCALE: 1/16"=1'-0" PAGE: OF 100

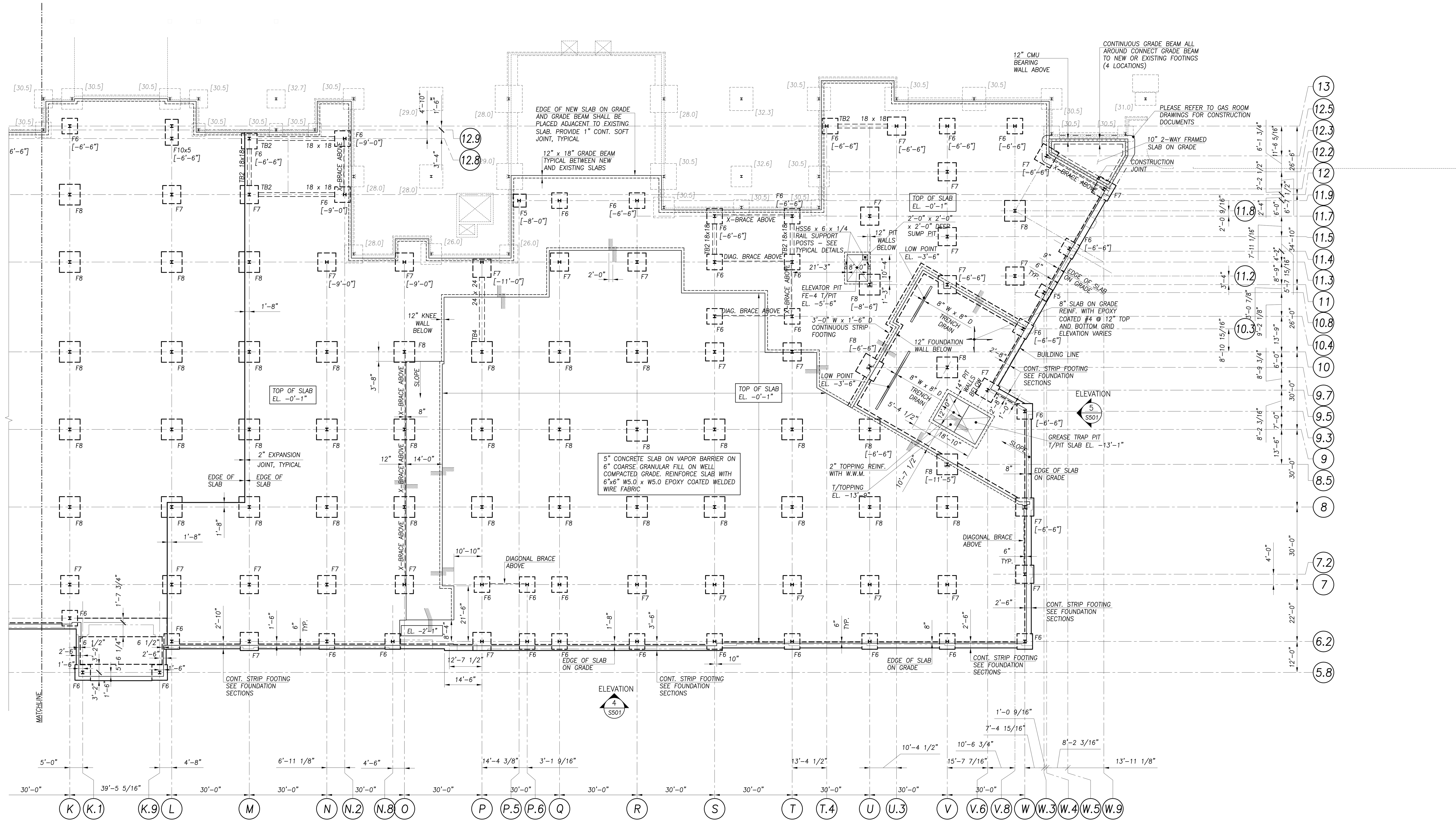
FO-104.00

DOB BSCAN STICKER

STATE OF NEW YORK · STEVEN J. NAJARIAN · No. 063868 · LICENSED PROFESSIONAL ENGINEER

SEAL

NOT FOR CONSTRUCTION
ISSUED FOR PRICING ONLY
06/27/2014



FOOTING (F) SCHEDULE (ALLOWABLE SOIL BEARING = 2 TONS/SQ. FT.)				
MARK	SIZE (LENGTH x WIDTH)	DEPTH (INCHES)	BOTTOM REINF. EACH WAY (U.O.N.)	REMARKS
F5	5'-0" x 5'-0	18	6 - #6 EA. WAY B.	-
F6	6'-0" x 6'-0	21	7 - #6 EA. WAY B.	-
F7	7'-0" x 7'-0	24	8 - #6 EA. WAY B.	-
F8	8'-0" x 8'-0	27	9 - #6 EA. WAY B.	-
F10x5	10'-0" x 5'-0	18	6 - #6 LONG WAY T&B 11 - #6 SHORT WAY B.	-

TIE BEAM SCHEDULE								
MARK	BEAM SIZE		CONT. REINFORCEMENT		SHEAR REINFORCEMENT			REMARKS
	WIDTH	DEPTH	BOTTOM BARS	TOP BARS CONT.	SIZE	TYPE	SPACING EACH END	
TB1	18	18	3 - #7	3 - #7	#4		6"	-
TB2	18	18	2 - #7	3 - #9	#4		6"	-
TB3	18	18	2 - #8	3 - #10	#4		6"	-
TB4	24	24	3 - #7	5 - #9	#4		9"	-
TB5	24	24	4 - #7	4 - #9	#4		9"	-

SOUTH GROUND FLOOR FOUNDATION PLAN

1/16" = 1'-0"

NOTE:

1. ALL FOOTINGS SHALL BEAR ON 2 TSF SOIL AND SHALL BE FIELD VERIFIED BY GEOTECHNICAL INSPECTOR PRIOR TO PLACING FOUNDATION CONCRETE.
2. ALL BOTTOM OF FOOTINGS SHALL BE 4'-0" BELOW TOP OF SLAB UNLESS OTHERWISE NOTED ON PLAN THUS [±. . .] INDICATING THE ELEVATION OF THE BOTTOM OF FOOTING FROM TOP OF SLAB ABOVE.
3. ALL CONCRETE FOR FOUNDATIONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
4. DATUM ELEVATION IS SET AT 0'-0" (CORRESPONDING TO NAVD 88 EL. +37'-0"). TOP OF SLAB IS AT DATUM UNLESS OTHERWISE NOTED ON PLAN THUS [± . . .] RELATIVE TO DATUM.
5. FOR SLAB CONSTRUCTION SEE PLAN.
6. TOP OF TIE BEAM ELEVATIONS SHALL MATCH TOP OF FOOTING BEING CONNECTED. IF FOOTINGS ARE AT DIFFERENT ELEVATIONS, TIE BEAMS SHALL BE SLOPED.
7. FOR FOOTING SCHEDULE, SEE FO-104
8. TOP OF TIE BEAM ELEVATIONS SHALL MATCH THE TOP OF FOOTINGS BEING CONNECTED. IF THE FOOTINGS ARE AT DIFFERENT ELEVATIONS, THE TIE BEAMS SHALL BE SLOPED.
9. FOR TIE BEAM SCHEDULE, SEE FO-104

NO.	DATE	REVISION
11	2015.10.01	STEEL AND FOUNDATION BID SET
10	2015.10.01	DEPARTMENT OF BUILDINGS SUBMISSION
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.08.24	ISSUED FOR PROGRESS
8	2015.07.23	30% CDs
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN

KEY PLAN

S9 an affiliate of Perkins Eastman Architects, PC
115 FIFTH AVENUE
NEW YORK, NY 10003
T. 212.353.7200
F. 212.353.7676

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

CIVIL / SITE
LANGAN
River Drive Center 1, 619 River Drive
Elmwood Park, NJ 07407
Tel: 201.794.6900
Fax:

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th Fl.
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T.
F. 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1654

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-687-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:

STATEN ISLAND MALL ENLARGEMENT

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9/14893

DOB NO.: XXXXX

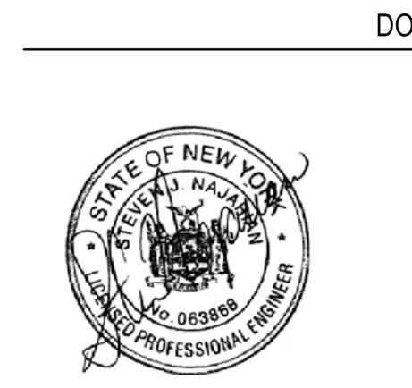
DRAWING TITLE:

SOUTH GROUND FLOOR FOUNDATION PLAN

SCALE: 1/16"=1'-0" PAGE: OF 100

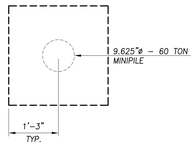
FO-105.00

DOB BSCAN STICKER



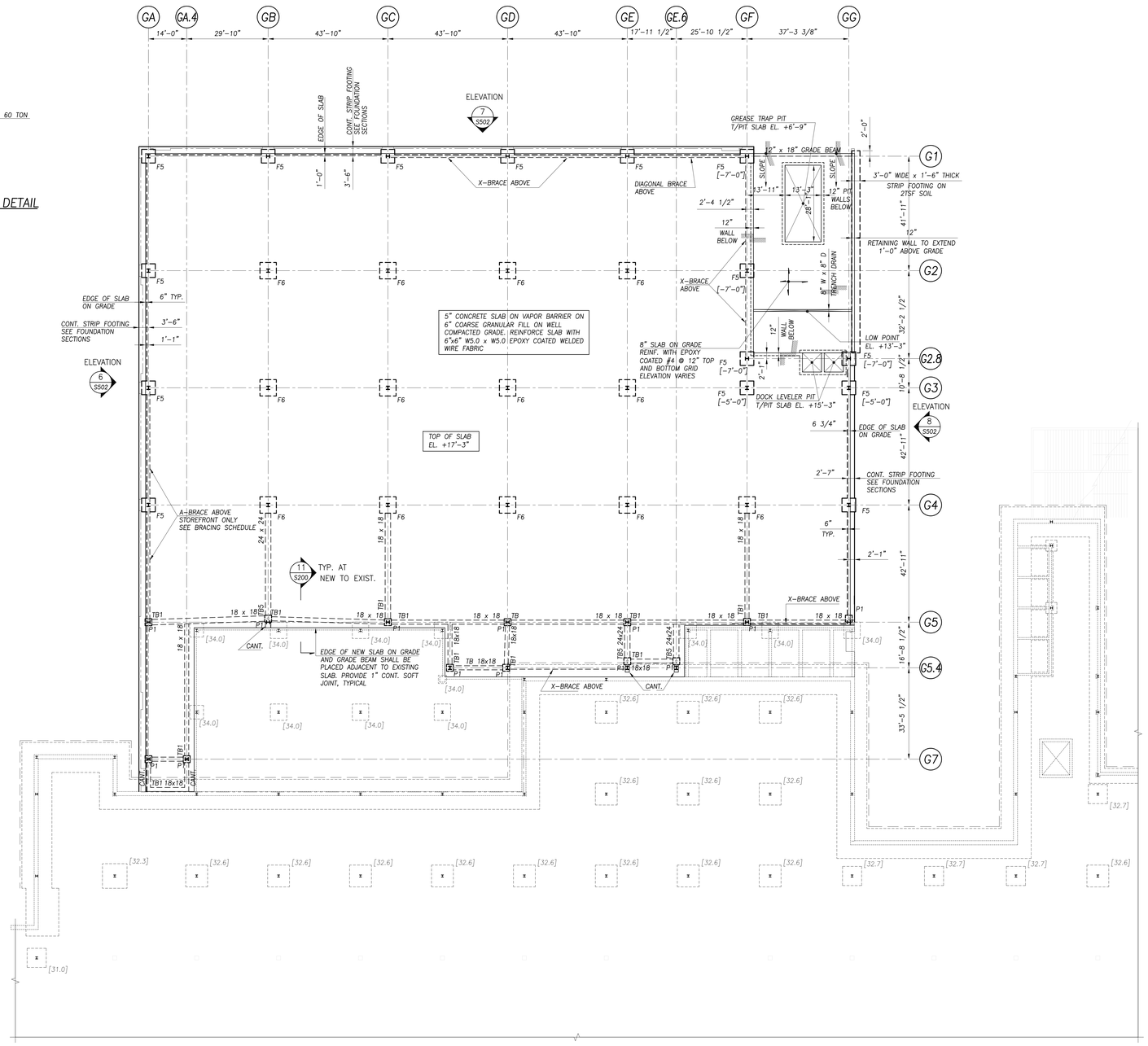
SEAL

NOT FOR CONSTRUCTION
ISSUED FOR PRICING ONLY
06/27/2014



TYPICAL PILE CAP (P1) DETAIL

DEPTH = 2'–0"
FOR REINF. SEE TYPICAL DETAILS



EAST GROUND FLOOR FOUNDATION PLAN

1/16" = 1'–0"

NOTE:

1. ALL FOOTINGS SHALL BEAR ON 2 TSF SOIL AND SHALL BE FIELD VERIFIED BY GEOTECHNICAL INSPECTOR PRIOR TO PLACING FOUNDATION CONCRETE.
2. ALL BOTTOM OF FOOTINGS SHALL BE 4'–0" BELOW TOP OF SLAB UNLESS OTHERWISE NOTED ON PLAN THUS [± . . .] INDICATING THE ELEVATION OF THE BOTTOM OF FOOTING FROM TOP OF SLAB ABOVE.
3. ALL CONCRETE FOR FOUNDATIONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
4. DATUM ELEVATION IS SET AT 0'–0" (CORRESPONDING TO NAVD 88 EL. +37'–0"). TOP OF SLAB IS AT DATUM UNLESS OTHERWISE NOTED ON PLAN THUS [± . . .] RELATIVE TO DATUM.
5. FOR SLAB CONSTRUCTION SEE PLAN
6. ○ ON PLAN INDICATES 9.625"ø DRILLED MINIPILE WITH 60 TON AXIAL CAPACITY. SEE TYPICAL DETAILS AND GEOTECHNICAL SPECS FOR BALANCE OF DETAILS AND INSTALLATION PROCEDURES.
7. FOR FOOTING SCHEDULE, SEE FO–104.
8. TOP OF PILE CAPS SHALL BE 1'–0" BELOW SLAB UNLESS OTHERWISE NOTED.
9. TOP OF TIE BEAMS ELEVATIONS SHALL MATCH THE TOP OF PILE CAP OR FOOTING BEING CONNECTED TO. IF CONNECTING FOOTINGS OR PILE CAPS ARE AT DIFFERENT ELEVATIONS, THE TIE BEAM SHALL BE SLOPED.
10. FOR TIE BEAM SCHEDULE SEE FO–104.

FOOTING (F) SCHEDULE
(ALLOWABLE SOIL BEARING = 2 TONS/SQ. FT.)

MARK	SIZE (LENGTH x WIDTH)	DEPTH (INCHES)	BOTTOM REINF. EACH WAY (U.O.N.)	REMARKS
F5	5'–0" x 5'–0	18	6 – #5 EA. WAY B.	–
F6	6'–0" x 6'–0	21	7 – #5 EA. WAY B.	–
F7	7'–0" x 7'–0	24	8 – #5 EA. WAY B.	–
F8	8'–0" x 8'–0	27	9 – #5 EA. WAY B.	–
F10x5	10'–0" x 5'–0	18	8 – #5 LONG WAY TAB 11 – #5 SHORT WAY B.	–

TIE BEAM SCHEDULE

MARK	BEAM SIZE		CONT. REINFORCEMENT		SHEAR REINFORCEMENT			REMARKS
	WIDTH	DEPTH	BOTTOM BARS	TOP BARS CONT.	SIZE	TYPE	SPACING EACH END	
TB1	18	18	3 – #7	3 – #7	#4	☐	6"	–
TB2	18	18	2 – #7	3 – #9	#4	☐	6"	–
TB3	18	18	2 – #8	3 – #10	#4	☐	6"	–
TB4	24	24	3 – #7	5 – #9	#4	☐☐	6"	–
TB5	24	24	4 – #7	4 – #9	#4	☐☐	6"	–

NO.	DATE	REVISION
11	2015.10.01	STEEL AND FOUNDATION BID SET
10	2015.10.01	DEPARTMENT OF BUILDINGS SUBMISSION
9	2015.10.01	60% CONSTRUCTION DOCUMENTS
8	2015.08.24	ISSUED FOR PROGRESS
8	2015.07.23	30% CDs
7	2015.06.05	100% DESIGN DEVELOPMENT 3
6	2015.02.13	100% DESIGN DEVELOPMENT REDESIGN
5	2014.09.19	ISSUE FOR PERMIT
4	2014.06.26	100% DESIGN DEVELOPMENT
3	2014.05.15	50% DESIGN DEVELOPMENT
2	2014.01.06	100% SCHEMATIC DESIGN
1	2013.12.13	80% SCHEMATIC DESIGN

KEY PLAN

S9 an affiliate of Perkins Eastman Architects, PC
1 Bryant Park
NEW YORK, NY 10036
T. 212.353.7200
F. 212.353.7474

OWNER
GENERAL GROWTH PROPERTIES
110 N Wacker Drive
Chicago, Il 60606
Tel:
Fax:

CIVIL / SITE
LANGAN
River Drive Center 1, 619 River Drive
Elmwood Park, NJ 07407
Tel: 201.794.6900
Fax:

CODE CONSULTANTS
CODE CONSULTANT PROFESSIONAL ENGINEERS, PC
215 West 40th Street, 15th Floor,
New York, NY 10018
Tel:
Fax:

ENVIRONMENTAL GRAPHICS
RUSSELL DESIGN
115 Fifth Avenue
New York, New York 10003
Tel:
Fax:

EXTERIOR ENVELOPE WATERPROOFING
VIDARIS, INC
360 Park Avenue South, 15th Fl.
New York, New York 10010
Tel: 212.689.5389
Fax:

LANDSCAPE ARCHITECTURE
LEE WEINTRAUB LANDSCAPE ARCHITECTURE, LLC
59 Edgecliff Terrace
Yonkers, NY 10705
T: 914-965-6540
F: 914-965-6546

LIGHTING DESIGNER
DOMINGO GONZALEZ ASSOCIATES
25 Park Place - NYC 10007
Tel: (212) 608-4800
Fx: (212) 385-9160

MEP
DAGHER ENGINEERING, PLLC
29 Broadway, New York, NY 10006
T:
F: 212.480.2654

PARKING GARAGE
DESMAN
49 West 37th Street, 5th Floor
New York, NY 10018
Tel:
Fax: 212.779.1654

STRUCTURAL
SEVERUD ASSOCIATES CONSULTING ENGINNERS, PC
469 Seventh Avenue-Suite 900
New York, NY 10018
Tel: 212-986-3700
Fax: 212-687-6467

VERTICAL TRANSPORTATION
VAN DEUSEN & ASSOCIATES
5 Regent Street, Suite 524
Livingston, NJ 07039
Tel: 973-994-9220
Fax: 973-994-2539

PROJECT TITLE:

STATEN ISLAND MALL
ENLARGEMENT

2655 RICHMOND AVENUE
STATEN ISLAND, NY

PROJECT NO.: 51690.00.9/14893

DOB NO.: XXXXX

DRAWING TITLE:

EAST CELLAR FLOOR FOUNDATION PLAN

SCALE: 1/16"=1'-0" PAGE: OF 100

FO-106.00

DOB BSCAN STICKER

SEAL

NOT FOR CONSTRUCTION
ISSUED FOR PRICING ONLY
06/27/2014

APPENDIX B

Citizen Participation Plan

APPENDIX B

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and GGP Staten Island Mall, 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, GGP Staten Island Mall, 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, William Wong, 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 BOA grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

REPOSITORIES: A document repository is maintained online. Internet access to view OER's document repositories is available at public libraries. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including RI plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. The library nearest the Site is:

Todt Hill-Westerleigh Public Library
2550 Victory Boulevard, Staten Island, New York 10314
(718) 494-1642

Sunday – 1:00PM to 5:00PM
Monday, Wednesday and Thursday – 10:00AM to 7:00 PM
Tuesday – 11:00AM to 8:00PM
Friday and Saturday – 10:00AM to 5:00PM

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

ISSUES OF PUBLIC CONCERN: There are no specific issues of concern to stakeholders proximate to the project Site.

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

CITIZEN PARTICIPATION MILESTONES: Public notice and public comment activities occur at several steps during a typical NYC VCP project. These steps include:

- **Public Notice of the availability of the RIR and RAWP and a 30-day public comment period on the RAWP:** 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 RIR and RAWP and the initiation of a 30-day public comment period on the RAWP. 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

APPENDIX C

SUSTAINABILITY STATEMENT

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

REUSE OF CLEAN, RECYCLABLE MATERIALS AND REDUCED CONSUMPTION OF NON-RENEWABLE RESOURCES: Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

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

REDUCED ENERGY CONSUMPTION AND PROMOTION OF GREATER ENERGY EFFICIENCY: Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

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

CONVERSION TO CLEAN FUELS: Use of clean fuel improves NYC's air quality by reducing harmful emissions.

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

RECONTAMINATION CONTROL: Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective

of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

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

STORMWATER RETENTION: Stormwater retention improves water quality by lowering the rate of combined stormwater and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced stormwater retention capability of the redevelopment project will be included in the RAR.

LINKAGE WITH GREEN BUILDING: Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

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

PAPERLESS VOLUNTARY CLEANUP PROGRAM: GGP Staten Island Mall, LLC is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

LOW-ENERGY PROJECT MANAGEMENT PROGRAM: GGP Staten Island, Mall, LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing

and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

TREES AND PLANTINGS: Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.
An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

APPENDIX D

Soil / Materials Management Plan

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

1.2 Stockpile Methods

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

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out, and Departure

The PE/QEP overseeing the remedial action will:

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

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

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

1.5 Off-Site Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are described in the remedial report. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive

sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in New York City under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the final remedial report.

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

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

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be

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

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

1.7 Materials Reuse On-Site

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

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

1.8 Demarcation

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent

material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

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

1.9 Import of Backfill Soil From Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 remedial action projects will not exceed Track 1 SCO's.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYSDEC.

- All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this remedial plan. The final remedial report will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

- All material will be subject to source screening and chemical testing.

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

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;

- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and

- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

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

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City

sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e., a stream or river) is prohibited without a SPDES permit issued by 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 remedial plan (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan for Unknown Contamination Sources

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYSDEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical

analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust, and Nuisance Control

Odor Control

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

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

DUST CONTROL

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

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

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

OTHER NUISANCES

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided during Site clearing and grubbing and during the remedial program, as necessary, to prevent nuisances.

APPENDIX E

Manufacturer Specification for Vapor Barrier

Details to be Provided Later

APPENDIX F

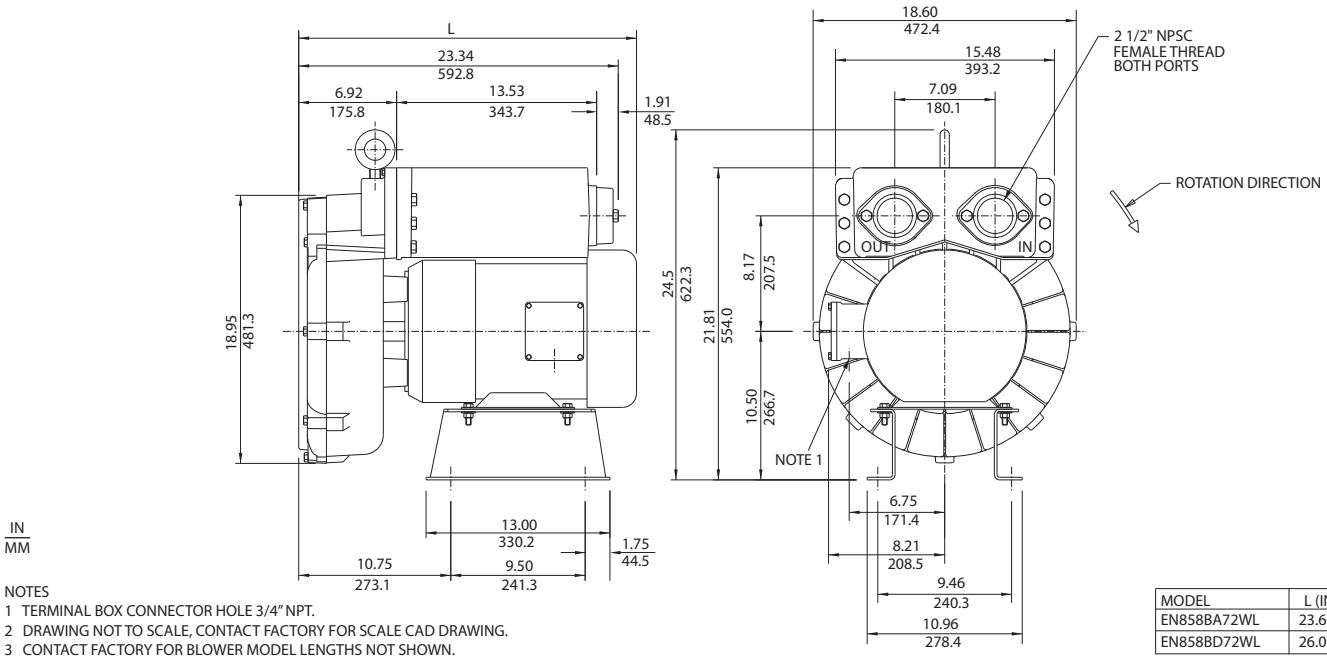
Manufacturer Specification for Blowers

Environmental / Chemical Processing Blowers

EN 858 & CP 858

ROTRON®

7.5 / 10.0 HP Sealed Regenerative w/Explosion-Proof Motor



IN
MM

NOTES
1 TERMINAL BOX CONNECTOR HOLE 3/4" NPT.
2 DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3 CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

MODEL	L (IN/MM)
EN858BA72WL	23.65/600.7
EN858BD72WL	26.00/660.4

		Part/Model Number			
		EN858BD72WL	EN858BD86WL	EN858BA72WL	CP858FZ72WLR
Specification	**Units**	**038744**	**038745**	**080070**	**038980**
Motor Enclosure - Shaft Mtl.	-	10.0	10.0	7.5	10.0
Horsepower	-	Explosion-proof-CS	Explosion-proof-CS	Explosion-proof-CS	Chem XP-SS
Phase - Frequency	-	Three-60 hz	Three-60 hz	Three-60 hz	Three-60 hz
Voltage	AC	230/460	575	230/460	230/460
Motor Nameplate Amps	Amps (A)	24/12	9.6	18.6/9.3	24/12
Max. Blower Amps	Amps (A)	30/15	11.6	26/13	30/15
Inrush Amps	Amps (A)	234/117	93	126/63	234/117
Service Factor	-	2/1	1	1/1	2/1
Starter Size	-	1.0	1.0	1.0	1.0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	338	338	326	338
	Kg	153.3	153.3	147.9	153.3

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply vari… motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

XP Motor Class - Group - See Explosive Atmosphere Classification Chart in Section I

AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477
USA: +1 215-256-6601 - Europe: +44 (0) 845 366 9664 - Asia: +86 21 5763 1258
Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK®
TECHNICAL & INDUSTRIAL PRODUCTS

Environmental / Chemical Processing Blowers

EN 858 & CP 858

ROTRON®

7.5 / 10.0 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 380 SCFM
- Maximum pressure: 120 IWG
- Maximum vacuum: 95 IWG
- Standard motor: 10 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

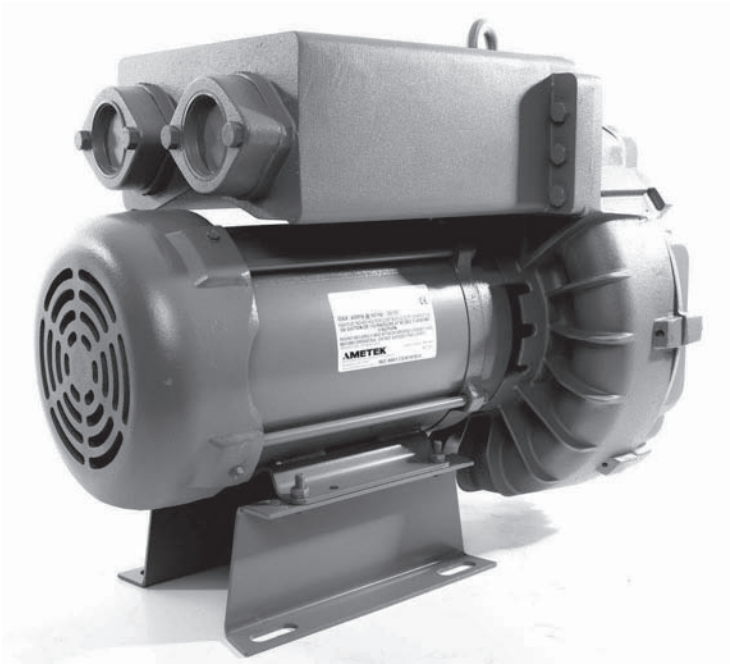
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

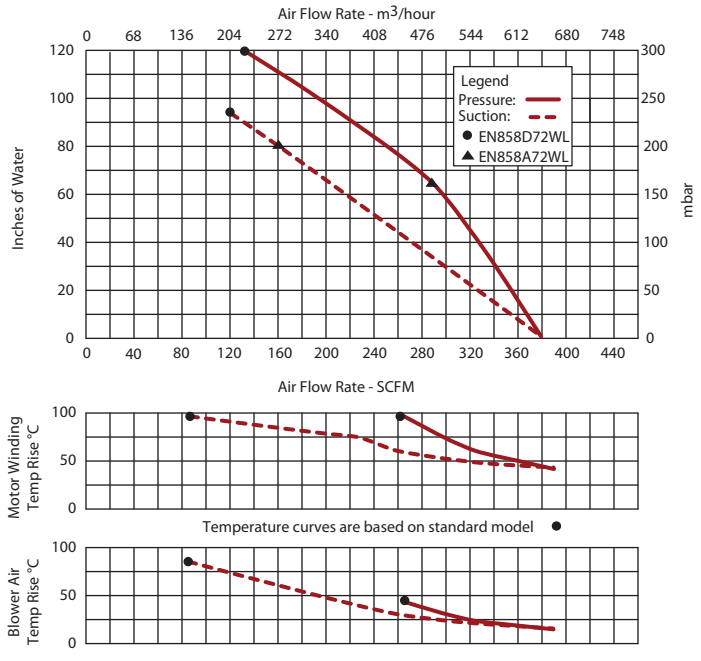
ACCESSORIES

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

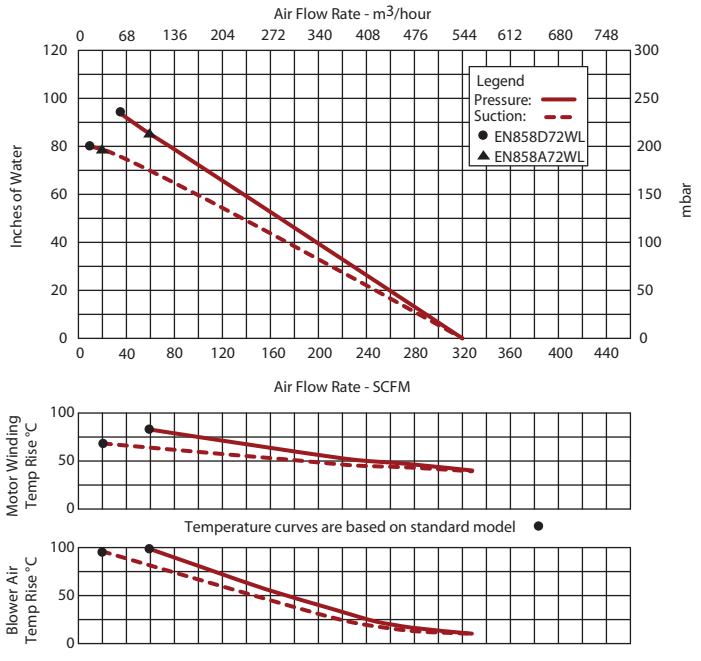


Blower Performance at Standard Conditions

60 Hz



50 Hz



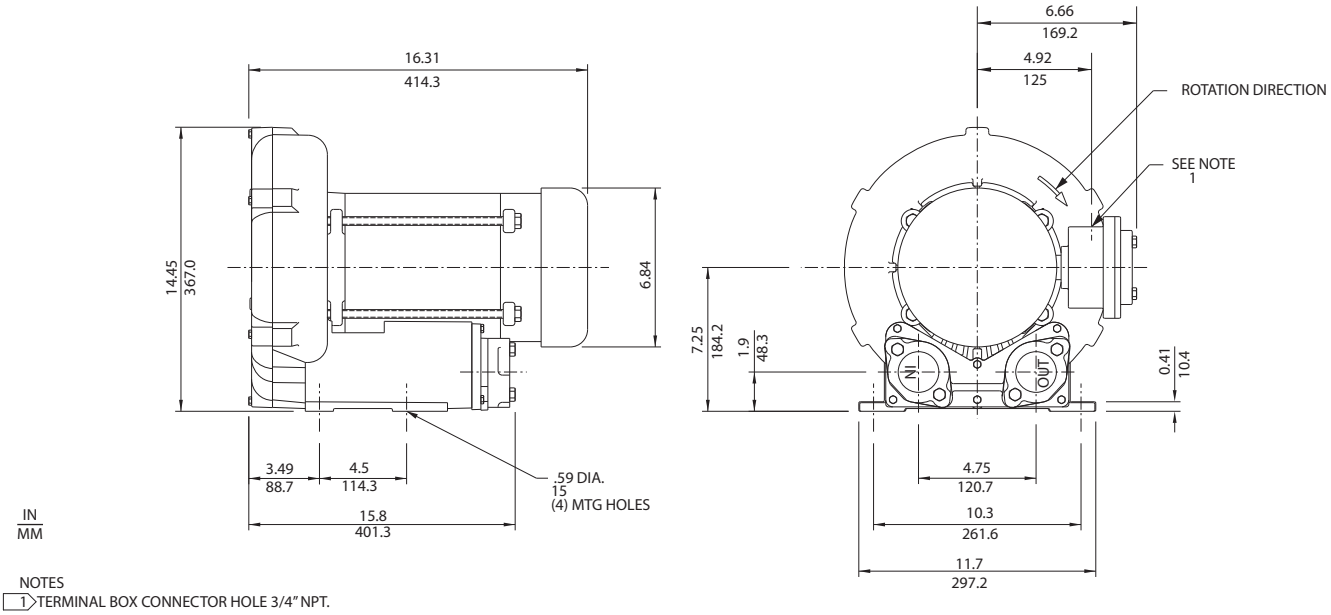
AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477
USA: +1 215-256-6601 - Europe: +44 (0) 845 366 9664 - Asia: +86 21 5763 1258
Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK® TECHNICAL & INDUSTRIAL PRODUCTS

EN 505 & CP 505

ROTRON®

2.0 / 2.5 HP Sealed Regenerative w/Explosion-Proof Motor



NOTES
1. TERMINAL BOX CONNECTOR HOLE 3/4" NPT.
2. DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3. CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

		Part/Model Number			
		EN505AX58ML	EN505AX72ML	CP505FS58MLR	CP505FS72MLR
Specification	Units	038177	038178	080655	038962
Motor Enclosure - Shaft Mtl.	-	2.0	2.0	2.0	2.0
Horsepower	-	Explosion-proof-CS	Explosion-proof-CS	Chem XP-SS	Chem XP-SS
Phase - Frequency	-	Single-60 hz	Three-60 hz	Single-60 hz	Three-60 hz
Voltage	AC	115/230	230/460	115/230	230/460
Motor Nameplate Amps	Amps (A)	22/11	5.8/2.9	22/11	5.8/2.9
Max. Blower Amps	Amps (A)	24/12	6.4/3.2	24/12	6.4/3.2
Inrush Amps	Amps (A)	112/56	56/28	112/56	56/28
Service Factor	-	1/0	0/0	1/0	0/0
Starter Size	-	1.0	1.0	1.0	1.0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	92	84	92	84
	Kg	41.7	38.1	41.7	38.1

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

XP Motor Class - Group - See Explosive Atmosphere Classification Chart in Section I

AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477
USA: +1 215-256-6601 - Europe: +44 (0) 845 366 9664 - Asia: +86 21 5763 1258
Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK® TECHNICAL & INDUSTRIAL PRODUCTS

Environmental / Chemical Processing Blowers

EN 505 & CP 505

ROTRON®

2.0 / 2.5 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 150 SCFM
- Maximum pressure: 75 IWG
- Maximum vacuum: 70 IWG
- Standard motor: 2.0 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

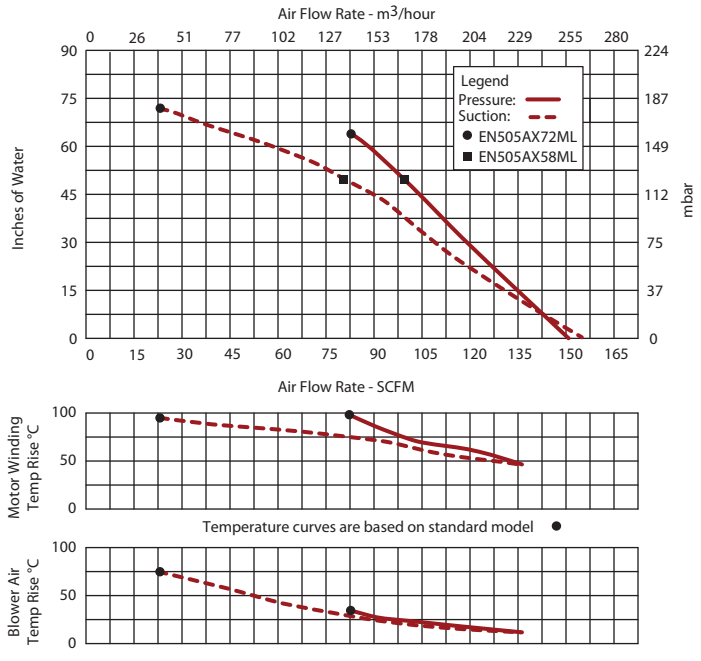
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

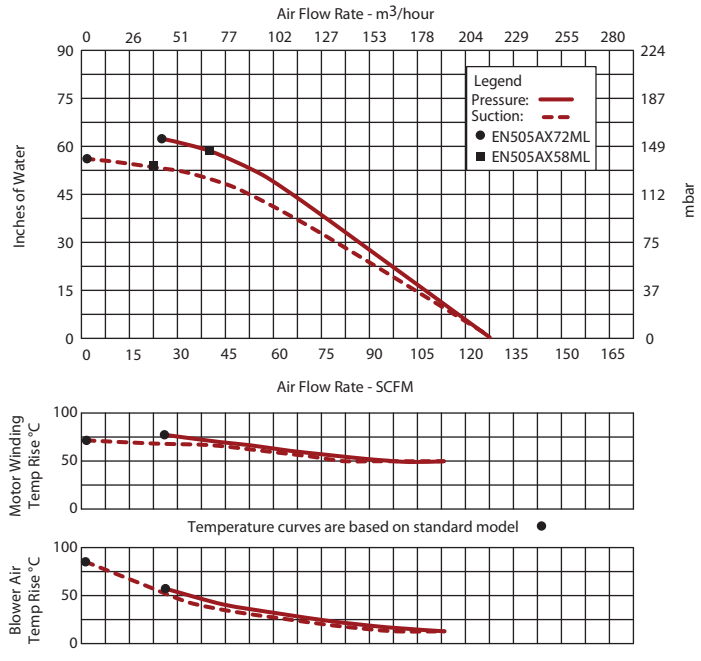
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477
USA: +1 215-256-6601 - Europe: +44 (0) 845 366 9664 - Asia: +86 21 5763 1258
Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK®
TECHNICAL & INDUSTRIAL PRODUCTS

APPENDIX G

Construction Health and Safety Plan

October 31, 2014

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Staten Island Mall Expansion Site
2655 Richmond Avenue
Staten Island, New York

Prepared for

GENERAL GROWTH PROPERTIES, INC.
10440 Little Patuxent Parkway, Suite 1000
Columbia, Maryland 21044

ROUX ASSOCIATES, INC.

Environmental Consulting & Management

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

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE

FIGURES

APPENDICES

1.0 INTRODUCTION

Roux Associates, Inc. prepared this site-specific Health and Safety Plan (HASP) in accordance with the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Operation and Emergency Response Standard (29 CFR 1910.120 and 1926.65) and other OSHA requirements for job safety and health protection (Appendix A), and our Standard Operating Procedures. In addition, various guidance documents were also consulted in preparing this HASP including the National Institute for Occupational Safety and Health's (NIOSH's) *Occupation Safety and Health Guidance Manual for Hazardous Waste Site Activities.* The HASP addresses health and safety issues associated with Roux Associates, Inc. conducting and managing investigative and/or remediation activities at the properties located at 2655 Richmond Avenue, Borough of Richmond, City and State of New York (Site). This HASP will be implemented by the designated Site Health and Safety Officer (SHSO) during site work. The HASP attempts to identify all potential hazards at the site; however, site conditions are dynamic and new hazards may appear constantly. Personnel must remain alert to existing and potential hazards as site conditions change and protect themselves accordingly.

Compliance with this HASP is required for Roux Associates, Inc. personnel who enter this site. Assistance in implementing this HASP can be obtained from the Roux Associates, Inc. Office Health and Safety Manager (OHSM). The content of this HASP may undergo revision based upon additional information made available. Any changes proposed must be reviewed and approved by the Roux Associates, Inc. OHSM or his designee and documented on the HASP Amendment Form included as Appendix B. Following are key personnel involved with this project.

Responsibility	Name	Telephone Number	Cell Phones
Project Principal	Sin Senh	(631) 232-2600	(516) 523-0291
Project Manager	Frank Cherena	(631) 232-2600	(631) 445-0357
Site Health and Safety Officer	David Bligh	(631) 232-2600	(631) 379-2281
Office Health and Safety Manager	Ray Fitzpatrick	(631) 232-2600	(631) 484-1168

1.1 Scope of Work

The scope of work will involve Roux Associates, Inc. subcontracting drilling companies, disposal companies, utility locating companies, land surveying companies, and/or analytical testing laboratories for the purpose of investigating environmental conditions at the Site. Roux Associates, Inc. will complete some combination, or all, of the scope of work detailed below:

- Initial site inspections;
- Oversight of utility mark-out activities and ground penetrating radar, if warranted;
- Media (e.g., soil, sediment, soil vapor, air, and groundwater) delineation/sampling activities;
- Oversight of soil boring/monitoring well installation and abandonment activities;
- Groundwater monitoring;
- Oversight of land surveying activities; and
- Disposal activities

Roux Associates, Inc. will contract the drilling company to request a utility mark-out through the state One-Call System at least 4 days prior to the scheduled drilling event. If this mark-out is not sufficient to identify the utilities in the area where drilling activities are to occur, Roux Associates, Inc. will contract and oversee an independent utility mark-out service company to identify potential underground utilities in the area of concern.

Roux Associates, Inc. will contract and oversee a licensed drilling company during Site investigation to perform soil borings and install monitoring wells and soil vapor points. These activities will be completed as part of the monitoring, sampling, and remediation process as required by regulatory agencies at the Site. In most cases, the driller will use a track or truck-mounted drilling rig to conduct these drilling activities.

Roux Associates, Inc. will contract a licensed company to load, transport, and dispose of waste materials at approved disposal facilities. Roux Associates will oversee the loading and check all paperwork for completeness. Roux Associates, Inc. personnel will NEVER sign any disposal and

transportation documentation; the insured or insurance carrier will be responsible for signing all disposal and transportation paperwork.

Roux Associates, Inc. will conduct groundwater monitoring, sampling, and remediation activities as required. Roux Associates, Inc. will conduct these activities using Roux Associates, Inc.-owned or vendor-rented field equipment.

Roux Associates, Inc. will contract and oversee land surveying services.

Job Safety Analysis (JSA) forms for each task are provided in Appendix C.

1.2 Emergency Contacts

Type	Name	Telephone Numbers
Police	New York Police Department 121st Precinct 970 Richmond Avenue, Staten Island, New York	911
Fire	FDNY	911
Hospital	Staten Island University Hospital South	(718) 226-2000
State Poison Control Centers	New York	(800) 222-1222
Emergency Response	NYPD/FDNY	911
Ambulance	NYPD/FDNY	911
Police Non-Emergency	NYPD 121st Precinct	(718) 697-8700
Fire Department Non-Emergency	NYFD	(718) 999-2000

ENVIRONMENTAL EMERGENCY
(e.g., release or spill)

Type	Name	Telephone Numbers	Cell Numbers
Project Principal	Sin Senh	(631) 232-2600	(516) 523-0291
Project Manager	Frank Cherena	(631) 232-2600	(631) 445-0357
Office Health and Safety Manager	Ray Fitzpatrick	(631) 232-2600	(631) 484-1168
Site Health and Safety Officer	David Bligh	(631) 232-2600	(631) 379-2281
National Response Center		(800) 424-8802	
Client Contact			
General Growth Properties	Kelly Webb	(410) 992-6581	

Note: All Roux Associates, Inc. site personnel will be equipped with mobile phones.

(Additional emergency information is provided in Section 13.0).

2.0 HEALTH AND SAFETY PERSONNEL RESPONSIBILITIES

2.1 Office Health and Safety Manager

The Office Health and Safety Manager (OHSM) serves in assuring that the policies and procedures of the HASP are implemented by the SHSO. The OHSM provides guidance regarding the appropriate monitoring and safety equipment and other resources necessary in implementing the HASP. The OHSM verifies that all Roux Associates, Inc. personnel designated to work onsite are qualified according to applicable EPA, OSHA, and state requirements.

2.2 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) will be on-site during intrusive field operations. On a site-specific basis, routine activities such as groundwater sampling and gauging may be performed when the SHSO is not on-site. The SHSO is responsible for health and safety activities and has the authority to make related decisions. The determination of hazard levels will be made by the SHSO. The SHSO has stop-work authorization that he or she will execute upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation, such as detrimental weather conditions. Authorization to proceed with work will be issued by the OHSM in consultation with the Project Principal (PP) or his/her designee (e.g., Project Manager [PM]). The SHSO or PP will contact emergency facilities and personnel when appropriate. Alternate SHSOs may be designated by the SHSO, if required, but must be pre-qualified and approved by the OHSM. The SHSO is responsible for verifying that a duplicate office copy of this HASP is placed in the central project files.

2.3 Project Principal

The Project Principal is responsible for defining the overall project objectives (field and office related activities) determining chain-of-command, evaluating program outcome and serves as final technical review of deliverables. For Roux Associates, Inc., the Project Principal is ultimately responsible for overall site activities including health and safety issues. The day-to-day management of health and safety issues is the responsibility of the Project Manager. The SHSO, OHSM, Project Manager, and Project Principal shall consult and make an agreeable determination should site information or unforeseen circumstances indicate a change in field procedures may be warranted. Changes to the HASP must be made by formal addendum and be approved by the

Project Principal, Project Manager, OHSM, and SHSO. The Project Principal is responsible for verifying that all required signatures are in place prior to implementing field work.

2.4 Project Manager

The Project Manager is responsible for day-to-day activities associated with his/her project including health and safety. Because there may be more than one Project Manager for a site (for example, a Remedial Project Manager and a Site Investigation Project Manager), each Project Manager must verify that the HASP addresses the hazards associated with each phase of the project and is appropriate for the current specified scope of work.

2.5 Field Crew Personnel

All field crew personnel are responsible for reporting unsafe or hazardous conditions to the SHSO. All field personnel (including the above listed personnel) are responsible for understanding and complying with this HASP.

3.0 SITE HISTORY AND PHYSICAL DESCRIPTION

Location

The Site is located at 2655 Richmond Avenue, Staten Island, New York. The Site is comprised of the parking lots surrounding the Staten Island Mall, Tax Block 2400, Lot 180.

Description and History of Site

The Site is comprised of four separate parcels located within the parking lots the Staten Island Mall. The footprint of the combined parcels is 401,823 square feet. The Site's current use is as a parking lot for patrons of the Staten Island Mall. The Site has been used a parking lot since the construction of the mall in the 1970s. Prior to the 1960s the site was used as the Richmond County Airport.

4.0 SITE-RELATED INCIDENTS, COMPLAINTS AND ACTIONS

There are no known site related incidents, complaints or actions identified at this time.

5.0 WASTE DESCRIPTION AND CHARACTERIZATION

Wastes may be encountered or generated during site activities. These wastes are anticipated to be characterized as follows:

- Waste Types

Liquid	☒	Solid	☒	Gas	☒
Sludge	☐	Semi-Solid	☐	Other (describe):	_____

- Waste Characteristics

Corrosive	☒	Toxic	☐	Ignitable	☐
Volatile	☒	Carcinogen	☐	Radioactive	☐
Reactive	☐	Other (describe):	Corrosive with respect to HCl preservative in sample bottleware		

For purposes of this HASP, toxic chemicals are those materials as defined by OSHA in 29 CFR 1910.1200 (Appendix A). In general, toxicity is defined by OSHA on the basis of median lethal dose (LD_{50}) or median lethal concentration (LC_{50}) based upon the effects of the chemical in laboratory studies with animals. A chemical is considered a carcinogen, as defined by OSHA in 29 CFR 1910.1200 (Appendix A), if "(a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or (b) It is listed as a carcinogen or a potential carcinogen in the *Annual Report on Carcinogens* published by the National Toxicology Program (NTP) (latest edition); or (c) It is regulated by OSHA as a carcinogen."

- Waste Containment

Pond	☐	Process Vessel	☐	Tank	☐
Lagoon	☐	Piping	☐	Lab	☐
Lake	☐	Drum	☒	Other (describe):	_____
Tank Car	☐	Soil Stockpile	☐	Describe:	_____

- See Table 1 entitled "Site-Specific Hazards – Toxicological, Physical, and Chemical Properties of Compounds" which addresses exposure limits, routes of exposure, toxic properties, target organs, carcinogenicity, and physical and chemical properties.

6.0 HAZARD ASSESSMENT

- Chemical Hazards

  — The toxicological, physical, and chemical properties of potential contaminants are presented in Table 1. The compound listed in Table 1 may pose a potential exposure hazard through inhalation, skin absorption, ingestion or a combination of these routes. These exposures will be further controlled through the use of personal protective equipment (PPE), designated action levels based upon on-site air monitoring, and the assignment of experienced field personnel. Chemical hazards are unknown but may include the following petroleum-related compounds: Benzene, Toluene, Ethylbenzene, Xylenes, Diesel Fuel (No.2), Fuel Oil, Gasoline, Kerosene, Slop Oil, Petroleum Hydrocarbons, Mercury Vapor, Lead, and Chromium (VI).

  Chemical hazards will be monitored with the following instrument:

  - Photoionization Detector (PID)

  Action levels for level of protection upgrades are discussed in Section 8.2.1.

- Ambient Air Hazards

  — Potential exposure to impacted airborne particulates.

  — Potential exposure to organic vapors.

  — All personnel will remain up-wind as the task allows.

- Heat/Cold Stress and Sun Exposure

  — Heat and cold stress associated with seasonal temperatures in the Northeast US. Heat stress and cold stress symptoms, prevention, and treatment are described in Appendix D. Protection against sun exposure by wearing a sun screen, hat, and long-sleeved shirts must be implemented when warranted.

- Noise

  — Noise, associated with close proximity to operating heavy equipment, power tools, pumps, and generators. Personnel with 8-hour time weighted average (TWA) exposures exceeding 85 dBA must be included in a hearing conservation program in accordance with 29 CFR 1910.95. High noise operations will be evaluated by the SHSO. Noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs or by maintaining set-backs from high noise equipment as warranted.

- General Safety Hazards

  — Heavy equipment and motor vehicle traffic. Workers shall wear fluorescent vests or high visibility outerwear in high traffic areas and utilize traffic cones, barricades and caution tape to protect work areas, as necessary.

— Slip, trip, fall hazards associated with uneven terrain, obstacles, and slippery or icy surfaces. General housekeeping will be performed to reduce slip, trip and fall hazards.

— Sharp edges, broken glass, exposed nails, rusty metal (wear cut-resistant gloves).

— Pinch points.

— Overhead hazards (wear hard hats as applicable).

— Flying objects and airborne particulate hazards. Wear safety glasses, goggles, or face shields when appropriate.

- Electrical Hazards

  — Portable pumps, generators, and other power tools require proper grounding and/or a ground fault circuit interrupter (GFCI) before operation. Personnel should never attempt to move an operating pump or generator.

  — Overhead and underground utility lines.

- Biological Hazards

  — Biological hazards include the possibility of snake bites, potentially rabid stray or wild animal bites, ticks, or other insect bites and bee and wasp stings. Ticks may carry Lyme disease and/or Rocky Mountain spotted fever. Personnel shall examine themselves for ticks. Insecticides containing DEET may be an effective tick repellent. Personnel allergic to bee and/or wasp stings shall provide medicine and antidotes to treat allergic reactions as prescribed by their personal physician and alert co-workers and the PM of their sensitivity.

  — Other biological hazards include poison ivy, poison oak, and poison sumac. If exposed to these plants, wash skin thoroughly with soap and water.

7.0 TRAINING REQUIREMENTS

7.1 Basic Training

Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety trained prior to performing work onsite per OSHA 29 CFR 1910.120(e). Training records will be maintained by the on-site SHSO and as described in Section 7.2.

7.2 Site-Specific Training

Training will be provided by the SHSO that will specifically address the activities, procedures, monitoring, and equipment for the site operations to site personnel and visitors. The training will include site and facility layout, hazards, emergency services at the site, and will detail provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Site-specific training will be documented as part of the project records. In addition, any facility health and safety requirements will be followed.

7.3 Safety Briefings

Project personnel will be given briefings by the SHSO on an as-needed basis to further assist them in conducting their activities safely. Safety briefings will be provided at least before the start of work each day and whenever new operations are to be conducted, changes in work practices must be implemented due to new information made available, and before work is begun at each project site. Records of safety briefings will be part of the project records.

7.4 Record Keeping Requirements

Record keeping requirements mandated by OSHA 29 CFR 1910.120 will be strictly followed. Specifically, all personnel training records, accident reporting forms (Appendix D), and medical examination records will be maintained by Roux Associates, Inc. for a period of at least 30 years after the employment termination date of each employee. The SHSO will maintain a daily written log of health and safety monitoring activities and monitoring results will become part of the project records.

8.0 ZONES, PROTECTION AND COMMUNICATIONS

8.1 Site Zones

The level of protection for completion of the scope of work is Level D. Should the level of protection worn by field personnel need to be upgraded to Level C, Roux Associates, Inc. will cease all field activities, evaluate the hazards appropriately, and employ a three-zone approach to site operations to control the potential spread of contamination. If a three-zone approach needs to be implemented, these zones will be restricted to Roux Associates, Inc. personnel and OSHA-trained subcontractors of Roux Associates, Inc. Site occupants, insured, homeowner, or insurance carrier personnel will be requested to view the investigative and/or remediation activities from beyond the Support Zone. Level D operation will not generally require segregated zones. Note, Roux Associates, Inc. does not perform work in Levels A or B. The three zones to be employed when Level C is in use include:

- The Exclusion Zone;
- The Contamination Reduction Zone; and
- The Support Zone.

8.1.1 Exclusion Zone

The area(s) which contain or are suspected to contain hazardous materials will be considered the Exclusion Zone. This zone will be clearly delineated by a "Hotline." The "Hotline" is a length of colored flag tape completely surrounding the Exclusion Zone. The SHSO may establish more than one restricted area within the Exclusion Zone when different levels of protection may be used or various hazards exist. Personnel are not allowed in the Exclusion Zone without the following:

- A buddy;
- Appropriate personal protective equipment;
- Medical authorization;
- A need to be in the Zone; and
- Training certification.

For purposes of this project, the Exclusion Zone will typically include all areas inside of a 10-foot radius of the release area, subject to site conditions, including proximity of structures and property boundary.

8.1.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is established between the Exclusion Zone and the Support Zone. The CRZ will contain the Contamination Reduction Corridor (CRC) and will provide for full personnel and portable equipment decontamination. The CRZ is used for general site entry and egress in addition to access for heavy equipment for investigation activities. The CRZ will also contain safety and emergency equipment (see Section 8.2.3). No personnel are allowed in the Contamination Reduction Zone without:

- A buddy;
- The proper personal protective equipment;
- Medical authorization;
- A need to be in the Zone; and
- Training certification.

For purposes of this project, the CRZ will typically include all areas outside the exclusion zone to 20 feet away from the release area, subject to site conditions, including proximity of structures and property boundary.

8.1.3 Support Zone

The Support Zone is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line." The "Contamination Control Line" will be a different colored flag tape than the "Hotline." The Support Zone will contain the support facility, which will provide for team communications and emergency response. At least one person will remain in the Support Zone at all times during operations downrange to facilitate communications and emergency response. Appropriate sanitary facilities and safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The support facility will be located upwind of site operations, if possible, and may be used as a potential evacuation point. No potentially contaminated

personnel or materials are allowed in this zone except appropriately packaged/ decontaminated and labeled samples and drummed wastes.

For purposes of this project, the Support Zone will include all areas outside of the CRZ.

8.2 Personal Protection

8.2.1 General

Appropriate personal protective equipment (PPE) shall be worn by site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, noise) and as otherwise directed by the SHSO. The level of personal protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

Roux Associates, Inc. maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit, and inspection. PPE to be used at the site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for PPE.

- Head Protection — 29 CFR 1910.132
- Eye and Face Protection — 29 CFR 1910.133
- Respiratory Protection — 29 CFR 1910.134
- Hand Protection — 29 CFR 1910.138
- Foot Protection — 29 CFR 1910.136
- Protective Clothing — Not specifically regulated

The level of protection to be worn by field personnel will be defined and controlled by the SHSO in conjunction with the Project Principal or his/her designee. Where more than one hazard is indicated, further definition will be provided by review of site hazards, conditions, and operational requirements and by monitoring at the particular operation being conducted. Any upgrades or downgrades must be immediately communicated to the Project Principal or his/her designee.

Protection may be upgraded or downgraded by the SHSO in conjunction with the Project Principal on the basis of action levels presented below:

Task	Level of Protection
Initial site inspection	Level D
Media delineation/sampling activities	Level D
Monitoring well installation and abandonment activities	Level D
Contractor oversight activities	Level D

Action Levels for Respiratory Protection (Total Organic Vapors)	
Total Organic Vapors in Breathing Zone (ppm)[(1)]	**Action**
≤ 5	No Action
> 5 – < 25	Cease Field Operations
≥ 25	Cease Field Operations

[(1)] Based on relative response (sensitivity of PID to total organic vapors).

PID Action Levels

If photoionization detector measurements are above five ppm-v but below 25 ppm-v above background for five minutes in the breathing zone, employee protection will be upgraded to Level C with the use of a full-face respirator.

If photoionization detector measurements exceed 25 ppm-v above background for five minutes in the breathing zone, work activities will cease until airborne vapor levels can be reduced to less than 25 ppm-v and are quantified or the SHSO determines alternate methods to be followed in order to proceed.

Most activities are conducted outdoors, where breathing of high vapor levels are not likely in aboveground areas. Excavations which are not to be entered are likely to have higher vapor concentrations. Where a spill occurs in a basement or other indoor area, ventilation will not be as good as outdoors and extra care shall be taken in monitoring vapor levels.

8.2.2 Respiratory Protection and Clothing

The type of respiratory protection and clothing to be worn in each level of protection indicated above includes the following:

Level D
Coveralls (as appropriate)
Boots/shoes – chemical resistant with steel toes and shanks
Safety glasses
Hard hat*
Gloves
Hearing protection (as required)

Level C
Full-face, air-purifying, HEPA cartridge-equipped respirator (MSHA/NIOSH specifically approved for protection from organic vapors and particulates per OSHA 1910.1028)
Chemical-resistant clothing (coverall; hooded, two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls)
Gloves (outer), chemical-resistant – latex
Gloves (inner), chemical-resistant – nitrile
Boots (inner), chemical-resistant, steel toe and shank
Boots (outer), chemical-resistant (disposable)
Hard hat*
Hearing protection (as required)

* Hard hat is not required where there is no overhead hazard unless required by the client and if approved by the SHSO.

8.2.3 Safety Equipment

Basic emergency and first-aid equipment will be available at the work site, as appropriate. This may include HASP-specified communications, first-aid kit, emergency eyewash, or emergency shower or drench system, fire extinguisher, and other safety-related equipment.

Other safety equipment will be located at the site of specific operations, e.g., drilling, as appropriate. Traffic cones, barricades, and traffic vests or high visibility outerwear will be used when work is required in high traffic areas.

8.3 Communications

Telephones – for communication with emergency support services/facilities. All Roux Associates, Inc. site personnel will be equipped with a mobile phone.

9.0 MONITORING PROCEDURES FOR SITE OPERATIONS

9.1 Monitoring During Site Operations

The SHSO will monitor wind direction and approximate temperature during all invasive site activities and record the data in a log book. An air monitoring program is important to the safety of on-site and off-site personnel. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of site work. This survey will be conducted with the appropriate air monitoring instrument(s) as warranted by the field activity. Once this survey has been complete, any change in the type of personal protective equipment will be determined.

Air monitoring may be performed to verify that the proper level of equipment is used and to determine if increased protection or work stoppage is required. A PID may be used by Roux Associates, Inc. on-site to monitor conditions.

Section 8.0 lists the acceptable ranges for each piece of monitoring equipment and the action levels for changes in respiratory protection. Monitoring equipment will be calibrated in accordance with the manufacturer's specifications. Air monitoring during non-invasive site activities will be performed as appropriate as specified in Section 8.2.1. All air monitoring results will become part of the project records.

9.2 Personnel Monitoring Procedures

Personal breathing zone samples, 8-hour, time-weighted average (TWA) sampling, may be conducted if sustained operations in Level C are required and if the sampling is authorized by and under the direct supervision of the Corporate Health and Safety Manager (CHSM). The personal breathing zone samples will be collected according to NIOSH analytical methods and analyzed by an American Industrial Hygiene Association-accredited laboratory.

9.3 Medical Surveillance Requirements

Medical surveillance specifies any special medical monitoring and examination requirements as well as stipulates that all Roux Associates, Inc. personnel and subcontractors are required to pass

the medical surveillance examination or equivalent for hazardous waste work required by 29 CFR 1910.120. As a minimum, the examination will include:

- Complete medical and work histories
- Urinalysis
- Physical Exam
- Vision and Hearing Exam
- Blood Chemistry
- Pulmonary Function Test
- Audiometry

The examination will be annual, at a minimum, and upon termination of employment. Additional medical testing may be required by the OHSM in consultation with the CHSM, company physician and the SHSO if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance.

10.0 SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.1 General

Field sampling will be performed under the level of personal protection described in Section 8.0. In this section, non-monitoring safety-related procedures are described.

10.2 Site Walk-Throughs

Safety considerations during site walk-throughs precede all other field operations. The field team will maintain line of sight with each other at all times and regularly maintain communications with the Support Zone. Air monitoring will be performed as indicated in Section 9.0 and will be used to alert the walk-through team if a dangerous situation exists. Air monitoring will assist in prescribing levels of protection for future site operations, designating site layout, and identifying hazard areas, if any.

10.3 Heavy Equipment and Drill Rig Safety

The SHSO will be present on site during invasive operations such as excavation and drilling and will provide health and safety monitoring to verify that appropriate levels of protection and safety procedures are followed by Roux Associates, Inc. personnel. The proximity of chemical, water, sewer, and electrical lines will be identified by a utility mark-out service before any subsurface activity or sampling is attempted. The SHSO and Project Manager shall confirm that the utility mark-out service has been notified at least 72 hours prior to earth disturbing activities and that the mark-out was performed.

Hazardous waste sites use all of the mechanical equipment used on any major construction site. Typical machinery to be found includes pumps, compressors, generators, portable lighting systems, pneumatic tools (drum openers), hydraulic drum crushers, pug mills, forklifts, trucks, dozers, backhoes, and drill rigs. The equipment poses a serious hazard if not operated properly or if personnel near machinery cannot be seen by operators.

Drilling crews are confronted with all of these heavy equipment hazards. They must be responsible for good housekeeping around the rig because of the rods, auger sections, rope, and hand tools used for the operation. Maintenance is a constant requirement. Overhead and buried utilities require special precautions because of electrical and natural gas hazards. Electrical storms

may seek out a standing derrick. The hoist or cathead rope poses specific hazards; always use clean, dry, sound rope. Keep hands away from the test hammer. Hearing loss, while not an immediate danger, is considerable over time. Use hearing protection.

Proper containment and disposal practices will be followed in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP. The use of hard hats, eye protection, ear protection, and steel-toed boots will be required during heavy equipment operations. Contaminated equipment will be placed on liner material when not in use, or when awaiting and during decontamination. Communications with the Support Zone will be regularly maintained.

10.4 Sampling

Personnel must wear prescribed clothing, especially eye protection and chemical and cut-resistant gloves when sampling (for protection from chemical preservatives and sharp edges/broken glass). Sample bottles may be bagged prior to sampling to ease decontamination procedures. The sampling team must be aware of emergency evacuation procedures described in this HASP and the location of emergency equipment, including spill containment materials, prior to sampling. Contamination avoidance will be practiced at all times. In some situations, additional monitoring by the SHSO may be needed to confirm or establish the proper level of protection before the sampling team can proceed.

10.5 Sample Handling

Personnel responsible for the handling of samples will wear the level of protection described in Section 8.0. Samples will be identified as to their hazard and packaged to prevent spillage or breakage. Any unusual sample conditions will be noted. Lab personnel will be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or inclusion of a written statement with the samples. It may be necessary for the SHSO to review safety procedures in handling site samples to assist or assure that these practices are appropriate for the type of suspected contaminants in the sample.

10.6 Waste Disposal

Waste disposal operations will be monitored by the SHSO and performed under the appropriate level of personal protection described in Section 8.0. Personnel will wear the prescribed clothing, especially eye protection and chemical resistant gloves, when handling or drumming waste materials. Contamination avoidance will be practiced at all times. Also see Section 12.0.

10.7 Heavy Equipment Decontamination

A steam cleaner or pressure washer could be used to decontaminate the drilling equipment. Personnel will exercise caution when using a steam cleaner. The high pressure steam can cause severe burns. Protective gloves, face shields, hard hats, steel-toed boots, and Tyvek suits or rain gear may need to be worn when using steam cleaners.

10.8 Confined Space Entry

The scope of work does not require Roux Associates, Inc. personnel to enter confined space for this project. Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and CHSM. No Roux personnel are permitted to make a confined space entry. Confined space is defined as any space, depression, or enclosure that has limited opening for entry and egress, may have limited ventilation, may contain or produce life-threatening atmospheres due to oxygen deficiency, the presence of toxic, flammable, or corrosive contaminants, and which is not intended for continuous occupancy.

Examples of confined spaces prohibited from entry include, but are not limited to, storage tanks, ventilation and exhaust ducts, stacks, pits, basements, silos, vats, vaults, pipes and any topped open space 4 or more feet deep and not adequately ventilated.

10.9 Control of Hazardous Energy (LockOut/Tagout)

Hazardous energy at the site will be controlled through the use of a lockout/tagout procedure developed in accordance with OSHA's lockout/tagout standard (29 CFR 1910.147). The purpose of lockout/tagout procedures is to minimize exposures to hazards from the unexpected energizing, startup or release of residual or stored energy from equipment, machinery, or processes. Lockout/tagout procedures will be followed during the installation, servicing, and maintenance of machines or equipment that involve hazardous energy sources. Hazardous energy sources include

any electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy source that is capable of causing injury to personnel.

Lockout/tagout procedures require the placement of a lock and/or tag on an energy isolating device (a device that physically prevents the transmission or release of energy such as manually operated electrical circuit breakers, disconnect switches, valves and selector switches). After the energy isolation device is placed in the "off" or "safe" position, the lockout/tagout is placed on the energy isolation device to secure it in the "off" or "safe" position. This verifies that the equipment, machinery, or process is not capable of being operated while; installation, servicing, or maintenance is taking place.

If it is determined that lockout/tagout procedures are required for any aspect of site work, the following generic lockout/tagout procedures will be implemented. Note, these procedures will be tailored to the specific application of a lockout/tagout if there is a need for same. Presently, there are no known situations that would require the application of lockout/tagout procedures at this site.

1. Affected personnel and authorized personnel will receive lockout/tagout orientation training to become familiar with procedures to control hazardous energy. Affected personnel is defined as personnel whose job requires that they operate or use equipment, machinery or processes on which servicing or maintenance is being performed under lockout/tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed. Authorized personnel is defined as a qualified person to whom authority and responsibility to perform a specific lockout and/or tagout assignment has been given by the employer.

2. Before proceeding with the installation, maintenance or servicing of any equipment, machinery, or process at the site for which lockout/tagout procedures apply, a survey will be made to locate and identify associated energy isolation devices.

3. Once the survey is complete, the authorized personnel will notify all affected personnel, including the SHSO that a shutdown of the equipment or machine will occur.

4. Following notification, the equipment, or machine, if operating will be shut down by normal stopping procedure (i.e., depress stop button, open toggle switch, turn light switch off, etc.).

5. Once turned off, the energy isolating device (i.e., circuit breaker, disconnect switch, valve, etc.) will be operated in such a manner that the machine or equipment will be isolated from the energy source (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, etc.).

6. The energy isolating device is then "locked out" by applying the lockout, padlock, and tag to the device. In some cases, a chain must be used (in combination with a padlock) to sufficiently "lockout" a device (i.e., steam valve, hydraulic valve, etc.).

7. The tag will be filled out by the authorized personnel indicating the personnel's name and the date and time of the lockout.

8. Once the energy isolating device has been locked out and tagged, all potentially hazardous sources or residual energy will be purged or dissipated (i.e., grounding, bleeding, venting, lowering, etc.).

9. After verifying that no personnel are exposed, the authorized personnel will operate (i.e., "try") the normal operating controls to make certain the equipment will not restart. There operating controls must be returned to the "off" or "neutral" position after the test.

10. Use a volt meter to make sure that work is not energized, if applicable.

11. Attach a "ground stick" of sufficient size to handle any possible fault current to all three phases of the source, if applicable.

12. Maintenance or servicing of the machine or equipment can now be performed.

13. When the maintenance and/or service is completed, the work area is to be inspected to verify that all affected personnel are safely positioned and/or removed. In addition, remove all nonessential items from the equipment.

14. The lockout, padlock, and tag shall then be removed from the energy isolating device by the authorized personnel who applied the lockout devices.

15. Each and every personnel involved with the service or maintenance of the locked out equipment will place their assigned padlock and tag to each and every lockout device and/or chain in such manner that if every other padlock were removed, the personnel would still have a padlock assuring that each and every source of energy is still "locked out." No personnel may affix the personal lockout/tagout device of another personnel.

16. If work on a piece of equipment of machinery that is locked out carries over to the next shift, the authorized personnel may remove their lockout device, provided that the next authorized personnel applies their lockout device at the same time the previous authorized personnel removes their lockout device.

10.10 Hazard Communication

Personnel working at this site have the right to know about the chemical hazards associated with hazardous materials used and stored onsite. This information will be readily available to all site workers as required by OSHA's Hazard Communication Standard (29 CFR 1910.1200). This information will be communicated to personnel through the maintenance of a chemical

inventory system, chemical labeling, material safety data sheets (MSDSs) (Appendix E), hazard communication training, and a written hazard communication program.

Chemicals imported to the site will bear the original Department of Transportation (DOT) required labeling on the chemical's container. In addition, a new label will be affixed to the original container, if necessary, and to a new container to which the chemical is dispensed providing the chemical name and specific hazard warnings (e.g., flammability, health, reactivity). Hazard warnings will follow either the National Fire Protection Association (NFPA) format or the Hazardous Material Information System (HMIS) format. Both systems are easy to use and rely on numerically ranking hazards on a 0 to 4 scale. Most chemicals used onsite are subject to the Hazard Communication Standard related to sampling activities. These chemicals may include hexane, methanol, acetone, and nitric acid.

10.11 Additional Safe Work Practices

Refer to the SHSO for specific concerns on each individual site task. The safety rules listed below must be strictly followed:

- Use the buddy system when required.
- Practice contamination avoidance, both on and off site.
- Plan activities ahead of time.
- Do not climb over/under obstacles and barricades.
- Be alert to your own physical condition.
- Watch your co-workers for signs of fatigue, exposure, heat or cold stress, etc.
- Report all accidents, no matter how minor to include near losses, immediately to the SHSO.
- Do not eat, drink, chew gum, apply cosmetics, or use tobacco products while working on site (except in the support zone).
- Be aware of traffic, heavy equipment, and other obstacles around you.
- Do not work on-site while under the influence of drugs or alcohol, including prescription and non-prescription drugs that may impair your performance.
- Copies of this HASP shall be readily accessible at all times.

- Note wind direction. Personnel shall remain upwind wherever possible during on-site activities.

- **READ AND SIGN YOUR HEALTH AND SAFETY PLAN BEFORE ENGAGING IN SITE ACTIVITIES.**

A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. Work will not be conducted without adequate light or without supervision. Safety briefings may be held prior to beginning each task.

11.0 DECONTAMINATION PROCEDURES

11.1 Contamination Prevention

One of the most important aspects of decontamination is contamination prevention. Contamination prevention practices will minimize worker exposure and verify valid sample results by precluding cross contamination. Procedures for contamination prevention include the following:

- For Personnel
  - — Do not walk through areas of obvious or known contamination;
  - — Do not handle or touch contaminated materials directly;
  - — Make sure all PPE has no cuts, tears or other signs of deterioration prior to donning;
  - — Fasten all closures on suits, covering with tape, if necessary;
  - — Take particular care to protect any skin injuries;
  - — Stay upwind of airborne contaminants; and
  - — Do not carry cigarettes, gum, etc. into contaminated areas.
- Sampling/Monitoring
  - — When required by the SHSO, cover instruments with clear plastic, leaving opening for sampling and exhaust ports; and
  - — Bag sample containers prior to the placement of sample material.
- Heavy Equipment
  - — Care should be taken to limit the amount of contamination that comes in contact with heavy equipment;
  - — If contaminated tools are to be placed on non-contaminated equipment for transport to the decontamination pad, plastic should be used to keep the equipment clean; and
  - — Excavated soils should be contained and kept out of the way of workers.

11.2 Decontamination

All personnel and equipment exiting the Exclusion Zone will be thoroughly decontaminated. Safety briefings will explain the decontamination procedures for personnel and portable equipment for the various levels of protection indicated in Section 8.0. Heavy equipment will be

decontaminated with a steam cleaner. Rinseates will be collected, handled, and/or drummed as potentially hazardous waste (see Section 12.0).

Equipment Decontamination

Sampling equipment will be decontaminated through the following steps, if necessary:

- fresh water rinse;
- non-phosphate detergent wash;
- fresh water rinse; and
- distilled water rinse.

12.0 DISPOSAL PROCEDURES

Discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on site. Potentially contaminated materials as determined by the SHSO, e.g., soil, clothing, gloves, etc., will be bagged or drummed, as necessary, and segregated for disposal. Contaminated materials will be disposed in accordance with appropriate regulations. Non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste. Waste disposal operations conducted by Roux Associates, Inc. will be monitored by the SHSO and carried out under the appropriate level of personal protection described in Section 8.0.

13.0 EMERGENCY PLAN

As a result of the hazards on-site and the conditions under which operations are conducted, the possibility of an emergency exists. An emergency plan is required by OSHA 29 CFR 1910.120 to be available for use and is included below. A copy of this plan will be posted in the Support zone at each work site.

13.1 Site Emergency Coordinator(s)

The Site Emergency Coordinator is the Site Health and Safety Officer. The Site Emergency Coordinator(s) will contact the local fire, police, and other emergency units prior to beginning work on-site. In these contacts, the Site Emergency Coordinator(s) will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time, the coordinators and the emergency response units will make arrangements to handle any emergencies that might occur.

The Site Emergency Coordinator(s) will implement the emergency plan whenever conditions at the site warrant such action. The coordinator(s) will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units, and the appropriate management staff.

13.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of particulates, etc., an air horn, automobile horn, or other appropriate device will be sounded by the SHSO or field crew personnel for approximately ten (10) seconds indicating the initiation of evacuation procedures. All persons in both the restricted and non-restricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site Emergency Coordinator(s). The Site Emergency Coordinator(s) will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been sounded. The SHSO must see that access for emergency equipment is provided and that all spark-producing apparatus has been shutdown once the alarm has been sounded. Once the safety of all personnel is established, the fire department

and other emergency response groups will be notified by telephone of the emergency. Then, other personnel listed in Section 13.4 will be notified.

13.3 Potential or Actual Fire or Explosion

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedures will be implemented:

- Immediately evacuate the site as described above (Section 13.2); and
- Notify fire, security, and police departments.

Note that although home heating oil is classified as a combustible (not flammable) material, fuel oil vapors in a poorly ventilated space, such as a residential basement tank spill, may result in a fire or explosion hazard.

Emergency Site Control

In the event of an emergency, the SHSO will discourage any unauthorized personnel from entering the site. If necessary, the SHSO will contact the proper authorities to assist in control.

13.4 Environmental Incident (Release or Spread of Contamination)

If possible, the spread of contamination will be controlled or stopped. The Site Emergency Coordinator(s) will instruct a person on-site to immediately contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National Response Center and other appropriate groups will be contacted. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the remaining personnel listed in the table below will be notified, as necessary.

Responsibility	Contact	Telephone
Fire Department	FDNY	911
Emergency Response	FDNY	911
Police Department	NYPD	911
Ambulance	NYPD	911
Hospital	Staten Island University Hospital (South Street)	(718) 226-2000
National Response Center (Release or Spill)		(800) 424-8802

Responsibility	Contact	Telephone
Chemical Transport Emergency Center CHEMTREC)		(800) 424-9300
Site Health and Safety Officer	David Bligh	(516) 503-3094
Project Manager	Frank Cherena	(631) 445-0357
Project Principal	Sin Senh	(516) 523-0291
Client Contact	Kelly Webb	(410) 992-6581

13.5 Personal Injury

If on-site personnel require emergency medical treatment, the following steps will be taken:

1) Notify the Fire Department or Ambulance service and request an ambulance or transport the victim to the hospital, as appropriate.

2) Decontaminate to the extent possible prior to administration of first aid or movement to emergency facilities.

3) First aid will be provided by emergency medical services (EMS) or by on-site personnel trained in first aid, CPR, and bloodborne pathogens, if available.

4) The OHSM will supply medical data sheets on the victim (if a Roux Associates, Inc. employee) to appropriate medical personnel.

Accident Report Forms and Medical Services Form are provided in Appendices F, G, and H.

13.6 Overt Personnel Exposure

If an overt exposure to toxic materials occurs, the exposed person will be treated on site as follows:

Skin Contact: Remove contaminated clothing. Wash immediately with water. Use soap if available. Contact EMS, if necessary.

Inhalation: Remove from contaminated atmosphere. Contact EMS, if necessary. Transport to hospital.

Ingestion: Never induce vomiting on an unconscious person. Also, never induce vomiting when acids, alkalis, or petroleum products are suspected. Contact the poison control center. Contact EMS, if necessary.

Puncture Wound or Laceration: Decontaminate and transport to emergency medical facility or contact EMS. Do not contact blood or bodily fluids. SHSO or OHSM will provide medical data sheets to medical personnel as requested.

13.7 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO will determine if work can continue without risking the health and safety of on-site workers. Some of the items to be considered prior to determining if work should continue are the following:

- Heavy rainfall;
- Potential for heat stress (see Appendix D);
- Potential for cold stress and cold-related injuries (see Appendix D);
- Limited visibility;
- Potential for electrical storms;
- Potential for malfunction of H&S monitoring equipment or gear;
- Potential for accidents;
- Unsafe driving and working conditions due to snow or ice; and
- High wind.

14.0 FIELD TEAM REVIEW

Each Roux Associates, Inc. field member shall sign this section after site-specific training is completed and before being permitted to work on-site.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained herein. I have been provided with an opportunity to have questions and concerns addressed by the Project Manager.

Site/Project: Staten Island Mall Expansion, General Growth Properties

Name Printed	Signature	Date

15.0 APPROVAL PAGE

The Approval Page must be attached and signed by the SHSO, OHSM, Project Manager, and Project Principal.

By their signature, the undersigned certify that this HASP is approved and will be utilized by Roux Associates, Inc. personnel at ACE Group claim sites.

Site Health and Safety Officer	Date
Office Health and Safety Manager	Date
Project Manager	Date
Project Principal	Date

TABLE

1. Site-Specific Hazards – Toxicological, Physical, and Chemical Properties of Compounds

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Staten Island Mall Expansion Project Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Arsenic (As)	7440-38-2	0.01	5 mg/m^3	0.5 mg/m^3 organic 0.010 mg/m^3 - inorganic	Dermal; inhalation; ingestion	Sensory irritant Lung & Skin Cancer Aplastic anemia Numbness	skin eyes lungs blood peripheral nervous system	Silver gray - tin white BP: sublimes
Barium (soluble)	7440-39-3	0.5 mg/m^3	50 mg/m^3	0.5 mg/m^3	Inhalation; ingestion	Sensory irritant Increase muscle contractility Slows heart rate	skin eyes smooth muscle heart	Silver white BP: 1640°
Barium (insoluble) (as barium sulfate)	7727-43-7	mg/m^3	(ND)	15 mg/m^3 5 mg/m^3 resp.	Inhalation; ingestion	Baritosis	lungs	White or yellow odorless
Benzene	71-43-2	1.6 mg/m^3 0.5 ppm	Ca 500 ppm	1 ppm	Dermal; inhalation; ingestion	CNS depression Hematopoietic depression Dermatitis Leukemia	CNS blood skin eyes resp system bone marrow	Liquid (solid below 42°F BP: 80.093°C flammable LEL: 1.4% UEL: 8.0%
Cadmium (dust)	7440-43-9	0.01 mg/m^3	9 mg/m^3	0.005 mg/m^3	Inhalation; ingestion	Sensory irritant Lung injury Kidney disease Cancer	skin eyes kidneys bone	Silver-white/blue tinged BP: 1409°F Noncombustible
Chromium (III)	7440-47-3	0.5 mg/m^3	250 mg/m^3	1 mg/m^3	Dermal; inhalation; ingestion	Decreased pulmonary function Sensory irritant	lung skin eyes	Steel gray metal
Chromium (VI)	7440-47-3	0.05 mg/m^3	Ca 25 mg/m^3	0.005 mg/m^3	Dermal; inhalation; ingestion	Nasal and lung tumors Sensory irritant Cancer	lungs eyes skin	Red, rhombic crystals
Coal tar pitch volatiles (PAHs)	65996-93-2	0.2mg/m^3	80 mg/m^3	0.2 mg/m3	Inhalation; absorption; ingestion	Dermatitis Bronchitis Carcinogen	liver skin eyes stomach	Appearance and odor vary depending on the specific compound
Copper (dusts and mists as Cu)	7440-50-8	1 mg/m^3	100 mg/m^3	1 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant GI irritation CNS depressant	skin eyes GI tract CNS	Reddish metal BP: 4730°F Powdered form may ignite
1,1-Dichloroethane	75-34-3	405 mg/m^3 100 ppm	3,000 ppm	400 mg/m^3 100 ppm	Dermal; ingestion; inhalation	CNS depression Liver damage Sensory irritant	CNS liver eyes	Liquid; Chloroform odor BP: 57.3°C flammable LEL: 5.6% UEL: 11.4%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Staten Island Mall Expansion Project Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	40 mg/m^3 10 ppm	Ca (ND)	4.0 mg/m^3 1 ppm	Dermal; ingestion; inhalation	CNS depressant Liver neurosis Kidney damage Dermatitis	CNS liver kidneys skin	Colorless liquid BP: 83.5° LEL: 6.2% UEL: 15.9%
1,2-Dichloroethene	540-59-0	793 200 ppm	1,000 ppm	790 200 ppm	Dermal; ingestion; inhalation	CNS depressant Epigastric cramps Sensory irritant Dermatitis	CNS stomach skin	Colorless liquid BP: 59° LEL: 9.7% UEL: 12.8%
Diesel Fuel	68334-30-5	NA	NA	NA	Dermal; inhalation	Resp irritation Dizziness, nausea Skin disorders Liver disorders	lungs CNS skin liver	Light amber liquid F1.Pt = >100°F LEL = 0.6% UEL = 7.0%
Ethylbenzene	100-41-4	434 mg/m^3 100 ppm	800 ppm (10% LEL)	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant CNS depressant Narcosis Hematological disorders	eyes skin CNS respiratory system blood	Liquid aromatic odor BP: 277°F Fl.P: 59°F LEL: 1.2% UEL: 7.0%
Fuel Oil	68476-33-5	NA	(ND)	NA	Dermal; inhalation; ingestion	Skin cancer Liver damage Blood disorders	skin liver bone marrow	Dark liquid LEL = 1.0% UEL = 3.0% F1.Pt = >140°F
Gasoline	8006-61-9	896 mg/m^3 300 ppm	Ca (ND)	None	Dermal; inhalation; ingestion	CNS depression Sensory irritant Dermatitis Pulmonary Edema	CNS eyes skin resp system	Liquid, aromatic F1.Pt = -50°F
Kerosene	8008-20-6	None	NA	NA	Dermal; inhalation	Eye/skin irritation Resp. irritation Dizziness, nausea	eyes skin resp. system CNS	yellow to white oily liquid F1.Pt = >115°F LEL = 0.7% UEL = 5.0%
Lead (as Pb)	7439-92-1	0.05 mg/m^3	100 mg/m^3	0.05 mg/m^3	Dermal; inhalation; ingestion	Abdominal pain CNS depressant Anemia Nephropathy Reproductive effects	GI tract CNS blood kidneys	Metal - soft gray BP: 3164°F
Mercury (Hg)	7439-97-6	0.025 mg/m^3	10 mg/m^3	0.1 mg/m^3	Dermal;	CNS effects	CNS	Liquid - shiny metal
Naphtha	8030-30-6	1,590 mg/m^3 400 ppm	1000 ppm	400 mg/m^3 100 ppm	Inhalation; ingestion	Resp irritant Eye irritation	eye resp tract	Clear, flammable
Napthalene	91-20-3	15 ppm	250 ppm	10 ppm	Inhalation; skin absorption; contact; ingestion	Irritation of the eyes, skin, headache, confusion, excitement, nausea, vomiting, abdominal pain, irritation of bladder, profuse sweating, kidney failure	blood CNS	Colorless to brown solid with an odor of mothballs

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Staten Island Mall Expansion Project Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Nickel	7440-02-0	1.5 mg/m^3	Ca 10 mg/m^3	0.015 mg/m^3	Dermal; inhalation; ingestion	Pulmonary fibrosis Lung cancer Sinus cancer Sensory irritant GI irritation	lungs skin eyes GI tract	Silver-white metal BP: 2730°
Selenium (Se)	7782-49-2	0.2 mg/m^3	1 mg/m^3	0.2 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant Bronchial irritation GI distress	respiratory system skin eyes liver kidneys blood	Steel grey, non-metallic BP: 690°F
Silver (Ag)	7440-22-4	0.1 mg/m^3	10 mg/m^3	0.01 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant Bronchitis	skin eyes lungs	Lustrous white metal BP: 2212°
Tetrachloroethene (perchloroethylene PCE)	127-18-4	170 mg/m^3 25 ppm	Ca 150 ppm	100 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Sensory irritant	CNS liver skin eyes kidneys	Liquid ether-like odor BP: 121.20°C
Toluene	108-88-3	188 mg/m^3 50 ppm	500 ppm	200 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Kidney damage Defatting of skin	CNS liver kidney skin	Liquid benzene odor BP: 110.4°C flammable LEL: 1.2% UEL: 7.1%
Trichloroethene (TCE)	79-01-6	269 mg/m^3 50 ppm	Ca 1000 ppm	100 ppm	Dermal; inhalation; ingestion	CNS depression Sensory irritant Kidney damage Liver damage Heart damage	CNS skin eyes kidney liver CVS	Liquid BP: 86.7°flammable LEL: 12.5% UEL: 90%
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1,910 mg/m^3 350 ppm	700 ppm	1,900 mg/m^3 350 ppm	Dermal; ingestion; inhalation	Sensory irritant CNS depression Cardiac arrhythmia	skin CNS CVS eyes	Liquid; BP: 74.1° Fl.P: = 32.5°
Vinyl chloride (chloroethylene)	75-01-4	2.6 mg/m^3 1 ppm	Ca (ND)	1 ppm	Inhalation; ingestion	Liver tumors Blood tumors Sensory irritant CNS depressant Cancer	liver blood eyes skin CNS	Colorless gas Highly flammable BP: 13° FP: -159.7° LEL: 4% UEL: 22%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Staten Island Mall Expansion Project Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Xylene(s)	1330-20-7	434 mg/m^3 100 ppm	900 ppm	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant Blood dyscrasia Bronchitis CNS depression	CNS eyes skin GI tract blood liver kidneys	Liquid Aromatic odor BP: 138.5° flammable LEL: 1.1% UEL: 7.0%
Zinc Oxide (dust)	7440-66-6	10 mg/m^3	500 mg/m^3	15 mg/m^3 (total) 5 mg/m^3 (resp.)	Dermal; inhalation; ingestion	Skin irritant Cough	skin lungs	Bluish-white metallic element BP: 908°

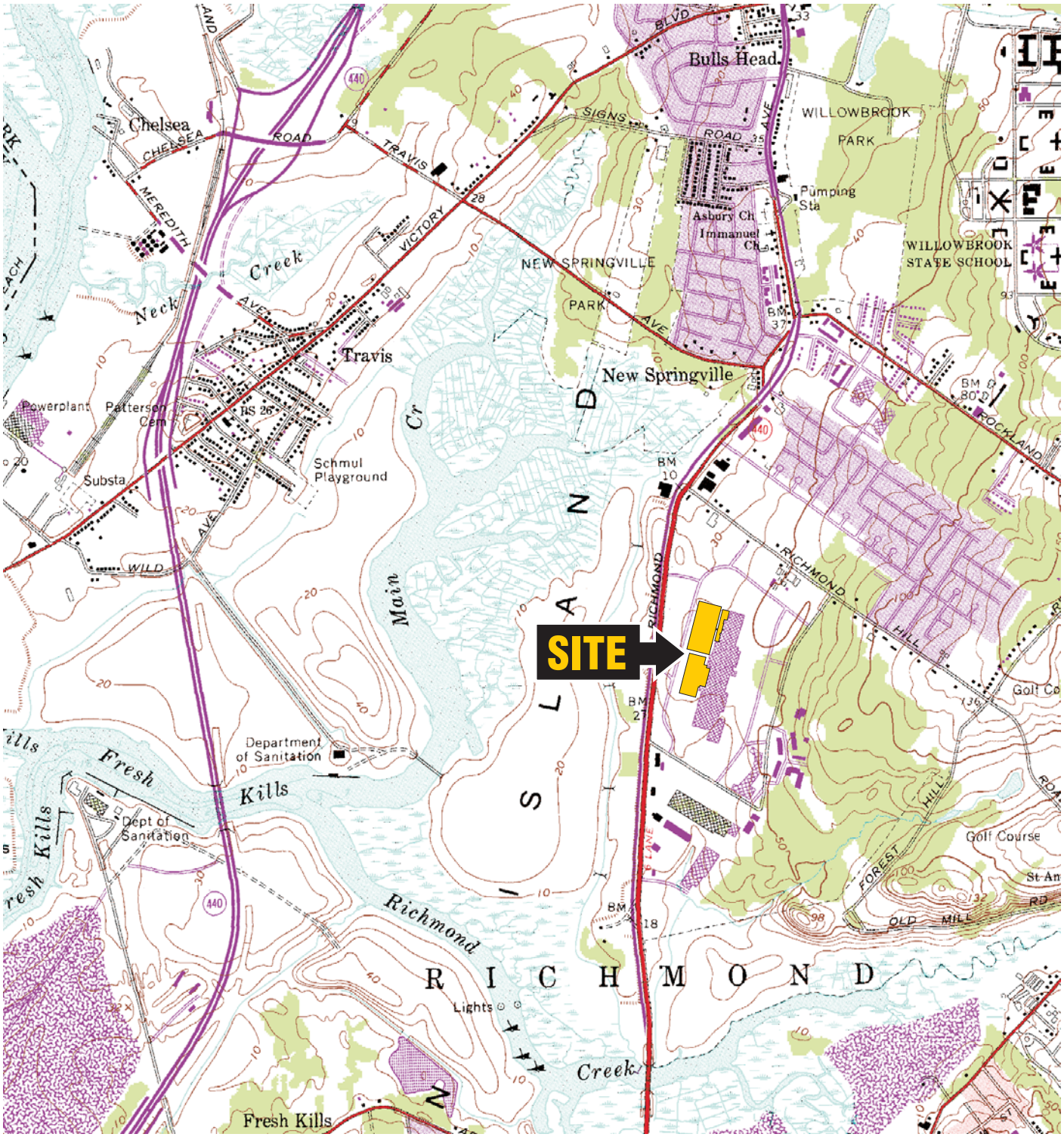
Notes:
Ca - Carcinogen
TLV - Threshold Limit Value (ACGIH)
IDLH - Immediately Dangerous to Life and Health (OSHA)
PEL - Permissive Exposure Level (OSHA)
PPM - Parts per million
mg/m3 - milligrams per cubic meter
Fl. Pt. - Flash point
LEL - Lower Explosive Level
UEL - Upper Explosive Level
BP - Boiling Point
NA - Not Available
ND - Not Determined

References

Guide to Occupational Exposure Values, 2000. American Conference of Governmental Industrial Hygienists.
Hawley's Condensed Chemical Dictionary, Sax, N. Van Nostrand and Reinhold Company, 11th Edition, 1987.
Occupational Safety and Health Administration, 1993. General Industry Air Contaminant Standard (2a CFR 1910.1000).
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis, 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
U.S. Department of Health and Human Services, 1997. NIOSH Pocket Guide to Chemical Hazards.

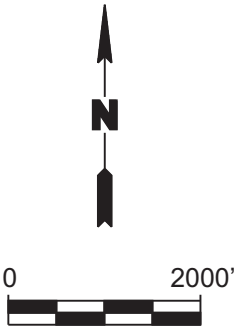
FIGURES

1. Site Location Map
2. Occupational Health Clinic Route Map
3. Hospital Route Map



QUADRANGLE LOCATION

SOURCE:
USGS; 1981, Arthur Kill, N.Y.-N.J.
7.5 Minute Topographic Quadrangle



Title:

SITE LOCATION MAP

CONSULTANT'S HEALTH & SAFETY PLAN

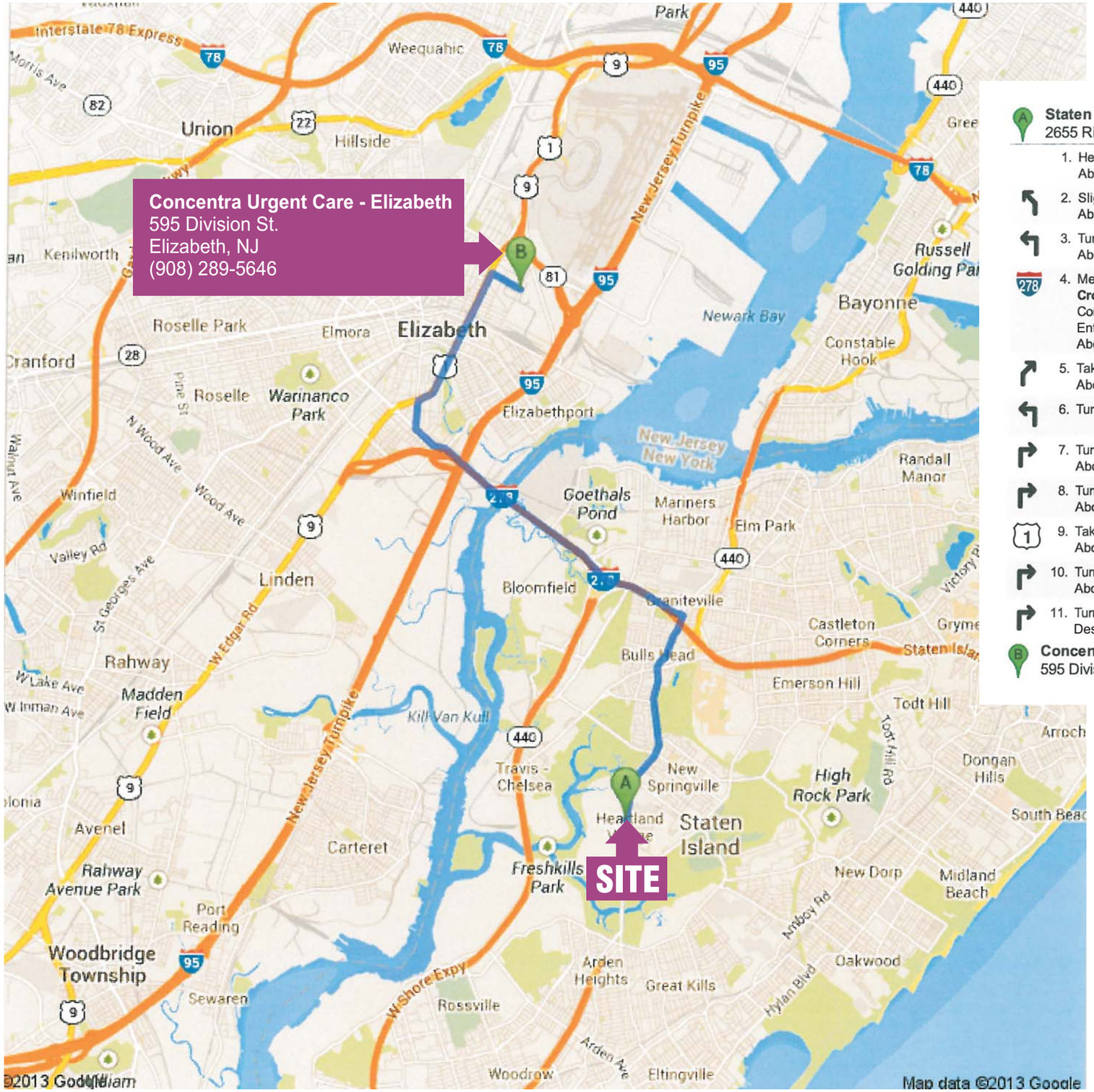
Prepared for:

GENERAL GROWTH PROPERTIES

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.A.	Date: 18OCT13	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr.: M.A.	Project No.: 1287.0007Y000	
File: 1287.0007Y100.01.CDR		

NETWORKDRIVE:\PATH TO DRAWING\FILENAME.CDR



Staten Island Mall
2655 Richmond Ave, Staten Island, NY 10314

1.	Head **north** on **Richmond Ave** About 4 mins	go 1.8 mi total 1.8 mi
2.	Slight left to stay on **Richmond Ave** About 2 mins	go 0.8 mi total 2.6 mi
3.	Turn left onto **Goethals Rd N** About 1 min	go 0.4 mi total 3.0 mi
4.	Merge onto **I-278 W/NY-440 S** via the ramp on the left to **W Shore Expy/Outerbridge Crossing** Continue to follow I-278 W Entering New Jersey About 3 mins	go 2.8 mi total 5.8 mi
5.	Take the **NJ-439 W** exit toward **Bayway Ave/US-9 N/US-1 N/Elizabeth** About 1 min	go 0.2 mi total 6.0 mi
6.	Turn left onto **Cole Pl**	go 0.1 mi total 6.1 mi
7.	Turn right onto **Bayway** About 1 min	go 0.3 mi total 6.5 mi
8.	Turn right onto **S Broad St** About 51 secs	go 0.3 mi total 6.8 mi
9.	Take the 3rd right onto **U.S. 1 N** About 3 mins	go 1.7 mi total 8.6 mi
10.	Turn right onto **Fairmount Ave** About 1 min	go 0.4 mi total 8.9 mi
11.	Turn right onto **Division St** Destination will be on the left.	go 56 ft total 8.9 mi

Concentra Urgent Care - Elizabeth
595 Division St, Elizabeth, NJ 07201

N

Title:

OCCUPATIONAL HEALTH CLINIC ROUTE MAP

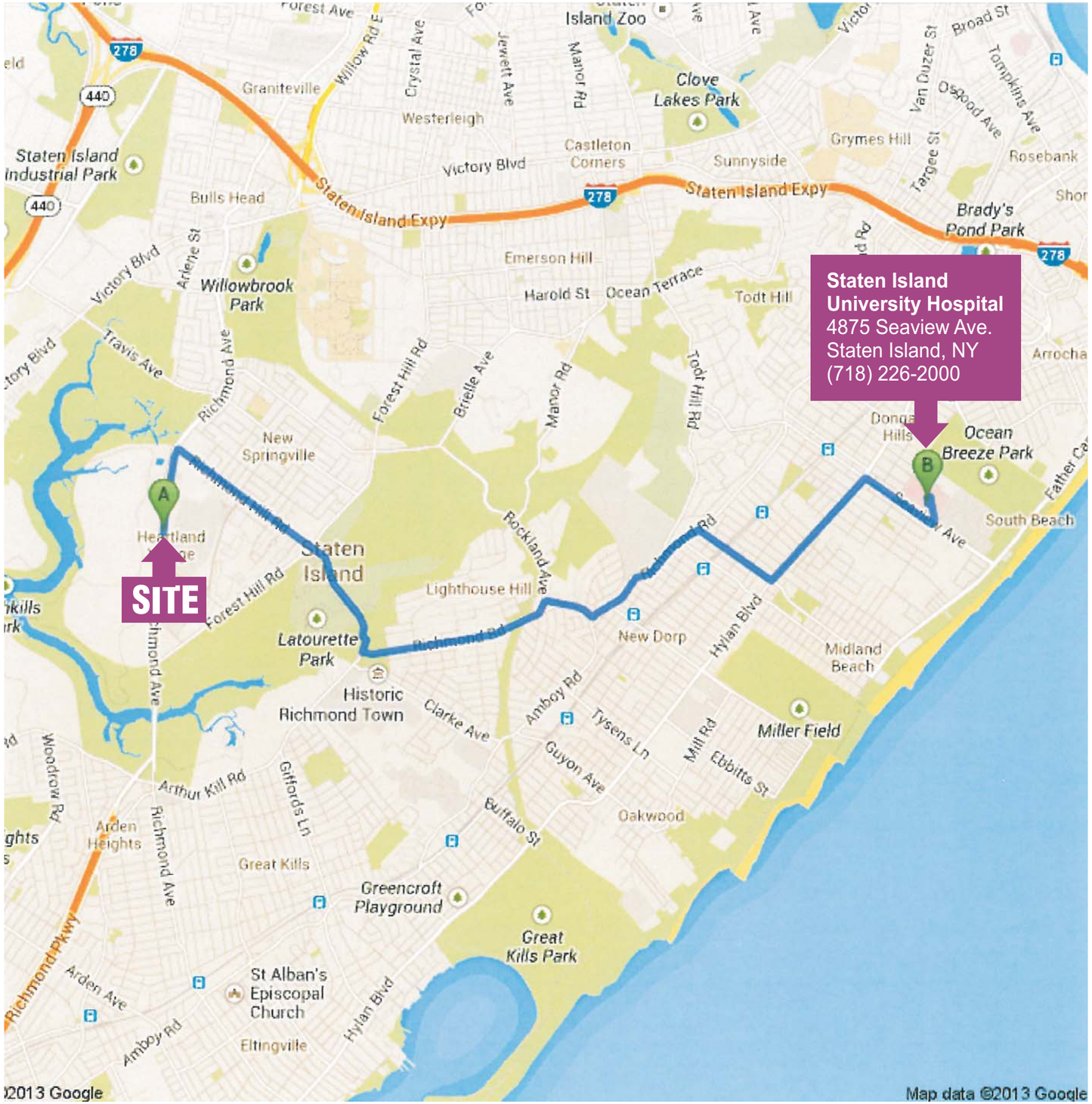
CONSULTANT'S HEALTH & SAFETY PLAN

Prepared for:
GENERAL GROWTH PROPERTIES

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.A.	Date: 18OCT13	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	2
Project Mgr.: M.A.	Project No.: 1287.0007Y000	
File: 1287.0007Y100.01.CDR		

\1287\0007Y\100\1287.0007Y100.01.CDR



Staten Island Mall
2655 Richmond Ave, Staten Island, NY 10314

1.	Head **north** on **Richmond Ave** About 52 secs	go 0.5 mi total 0.5 mi
2.	Turn right onto **Richmond Hill Rd** About 4 mins	go 1.6 mi total 2.1 mi
3.	Continue onto **Arthur Kill Rd**	go 338 ft total 2.2 mi
4.	Turn left onto **Richmond Rd** About 3 mins	go 1.1 mi total 3.3 mi
5.	Turn right to stay on **Richmond Rd** About 1 min	go 0.3 mi total 3.6 mi
6.	Turn left to stay on **Richmond Rd** About 2 mins	go 0.8 mi total 4.4 mi
7.	Turn right onto **Midland Ave** About 1 min	go 0.5 mi total 4.9 mi
8.	Turn left onto **Hylan Blvd** About 2 mins	go 0.8 mi total 5.7 mi
9.	Turn right onto **Seaview Ave** About 1 min	go 0.5 mi total 6.2 mi
10.	Turn left About 1 min	go 0.2 mi total 6.4 mi
11.	Turn left	go 207 ft total 6.4 mi
12.	Turn right	go 49 ft total 6.4 mi
13.	Turn right Destination will be on the left.	go 144 ft total 6.5 mi

B hospital

N

Title:

HOSPITAL ROUTE MAP

CONSULTANT'S HEALTH & SAFETY PLAN

Prepared for:

GENERAL GROWTH PROPERTIES

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.A.	Date: 18OCT13	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	3
Project Mgr.: M.A.	Project No.: 1287.0007Y000	
File: 1287.0007Y100.01.CDR		

NETWORKDRIVE:\PATH TO DRAWING\FILENAME.CDR

APPENDICES

A. Occupational Health and Safety Administration (OSHA) Poster
B. HASP Amendment Form
C. Job Safety Analysis (JSA) Forms
D. Heat Stress and Cold Stress Information
E. Material Safety Data Sheets (MSDS)
F. Accident Report Form
G. Acord Form
H. Concentra Authorization for Medical Services Forms

APPENDIX A

Occupational Health and Safety Administration
(OSHA) Poster

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

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

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

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

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

APPENDIX B

HASP Amendment Form

HASP AMENDMENTS

Site Name: _____

Start Date: _____ **End Date**: _____

Scope of Work/Change/Amendment/Update/Modification Made to the Plan:

Reason for Amendment:

Hazard Evaluation: _____

Level of Protection: _____

Air Monitoring: _____

Person Requesting Amendment: **Approval:**

Name	Name	Name
	Office Health and Safety Coordinator	Site Health and Safety Coordinator
Title	Title	Title
Date	Date	Date
Signature	Signature	Signature

APPENDIX C

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Ctrl. No. GEN-004	DATE 12/6/2012	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
Generic	**Drilling**	**Direct Push Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Jeffrey Wills	Project Hydrogeologist	Curtis Taylor	Health and Safety Officer
		Michael Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing, Long Sleeve Shirt	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

Exclusion Zone Policy – All non-essential personnel will maintain a distance of 10' feet from drilling equipment while moving/engaged.

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	1a. **CONTACT**: Equipment/property damage.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum **exclusion zone of 10 feet** for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation.
	1b. **FALL**: Slip/trip/fall hazards.	1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
2. Raising tower/derrick of drill rig	2a. **CONTACT**: Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance from overhead structures.
	2b. **CONTACT**: Pinch Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch points. 2b. Lower out riggers on rig to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of drilling equipment and well installation	3a. **CONTACT**: Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

3. Advancement of drilling equipment and well installation (Continued)	3b. **EXPOSURE**: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.
	3c. **CAUGHT**: Limb/extremity pinching; abrasion/crushing.	3c. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3c. Inspect the equipment prior to use for potential pinch points. Keep hands away from being between pinch points and use of tools is preferable compared to fingers and hands. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3c. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3c. Spinning rods/casing have an **exclusion zone of 10 feet** while in operation.
	3d. **CONTACT**: Equipment imbalance during advancement of drill equipment.	3d. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3d. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3d. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone of 10 feet**).
	3e. **EXPOSURE**: Inhalation of contamination/vapors.	3e. Air monitoring using a calibrated photoionization detector (PID) will be used to periodically to monitor the breathing zone of the work area. 3e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan.
	3f. **FALL**: Slip/trip/fall hazards.	3f. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3f. See 1b.
	3g. **EXERTION**: Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Decontaminate equipment.	4a. **EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).	4a. Wear chemical-resistant disposable gloves and safety glasses. 4a. Contain decontamination water so that it does not spill. 4a. Use an absorbent pad to clean spills, if necessary. 4a. See 3b.
	4b. **EXPOSURE:** To chemicals in cleaning solution including ammonia.	4b. See 4a. Review MSDS to ensure appropriate precautions are taken and understood.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS Ctrl. No. GEN-005	DATE 12/10/2012	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE:	WORK ACTIVITY (Description):
Generic	**Gauging and Sampling**	**Gauging and Sampling**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Gina Masciello	Project Scientist	Curtis Taylor	SHSM
		Michael Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather, Nitrile and cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Knee pads, Insect Repellant, sunscreen (as needed)
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Composite-toe or steel toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

42 inch Safety Cones, Caution Tape, Interface Probe and/or Water Level Meter, 20 lb. Fire Extinguisher, Buckets. Tools as needed: Socket Wrench, Screw Driver, Crow Bar, Mallet, and Wire Brush.

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization to monitoring well(s).	1a. **FALL:** Personal injury from slip/trip/fall due to uneven terrain and/or obstructions.	1a. Inspect pathway and plan for most suitable designated pathway prior to mobilization. 1a. Use established pathways, walk and/or drive on stable, secure, ground and avoid steep hills or uneven terrain.
	1b. **CONTACT:** With traffic/third parties.	1b. Identify potential traffic sources and delineate work area with 42 inch traffic safety cones. Position vehicle to protect against oncoming traffic. Use caution tape to provide a more visible delineation of the work area if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.
	1c. **EXPOSURE:** To biological hazards.	1c. Inspect work area for bees and insects. 1c. Use insect/tick repellent as necessary.
2. Open/close well.	2a. **OVEREXERTION:** Muscle strain.	2a. Use proper lifting techniques; keep back straight, lift with legs and bend knees when reaching to open/close well.
	2b. **CAUGHT:** Pinch points associated with removing/replacing manholes and working with hand tools.	2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover.
	2c. **EXPOSURE:** To potential hazardous vapors.	2c. No open flames/heat sources. 2c. To minimize exposure to vapors allow well to vent after opening it and before sampling activities begin. 2c. Stand up-wind, if possible, to avoid vapors.
3. Gauge well.	3a. **CONTACT:** With contamination (e.g. contaminated groundwater).	3a. Wear chemical-resistant disposable gloves and safety glasses when gauging well. 3a. Insert and remove probe slowly to avoid splashing. 3a. Use an absorbent pad to clean probe.
	3b. **CONTACT:** With traffic.	3b. See 1b.
4. Purge and sample well.	4a. **EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors) and/or sample preservatives.	4a. Open and fill sample jars slowly to avoid splashing and contact with preservatives. 4a. Wear cut-resistant gloves and chemical-resistant disposable gloves when sampling. 4a. Fill sample containers over purge container to avoid spilling water onto the ground. 4a. Use an absorbent pad to clean spills.
Assess [1]JOB STEPS	**Analyze [2]POTENTIAL HAZARDS**	**Act [3]CRITICAL ACTIONS**

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

4. Purge and sample well (Continued).	4b. **CONTACT:** Personal injury from cuts, abrasions, or punctures by glassware or sharp objects. 4c. **EXERTION:** Muscle strain while carrying equipment. 4d. **CONTACT:** With traffic.	4b. To avoid spills or breakage, place sample ware on even surface. 4b. Do not over tighten caps on glass sample ware. 4b. Wear cut-resistant (i.e., Kevlar) gloves and chemical-resistant disposable gloves when sampling and handling glassware (i.e., VOA vials) or when using cutting tools. 4c. Use proper lifting techniques when handling/moving equipment; bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50lbs or heavier. 4c. Make multiple trips to carry equipment. 4d. See 1b.
5. Management of purge water.	5a. **EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors). 5b. **EXERTION:** Muscle strain from lifting/carrying and moving containers.	5a. Do not overfill container and pour liquids in such a manner that they do not splash. 5a. Properly dispose of used materials/PPE in appropriate container in designated storage area. 5b. Use proper lifting techniques when lifting / carrying or moving container(s) (see 4c.). 5b. Do not overfill container(s).
6. Decontaminate equipment.	6a. **EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	6a. Work on the upwind side, where possible, of decon area. 6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension..

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-006	DATE 11/6/2013	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Surveying**	**Elevation Surveying**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Bjorn Wespestad	Project Engineer	Curtis Taylor	Health and Safety Officer
		Michael Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant or leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Surveying equipment (i.e., leveling rod/measuring ruler, tripod and scope).

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Locate surveying position for instrument and rod and set-up work area	1a. **FALL:** Slip/trip hazards. 1b. **CONTACT:** Traffic (surveying locations could potentially be located in parking areas and sidewalks). 1c. **OVEREXERTION:** Hazard due to carrying, lifting, and bending while transporting equipment. 1d. **CAUGHT/CONTACT:** Pinch Points / sharp edges associated with setting up the tripod.	1a. Inspect area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to setting up at the survey location. 1b. Be aware of oncoming traffic. Utilize a flagman / spotter for locations in streets or high-traffic areas. 1b. Place 42 inch cones around the work area, and delineate work zone with caution tape, if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective safety vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route. 1c. Use proper body positioning and lifting techniques; keep back straight, lift with legs, keep load close to body, and never reach with a load. 1c. Avoid carrying too much equipment at one time and team-lift equipment that is more than 50lb. 1d. Wear cut resistant gloves when handling the tripod. Don't carry tripod by the pointed ends.
2. Open / close manhole cover to well that is being surveyed (if necessary).	2a. **OVEREXERTION:** Muscle strain 2b. **CAUGHT:** Pinch points associated with removing / replacing manholes and working with hand tools. 2c. **EXPOSURE:** To potentially hazardous vapors. 2d. **CONTACT:** With traffic.	2a. See 1c. Bend knees when reaching to open well. Use manhole lifting hook or pry bar to avoid bending. 2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and crowbar or pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover. 2c. No open flames/heat sources. 2c. To minimize exposure to vapors allow well to vent after opening it and before survey activities begin. 2c. Work on the upwind side of well. 2d. See 1b.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Perform survey.	3a. **FALL:** Slip/trip hazards 3b. **CONTACT:** Traffic (surveying locations could be potentially located in parking areas and sidewalks)	3a. See 1a. 3b. See 1b. 3b. Personnel using the scope will be devoting most of their attention to the surveying activity. Personnel holding the measuring stick should be extra vigilant of survey personnel and communicate any potential hazards to the instrument person via handheld radio or similar means. Ensure reflective safety vest is worn.
4. Break down work area.	4a. **CONTACT:** Traffic (surveying locations can potentially be located in parking areas and sidewalks). 4b. **EXERTION:** Hazard due to carrying, lifting, and bending while transporting equipment	4a. See 1b. 4b. See 1c.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-007	DATE: 12/10/2012	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY **GENERIC**	WORK TYPE	WORK ACTIVITY (Description) **Movement of 55-gallon Drums/Drum Handling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Curtis Taylor	Health and Safety Officer	Michael Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant gloves
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel toed boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Drum Cart and/or forklift, safety cones, and caution tape

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A 10' exclusion zone will be maintained around forklift.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure Work Area, Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts. **See JSA Forklift for potential hazards and critical actions.** **Inspect forklift before operating to ensure it is in good condition and functioning correctly.**	1a. **FALL:** Tripping/falling due to uneven surface terrain. 1b. **EXPOSURE:** Drums could potentially be damaged and contain hazardous material. 1c. **OVEREXERTION:** Potential muscle strain while loosening or tightening bolts.	1a. Inspect walking path for uneven terrain, weather-related hazards (i.e., tree debris, puddles, etc.), and obstructions prior to accessing work area. 1a. Use established pathways and walk on stable, secure ground. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. 1b. When inspecting drums, don nitrile gloves under cut resistant glove. If drum is not properly labeled, do not open and cease all drum transport related activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed, or in poor condition, place drum in an over-pack drum. 1c. Keep back straight and secure grip on drum ratchet.
2. When using a forklift, position drum clamp in between drum ribs. When using a drum dolly, secure fastening hook on top of drum. .	2a. **CAUGHT/CONTACT:** Hazards between drum/forklift clamp or dolly fastener/drum. 2b. **OVEREXERTION/CONTACT:** Hazards associated with balancing drum on drum cart (leaning back and pulling drum with your back).	2a. Position drum clamp between the ribs on the drum to prevent possible slipping. Do not place hands between drum clamp and drum; wear cut resistant gloves. 2b. Do not jerk body. Wear cut-resistant gloves and steel toed boots. 2b. Ensure that drums are not over-filled.
3. Transport drums to designated location and disengage drum clamp.	3a. **EXPOSURE/ CONTACT:** Hazards associated with drum transport; skin contact and vapors. 3b. **CAUGHT:** Pinching hazards associated with maneuvering drums. 3c. **FALL:** Tripping/ falling due to obstructions and uneven terrain.	3a. **Maintain a 10' EZ around forklift.** Ensure drum clamp is secure on drum before beginning to move. 3a. Ensure that drum is sealed and lid is tight before beginning to move. 3b. Do not place fingers between drum clamp and drum; wear cut resistant gloves. 3c. See 2b. 3c. If path is too rough for drum cart, utilize forklift. 3c. Utilize a spotter while operating the forklift.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

JOB SAFETY ANALYSIS	Cntrl. No. GEN-009	DATE: 12//31/2012	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Hand Tools**	**Pre-Clearing activities, including Air Knifing and Soil Vacuuming**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Alyssa Lau	Staff Engineer	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Nitrile and cut resistant
☒ HARD HAT	☒ FACE SHIELD (while air knifing)	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION (as needed)	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ OTHER: Dust mask (as needed)
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toed		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Air Knife, Vactor Truck (Vac Truck), Compressor, Hand Tools, Photoionization Detector, Multi-Gas Meter, Traffic Cones, 20 lb. Fire Extinguisher, "Work Area" and/or "Exclusion Zone" Signs

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A 10 foot exclusion zone will be maintained around air knife and/or soil vacuum operations.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Verify pre-clearance protocol.	1a. **CONTACT**: Underground utility damage; property damage; personal injury. See Site Walk Inspection JSA for potential hazards.	1a. Confirm that local utility companies were contacted prior to drilling. 1a. Walk the Site to evaluate utility markings and review maps (**See Site Walk Inspection JSA for critical actions**). 1a. Review pre-clearing checklist form and sub-surface clearance form. Pre-clearing protocol indicates that clearance must be conducted to a minimum of 5 vertical feet below ground surface or 8 vertical feet below ground surface in the critical zone using hand tools.
2. Mobilize/demobilize and establish work area.	2a. **See Mobilization / Demobilization JSA for potential hazards.**	2a. **See Mobilization / Demobilization JSA for critical actions.**
3. Pre-clear with air knife and soil vacuum, and/or clearance with hand tools	3a. **CONTACT**: Flying debris.	3a. **Maintain 10 foot exclusion zone.** Only (air knife/vac truck) operator and designated helper shall remain within exclusion zone while air knife/vac truck is active. Use the required PPE, including (at a minimum), cut resistant gloves, safety glasses with side shields, and long sleeved shirt. 3a. Wear a face shield to protect face from flying debris when using air knife. 3a. Aim air knife tip away from self and others, so to avoid line-of-fire hazards. 3a. Use anti-whip devices on compressor hoses.
	3b. **EXPOSURE/ENERGY SOURCE**: Inhalation/exposure to hazardous vapors; inhalation/exposure to dust; electrocution.	3b. Monitor breathing zone with a calibrated PID and multi-gas meter. If vapors sustain levels > 5 ppm, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux Project Manager of the condition. The Roux Project Manager will then recommend additional precautions. 3b. Wear dust masks as needed. 3b. Ensure no open flames/heat sources are present within the work area. 3b. Ensure vac truck is properly grounded prior to use. 3b. Do not use metal dig bar; use fiberglass or equivalent.
	3c. **CONTACT:** Damage to unknown/known utility with air knife.	3c. Avoid contacting utilities directly with the high pressure air stream and using the air knife tip as a physical digging tool. 3c. Keep the air knife tip constantly moving to reduce direct pressure on a potential utility. 3c. Increase the distance between air knife tip and soil/utility. 3c. Continually remove soil slurry from hole with vacuum, which may have an abrasive effect on utility casings.
	3d.**OVEREXERTION**: Poor body positioning when handling equipment and materials.	3d. Use proper body positioning and lifting techniques that minimizes muscle strain; keep back straight, lift with legs, keep

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

		load close to body, and never reach with a load.
3. Pre-clearing with air knife and soil vacuum, and/or clearance with hand tools (continued)	3d. **OVEREXERTION**: (continued) Poor body positioning when handling equipment and materials.	3d. Ensure that loads are balanced to reduce the potential for muscle strain. 3d. Two people or a mechanical lifting aid are required when lifting objects over 50 lb. or when the shape makes the object difficult to lift.
	3e. **FALL**: Tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at the Site.	3e. Inspect walking path for uneven terrain, weather-related hazards (e.g., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 3e. Walk around any stored materials/equipment; do not climb over. Practice good housekeeping. 3e. Use established pathways and walk on stable, secure ground. 3e. Equipment and tools will be stored at the lowest point of potential energy and out of the walkway and immediate work area (i.e., tools should not be propped against walls or nearby equipment or vehicles). 3e. Equipment and tools that are not anticipated to be used will be returned to a storage area that is out of the immediate work area. 3e. Ensure power cords/hoses are grouped when used within the work area. Mark out cords/hoses that cross pathways with traffic cones. 3e. Ensure all Site personnel and equipment stay a minimum of 2 feet from an open hole. Mark out open holes with traffic cones/caution tape, etc. 3e. Pre-cleared location will be finished flush to grade as to prevent a slip/trip hazard.
	3f. **CAUGHT**: Pinch points associated with the equipment and vacuum hose.	3f. Always wear cut-resistant gloves when making connections and using hand tools. 3f. Inspect the equipment prior to use for potential pinch points. 3f. Test all emergency shutdown devices prior to using equipment. 3f. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3f. **All non-essential personnel shall maintain a 10 foot exclusion zone**; position body out of the line-of-fire of equipment. 3f. **Drillers and helpers will understand and use the "Show Me Your Hands Policy".**
	3g. **EXPOSURE**: Noise from vac truck and/or air compressor.	3g. Wear hearing protection when vac truck and air compressor are in operation. Otherwise, if sound levels exceed 85 dB, don hearing protection.
4. Move drum to staging area using drum cart.	4a. **EXPOSURE/CONTACT**: Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, soil).	4a. Wear chemically resistant gloves (i.e., Nitrile; worn in addition to cut resistant gloves). 4a. Do not overfill drums. Ensure that the drum lids are attached securely. 4a. Stage all drums in the designated storage area (per Roux Project Manager) and ensure they are labeled.
	4b. **EXERTION**: Muscle strain while maneuvering drums with drum cart/lift gate.	4b. See 3d. Do not overfill drums. Use lift gate on back of truck to load and unload drums or drum cart to transport drums.
	4c. **CAUGHT**: Pinch points associated with handling drum lid.	4c. Ensure that fingers are not placed under the lid of the drum. Wear cut-resistant gloves. Use 15/16" ratchet while sealing drum lid.
5. Decontaminate equipment and tools.	5a. **EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).	5a. See 4a. 5a. Contain decontamination water (closed lid) so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Store all impacted materials/PPE in a designated storage container (per Roux Project Manager) and ensure the container is labeled.
	5b. **EXPOSURE**: To chemicals in cleaning solution.	5b. See 4a.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl. No. GEN-010	DATE: 12/31/2012	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Site Recon**	**Mobilization/Demobilization**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Jared Lefkowitz	Staff Assistant Scientist	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☐ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment:

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A minimumexclusion zone of 10' will be maintained around moving equipment (if necessary)

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways.Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42" cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing when unnecessary. 1b. Maintain a minimum 10' exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1b. Delineate work area with 42" cones, flags, caution tape, and/or other barriers. 1b. Position "Work Area" signs at Site entrances, if possible, or at either side of work area. 1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient of work area. 1c. Wear leather gloves when handling any tools or equipment. Avoid wearing loose clothing. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Ensure loose clothing is secure.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either awkward to carry or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes, apply insect repellant containing DEET, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Heat and cold related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl. No. GEN-011	DATE: 12/31/2012	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Chelsea Willett	Staff Assistant Geologist	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest, long sleeves	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map and/or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site manager.	**1a. CONTACT/EXPOSURE/FALL:** Lack of communication could result in H&S incident.	1a. Inform Site personnel of work scope, timeline and location(s). 1a. Inquire about other activities taking place at the Site.
2. Traversing the Site and setting up at work locations.	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles.	2a. Maintain speed limit of 5 mph on-site. 2a. All equipment must be stowed and secured prior to moving. Use wheel chocks on all construction vehicles when not in motion. 2a. Drive on established roadways. 2a. Yield to all pedestrians. 2a. Do not back up vehicle without spotter where visibility is limited; use pull-through spots or back into parking spots; use an audible signal (horn/back-up alarm) when backing up vehicles. 2a. Wear high visibility clothing/safety vest.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the workzone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. Use established pathways and walk on stable, secure ground.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment. 2c. Two people or a mechanical lifting device are required when lifting objects over 50 lbs or when the shape makes the object difficult to lift.
	2d. EXPOSURE: Biological hazards - ticks, bees/wasps, poison ivy, insects, etc. (Ticks are most active any time the temperature is above freezing, typically from March to November)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before use with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: Use bee spray to remove nests. Protect exposed skin with insect repellent. 2d. Poison Ivy: • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin comes in contact with poison ivy, wash skin thoroughly with soap and water.
	2e. EXPOSURE: Sun, possibly causing sunburn.	2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Define and secure the work area.	**3a. CONTACT:** Personal injury or property damage from other vehicles on-site.	3a. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route. 3a. Look both ways in high traffic areas. 3a. Position vehicle to protect against oncoming traffic. 3a. Use 42" traffic cone and caution tapesto delineate work area. Use a spotter in high traffic areas. 3a. Wear high visibility clothing/safety vest.
4. Walking near heavy equipment and machinery.	**4a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris.	4a. See 3a. 4a. Place traffic cones to re-direct traffic flow around work area and to alert others as to activity taking place. 4a. Maintain a minimum exclusion zone of 10 feet from all equipment. Task specific JSAs should be referenced to determine the actual exclusion zone for that piece of equipment being used. 4a. Keep body parts from being present within the line of fire of pinch points. 4a. Routinely inspect work area and be aware of location of all Site personnel. Make eye contact with operator prior to entering the work area. 4a. Wear safety glasses.
	4b. OVEREXERTION: Personal injury from lifting/moving/rotating equipment.	4b. See 2c.
	4c. EXPOSURE: Hearing damage from excavation activities. Inhalation/exposure to hazardous vapors and or dust.	4c. Monitoring air quality with multi-gas meter and dust meter, if necessary. Utilize water to suppress dust, if necessary. Wear dust mask, if necessary. 4c. Wear hearing protection if >85 dB. 4c. Always wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects or cutting tools.
	4d. EXPOSURE: Working in a remote area.	4d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities to be established by the PM prior to commencing work. 4d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
5. Working in adverse weather conditions.	**5a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	5a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 5a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 5a. Wear appropriate rain gear. 5a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 5a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
6. Departing Site.	**6a. EXPOSURE:** Exposure to hazards should personnel believe Roux is on-Site during an emergency.	6a. Sign out or notify Site personnel of your departure.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl. No. GEN-012	DATE: 12/31/2012	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE: **Gauging & Sampling**	WORK ACTIVITY (Description): **Soil Sampling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Michael Hodess	Staff Environmental Scientist	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES ☒ FLAME RESISTANT CLOTHING (as needed)	☐ GOGGLES ☐ FACE SHIELD: ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment; 42" traffic cones, caution tape, trowel

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A minimum 10' exclusion zone will be maintained around moving equipment, if present.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	1a. **CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or fluorescent clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. **FALL:** Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools will in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be appropriate (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. **EXPOSURE:** Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke, Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire if occurred. Exposure to explosive vapors due to tank farm operations, Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are also expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or an area with air conditioning (i.e., car, site trailer, etc.). Move to an area that is warm. 1c. No open flames/heat sources. 1c. Flame resistant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill/repel ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	2a. **CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the "show me your hands" policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
3. Decontaminate equipment	3a. **EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil).	3a. Wear chemical-resistant disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area.
	3b. **EXPOSURE:** Chemicals in cleaning solution including ammonia.	3b. Wear chemical-resistant disposable gloves and safety glasses. 3b. Work on the upwind side of decon area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-013	DATE: 12/31/2012	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Gauging and Sampling**	**Soil Vapor Sampling (Permanent Monitoring Points)**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Jeff Wills	Project Hydrogeologist	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant & Nitriles
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Bug Spray, Sun Screen, Knee Pads or kneeling pad
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

9/16" Socket and Wrench, Non-Toxic Clay, Teflon-Lined Tubing, Masterflex Tubing, 3-Way Stopcock, Air Pump with Low Flow, Dry Cal, Enclosure (Bucket), Helium Gas Canister, Summa Canisters and Flow Controllers, MultiRae Gas Meters, CO2/O2 Meters, Helium Detector, Tubing Cutter, 42-inch Safety Cones, Caution Tape or Retractable Cone Bars

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

Exclusion Zone: Maintain a 5-Foot Exclusion Zone for Non-Essential Personnel

ACCESS [1]JOB STEPS	ANALYZE [2]POTENTIAL HAZARDS	ACT [3]CRITICAL ACTIONS
1. Define and secure work area.	1a. **FALL:** Potential tripping hazards.	1a. Ensure work area is secure and inform others (third party) of work activity. 1a. Remove tripping hazards and inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment.
	1b. **CONTACT:** Potential contact with moving vehicles or pedestrians.	1b. If working alongside roads, look both ways before entering roadways, face traffic, and utilize work vehicle to protect employees. 1b. Delineate work area (including vehicles) with traffic safety cones and caution tape or retractable cone bars. 1b. Maintain a 5 foot exclusion zone. 1b. Wear high visibility clothing or reflective safety vest.
	1c. **OVEREXERTION:** Muscle strain while lifting and carrying equipment.	1c. When carrying equipment to/from work area, keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced. Use mechanical assistance/make multiple trips to carry equipment.
2. Remove well cover / close well cover.	2a. **CONTACT/CAUGHT:** Pinch points and scrapes associated with hand tools and well covers.	2a. Keep hands away from pinch points. 2a. Use hand tools to remove and replace well covers. 2a. Wear cut-resistant gloves. 2a. Use knee pads or kneeling mat when repetitive kneeling on rough ground is anticipated.
	2b. **FALL:** Potential tripping hazards associated with installing bolts.	2b. Place security bolts in secure location so not to create tripping hazards. Replace security bolts so that they fit flush with monitoring well covers.
	2c. **OVEREXERTION:** Physical exertion to remove bolts that were over torque or stripped.	2c. Replace any security bolts that show signs of stripping. Do not over tighten. 2c. Use body positioning and bending techniques that minimize muscle strain; keep back straight, bend at the knees. 2c. See 2a.
3. Remove / replace brass caps at the end of the sample tubing.	3a. **CONTACT:** Pinch points associated with hand tools and brass caps.	3a. Use wrench to remove and replace brass caps. 3a. Wear cut-resistant gloves to protect against pinch points and scrapes.
	3b. **EXPOSURE:** Potential pathway for vapors to migrate to land surface.	3b. Replace brass caps immediately upon completion to avoid soil vapors migrating to the surface through sample tubing. 3b. Stand up wind of sample point location.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – Electricity, pressure, tension/compression, torque.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

ACCESS [1]JOB STEPS	ANALYZE [2]POTENTIAL HAZARDS	ACT [3]CRITICAL ACTIONS
4. Set up soil vapor sampling equipment and calibration of meters.	4a. **FALL:** Potential tripping hazards associated with equipment and tubing. 4b. **CONTACT:** Pinch points associated with handling equipment. 4c. **EXPOSURE:** Inhalation of calibration gas and helium.	4a. Place equipment in one area close to the sampling location. 4a. Keep tubing slack to a minimum and locate the summa canister as close to the sampling location as possible. 4a. Avoid stepping over equipment and tubing. 4b. Do not place fingers/hands under sampling equipment. 4b. Make multiple trips when unloading equipment in work area. 4b. Wear cut-resistant gloves to protect against pinch points while handling sampling equipment. 4c. Review MSDS for each type of calibration gas used before calibrating. 4c. Calibrate meters in a well vented area and keep air flow regulator away from face. 4c. Close valve on canisters after use to avoid inhalation of excess helium or calibration gas. 4c. Stand up wind of bucket during helium tracer gas test.
5. Screen sample tubing with multiple gas and CO_2/O_2 meters.	5a. **FALL:** Potential tripping hazards associated with equipment. 5b. **EXPOSURE:** Inhalation of soil vapor	5a. See 4a 5a. Identify area where equipment is to be stored within the work area (away from main walking path). 5a. Don't leave equipment on the ground. Return equipment to storage area between uses. 5b. See 3b. 5b. Use master flex to connect tubing to meter. 5b. Stand on opposite side of meter vent and upwind soil vapor point during screening activities.
6. Cleaning Work Area.	6a. **FALL:** Potential tripping hazards associated with equipment and tubing. 6b. **CONTACT:** Storing and transport of equipment in car.	6a. See 4a. 6a. See 5a. 6b. Ensure that equipment is placed securely in the vehicle. Do not stack equipment on top of each other. Secure equipment so that it will not slide while being transported. 6b. Wear cut-resistant gloves while handling/loading equipment.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – Electricity, pressure, tension/compression, torque.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-014	DATE 12/31/2012	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
GENERIC	**Drilling**	**Sonic Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Jeffrey Wills	Project Hydrogeologist	Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: steel toed boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Truck-Mounted Sonic Drilling Rig or Mini Sonic Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Interface Probe, 20 lb. Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 20' exclusion zone will be maintained around equipment by all non-essential personnel.

"SHOW ME YOUR HANDS"
Driller and helper should actively show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed) **See mobilization JSA**	1a. **CONTACT**: Equipment/property damage	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. Use a spotter for all required backing operations. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have an **exclusion zone of 20 feet** for non-essential personnel (i.e., driller helper, geologist) when the rig is being moved.
	1b. **FALL**: Slip/trip/fall hazards	1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
2. Raising tower/derrick of drill rig	2a. **CONTACT**: Overhead hazards	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. ExxonMobil requirements for raising a tower/derrick in the area of overhead wires must be reviewed prior to drilling, if applicable.The tower/derrick must not be raised beneath overhead power lines unless approved by both the ExxonMobil and Roux PMs. 2a. Maintain a safe distance from overhead structures.
	2b. **CONTACT**: Pinch Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch points. 2b. Lower out riggers on rig to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of soil boring and well installation **See also Soil Sampling JSA if collecting soil samples**	3a. **CONTACT**: Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.
	3b. **EXPOSURE**: Noise and dust	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.
	3c. **CAUGHT**: Limb/extremity pinching; abrasion/crushing	3c. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3c. Inspect the equipment prior to use for potential pinch points. Keep hands away from being between pinchpoints and use of tools is preferable compared to fingers and hands. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3c. Drillers and helpers will understand and use the “Show Me Your Hands” Policy. 3c. Spinning rods/casing have a minimum **exclusion zone of 20 feet** while in operation for all non-essential personnel.
	3d. **CONTACT**: Equipment imbalance during advancement of drill equipment	3d. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3d. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3d. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone of 20 feet**).
	3e. **EXPOSURE**: Inhalation of contamination/vapors	3e. Air monitoring using a calibrated photoionization detector (PID) and/or multi-gas meter will be used to periodically monitor the breathing zone of the work area. 3e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan.
	3f. **FALL**: Slip/trip/fall hazards	3f. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3f. See 1b.
	3g. **EXERTION**: Potential for muscle strain/injury while installing well casings and/or lifting sonic rods/casings	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Decontaminate equipment	4a. **EXPOSURE**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors)	4a. Wear chemical-resistant disposable gloves and safety glasses. 4a. Contain decontamination water so that it does not spill. 4a. Use an absorbent pad to clean spills, if necessary. 4a. See 3b.
	4b. **EXPOSURE:** To chemicals in cleaning solution including ammonia	4b. See 4a.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl#: GEN-015	DATE 11/6/13	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
GENERIC	**Drilling**	**Well Development**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Amy Hoffman	Staff Geologist	Mike Ritorto	Project Hydrogeologist
		Curtis Taylor	SHSM

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment as needed: Truck Rig or support truck, Trailer, 42 inch Safety cones and flags, Caution Tape, Interface Probe, Power Source, Submercible Pump, Surge Block/Plunger, 20 lb. Fire Extinguisher, Holding Tanks and/or Buckets, Tools as needed: Socket and Pipe Wrench, Screw Driver, Pry Bar, Ratchet, Vault Key.

COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

Maintain a 20 Foot Exclusion Zone During Development Activities

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization / Demobilization (**Review Mobilization and Demobilization JSA**)	1a. **CONTACT:** Equipment/property damage.	1a. The truck rig's tower/derrick will be lowered and secured prior to mobilization. 1a. Set-up the work area / position equipment in a manner that eliminates or reduces the need for backing of trucks and trailers. 1a. All non-essential personnel should **maintain an exclusion zone of 20 feet**. 1a. Beep horn twice before backing up. 1a. When backing up with an attached trailer use a spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. Stay away from the line-of-fire. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed.
	1b. **FALL:** Slip/trip/fall hazards.	1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Store equipment at lowest potential energy.
2. Open/close well.	2a. **OVEREXERTION:** Muscle strain (some wells have large vault covers).	2a. Keep back straight, lift with legs, keep load close to body, and never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Two people are required when lifting objects over 50 lbs or when the shape makes the object difficult to lift.
	2b. **CAUGHT:** Pinch points associated with removing/replacing manholes and working with hand tools.	2b. Wear leather gloves when working with well vault/cover and hand tools. Do not put fingers under well vault/cover. 2b. Use ratchet and pry bar for well cover and inspect before use.
	2c. **EXPOSURE:** Potentially hazardous vapors.	2c. No open flames/heat sources. 2c. Allow well to vent after opening it and before starting development activities to minimize exposure to vapors. Air monitoring must be performed prior to set up and during the well development activities. Work on upwind side of well.
	2d. **CONTACT:** Traffic.	2d. Wear required PPE including high visibility clothing or reflective vest. 2d. Delineate work area with 42" safety cones and/or other barriers. Position vehicle to protect against oncoming traffic. 2d. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – Electricity, Pressure, compression, tension, torque.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Develop well (mechanical surging).	3a. **CAUGHT:** Cut hazards and finger pinch points. 3b. **CONTACT/EXPOSURE:** Contamination (e.g., SPH, contaminated groundwater, vapors). 3c. **OVEREXERTION:** Muscle strain from lifting equipment. 3d. **CONTACT:** Injury while handling wench line/cable, or with active surging equipment	3a See 2b. 3a. Use required PPE including leather/cut-resistant gloves when handling development equipment. Identify finger/hand pinch points. Keep hands away from active surge equipment. 3a. All non-essential personnel should **maintain an exclusion zone of 20 feet**. 3b. See 2c. 3b. Wear Nitrile gloves and safety glasses. Insert and remove surge block/plunger and line/cable slowly to avoid splashing at the surface. 3b. Use an absorbent pad to clean any spills. 3c. See 2a. 3c. Use mechanical device to insert and remove surge block/plunger if greater than 50lb. 3d. If using a drill rig, inspect all wench lines/cables for any kinks or if frayed prior to use. Replace any damaged lines/cables. Review **Drill Rig checklist prior to development activities**. . 3d. See 3a.
4. Purging well (pumping water to holding tanks/drums/buckets).	4a. **CAUGHT:** Pinch points associated with connecting hose to tank. Pinch points associated with handling pump and hoses. 4b. **FALL:** Using side mounted ladder when attaching hose to tank. Slip, trip, fall from lines/hoses 4c. **CONTACT:** Contamination (e.g., SPH, contaminated groundwater). 4d. **EXERTION:** Muscle strain from lifting/carrying equipment. 4e.**FALL:** Spilled purge water.	4a. See 3a. 4a. Ensure that fingers are not placed near coupling when attaching and securing hose(s). Do not place fingers under pump/hoses. Wear leather or cut-resistant gloves when handling pump/hose(s). 4a. Keep hands clear from any line of fire. 4b. Inspect ladder steps make sure steps are not bent/damaged and free of debris/fluid. 4b. Use three points of contact at all times when using ladder. 4b. Utilize anti-whip cords on all compressed hoses. Keep hoses and lines coiled and organized out of designated walking paths around the work zone. 4c. Secure water hose. 4c. Do not overfill tanks, and purge/transfer liquids in such a manner that they do not splash. (See 3b). 4c. Dispose of used materials/PPE in the designated impacted PPE container. 4d. Use lifting techniques to minimize muscle strain when carrying equipment. When possible, use mechanic means to lift equipment. 4d. Use two people to lift any equipment or material that is over 50 lbs. 4e. Clean up any spills using absorbent pads or spill kits.
5. Decontaminate equipment	5a. **CONTACT/EXPOSURE:** Contamination (e.g., SPH, contaminated groundwater, vapors). 5b. **EXPOSURE/CONTACT:** Chemicals in cleaning solution	5a. See 3b. 5b. Decontaminate equipment in well-ventilated area. Wear nitrile gloves to avoid skin contact with cleaning solutions.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – Electricity, Pressure, compression, tension, torque.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl. No. GEN-016	DATE: 1/5/2013	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Vac Truck Operations**	**Vac Truck Operations**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
T. Henderson	Project Engineer/PM	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather / Kevlar/ Nitrile (chemical resistant)
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: High Visibility clothing, tyvek suit (if needed)	
☒ SAFETY GLASSES	☒ SAFETY SHOES: (Steel Toe)		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Vac hoses, 5-gas meter, (2) 20 lb fire extinguishers

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A 10 foot exclusion zone will be maintained around (Vac Truck).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set-up Vac Truck and Work Area.	**1a. CONTACT:** With personnel and structures.	1a. Prior to moving truck, review where truck is to be postioned. • Use spotter while backing truck. • Review hand signals with driver prior to backing. • Secure work area with traffic cones. • Don high visibility clothing.
	1b. CAUGHT: In the line of fire of vac truck while backing; Caught in pinch points while making hose connections.	1b. Back up spotter must position him/herself to “leave him/herself an out”.Do not stand in line with truck while backing; stand clear of truck. 1b. Keep hands clear of potential pinch points while making hose connections (i.e., cam fittings); wear cut-resistant gloves.
	1c. FALL: Falls from trip hazards in the work area (i.e., rocks, branches, depressions, tools and equipment).	1c. Inspect work area for slip, trip or fall hazards and remove or delineate. • Keep tools and equipment not in use out of the work area. • Minimize vac hose lengths.
	1d. EXPOSURE: Biohazards; residual contaminants in or on vac hose; loud noise.	1d. Review SOP for tick prevention. 1d. Identify potential bees nests in work area and avoid or spray with an insecticide. 1d. Inspect inside of hoses for residual liquids, do not handle hoses without chemical resistant gloves. 1d. Don hearing protection when noise levels exceed 85 dBa.
	1e. OVEREXERTION: From setting up work area and vac hoses.	1e. Utilize correct body positioning (i.e., knees bent, back straight, shoulders square). • Do not reach over an arm’s length away to obtain an item. • Do not lift loads over 50lbs without additional assistance.
	1f. ENERGY SOURCE: Static electricity.	1f. Verify truck is either bonded to vessel that is being vacced or that he truck is grounded. • Verify <10 ohms measured on ground wire.
2. Perform Vac activities.	**2a. CONTACT:** With Vac hose due to hose jumping; Vac truck movement.	2a. Maintain distance of 10 feet from vac hose while operating. 2a. Chock tires of truck with 2 tire chocks once positioned.
	2b. CAUGHT: In pinch points associated with vac truck valve handles.	2b. See 1b above.
	2c. FALL: From trip hazards in the work area.	2c. See 1c above.
	2d. EXPOSURE/CONTACT: Liquids, noise and vapors.	2d. Tape all hose connections prior to beginning vac activities. 2d. Upon completing vac activities, wipe down equipment with sorbent pads. • Don nitrile gloves while handling impacted equipment. • Monitor breathing zone with air monitoring device (e.g.,

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

		PID, Multi-gas meter). • Minimize duration or work around loud equipment if possible.See 1d above.
3. Obtain tank level measurement / Pack truck for departure.	**3a. FALLS:** From tools and equipment in the work area; climbing fixed ladder to gauge truck. **3c. EXERTION:** From opening vac truck dome. **3b. EXPOSURE:** To residual impacted material. **3c. CAUGHT:** In pinch points while closing dome, storage boxes.	3a. Keep tools and equipment to be packed away out of work/walk area. 3a. Prior to ascending truck ladder, verify that it is secure and in good condition (i.e., all steps intact, no signs of rot, no missing hardware). 3a. Don harness if truck is not equipped with catwalk around dome of truck. 3a. See 1c above. 3b. See 1e above. 3c. Wipe down gauge stick over dome so as not to drip liquids on truck or ground. 3c. See 1 above. 3c. See 1b above.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Cntrl. No. GEN-017	DATE: 10/9/12	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction – Concrete & Asphalt**	**Concrete Sidewalk Flag / Well Pad Replacement**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Ron Lombino	Staff Assistant Geologist	Curtis Taylor	SHSM
		Mike Ritorto	Project Hydrogeologist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYINGRESPIRATOR	☒ GLOVES: Cut Resistant and/or Leather
☒ HARD HAT	☒ FACE SHIELD: (When Jackhammering)	☐ SUPPLIED RESPIRATOR	☒ OTHER: Dust Mask
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION: (While Compressor is Running)	☒ PPE CLOTHING: High visibility long sleeved shirt/ Safety vest	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or Composite toe		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Concrete-Truck, Concrete Mixer, Jack Hammer, Air Saw or Gas Powered Saw, Compressor, Hand Tools, Wheel Barrel, Multi-Gas Meter, 42 Inch Safety Cones, Caution Tape, 20 lb. Fire Extinguisher, "Work Area" Signs, Pressurized Water Sprayer, Flush-Mounted Curb Boxes

Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE: A 10 foot exclusion zone will be maintained while jackhammering.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Verify pre-clearance protocol and mobilize/demobilize.	1a. **CONTACT:** Property damage, personal injury, or underground utilities.	1a. Confirm that local utility companies were contacted prior to sidewalk flag / concrete pad replacement. 1a. Walk the Site to evaluate utility markings and review maps and subsurface clearance form.
	1b. **CONTACT:** With traffic (including any unintended movement of the work truck), contact / interference with other site activities.	1b. Identify potential traffic hazards. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing up when unnecessary. Use additional spotters if necessary. 1b. 1b. Ensure that truck has wheel chocks when parked and compressor has wheel chocks if detached from truck. 1b. Delineate work area with cones, flags, caution tape, and/or other barriers. Construct pedestrian walkway, if needed. Use truck to barricade if possible 1b. Maintain an exclusion zone of 10 feet for workers and pedestrians. 1b. Position "Men at work" signs at site entrances or on either side of exclusion zone. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route; wear bright colored clothing/safety vest.
2. Concrete saw cutting and jackhammering.	2a. **CONTACT:** Flying debris and hoses.	2a. Wear PPE (especially hand, eye, ear and respiratory protection). 2a. Use anti-whip devices on compressor hoses. 2a. Maintain a minimum exclusion zone of 10 feet.
	2b. **EXPOSURE:** Inhalation/exposure to hazardous vapors and/or concrete dust, noise.	2b. Monitor breathing zone with a calibrated PID and multi-gas meter. If vapors sustain levels > 5 ppm, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings. 2b. Wet concrete while using saw to minimize dust. If possible, use Vactron as dust suppression in freezing weather conditions. 2b. Stand upwind and keep body behind saw. 2b. No open flames/heat sources. 2b. Wear hearing protection when saw, jackhammer or air compressor is in operation.
	2c. **EXERTION:** Poor body positioning and use or from handling equipment and materials.	2c. Keep back straight, lift with legs, keep load close to body, and never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use buddy system over 50 lbs or a mechanical lifting device.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Concrete saw cutting and jackhammer (Continued).	2d. **FALL:** Tripping/falling due to uneven terrain, weather conditions, and materials /equipment stored at the Site, broken up concrete.	2d. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2d. Equipment and tools will be staged in a designated-convenient, stable, and orderly manner. Stored at the lowest point of potential energy and out of the walkway and immediate work area. 2d. Ensure power cords and water lines are grouped when used within the work area. 2d. Concrete flag and flush-mounted curb box will be finished flush to grade so that not presenting a slip/trip hazard. 2d. Place concrete chunks in drum(s).
	2e. **CAUGHT:** Pinch points associated with the equipment and vacuum hose.	2e. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 2e. Inspect the equipment prior to use for potential pinch points. 2e. Test all emergency shutdown devices prior to performing task. 2e. Inspect saw blade for worn surface or missing teeth; switch blade if damaged or blunt. 2e. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 2e. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. Maintain established exclusion zone distance. 2e. Drillers and helpers will use the **"Show Me Your Hands"** Policy.
3. Mixing/Pouring concrete and installing manhole.	3a. **CONTACT:** Burn from handling/pouring concrete.	3a. Wear required PPE (including Nitrile gloves, long sleeved shirts, safety glasses) when handling dry/wet concrete and forming concrete flags. 3a. Inspect all transfer equipment (Concrete-Truck, wheel barrel, etc.) prior to pouring concrete. 3a. All non-essential personnel should stay away from the immediate work area; position body out of line-of-fire of equipment and concrete flow. Maintain established exclusion zone distance.
	3b. **EXERTION:** Poor body positioning and use or from handling equipment and materials.	3b. See 2c.
	3c. **FALL:** Tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at the site.	3c. See 2d.
	3d. **EXPOSURE:** Concrete silicates pose dermal and inhalation hazard.	3d. Nitrile {inner} gloves and long sleeve shirt to mitigate dermal contact. 3d. Dust mask must be worn for personnel mixing concrete.
4. Move drum to designated staging area.	4a. **Refer to Drum Handling JSA for Potential Hazards.**	4a. **Refer to Drum Handling JSA for Critical Actions.**
5. Decontaminate equipment	5a. **EXPOSURE:** Wet concrete and dust.	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Use an absorbent pad to clean spills.
	5b. **EXPOSURE:** Chemicals in cleaning solution including ammonia.	5b. See 3a.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX D

Heat Stress and Cold Stress Information

Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment (PPE) in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat cramps are as follows:

- severe muscle cramps, usually in the legs and abdomen;
- exhaustion, often to the point of collapse; and
- dizziness or periods of faintness.

First aid treatment includes moving to a shaded area, rest, and fluid intake. Normally, the individual should recover within one-half hour. If the individual has not recovered within 30 minutes and the temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat. The circulatory system of the individual fails as blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- rapid and shallow breathing;
- weak pulse;
- cold and clammy skin with heavy perspiration;
- skin appears pale;
- fatigue and weakness;
- dizziness; and
- elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids and electrolytes. If the individual has not recovered within 30 minutes and the temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a **MEDICAL EMERGENCY**, requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- dry, hot, red skin;
- body temperature approaching or above 105°F;
- large (dilated) pupils; and
- loss of consciousness - the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility.

Heat stress (heat cramps, heat exhaustion, and heat stroke) is a significant hazard if any type of protective equipment (semi-permeable or impermeable) which prevents evaporative cooling is worn in hot weather environments. Local weather conditions may require restricted work schedules in order to adequately protect personnel. The use of work/rest cycles (including working in the cooler periods of the day or evening) and training on the signs and symptoms of heat stress should help prevent heat-related illnesses from occurring. Work/rest cycles will depend on the work load required to perform each task, type of protective equipment, temperature, and humidity. In general, when the temperature exceeds 88°F, a 15 minute rest cycle will be initiated once every two hours. In addition, potable water and fluids containing electrolytes (e.g., Gatorade) will be available to replace lost body fluids.

Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 40°F. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. Training on the signs and

symptoms of cold stress should prevent cold-related illnesses from occurring. The signs and symptoms of cold stress include the following:

- severe shivering;
- abnormal behavior;
- slowing of body movement;
- weakness;
- stumbling or repeated falling;
- inability to walk;
- collapse; and/or
- unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks, and encourage activity, such as walking wrapped in a blanket.

APPENDIX E

Material Safety Data Sheets (MSDS)

AIR LIQUIDE™

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NONFLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas:
Oxygen 0-23.5%; Isobutylene, 0.0005-0.9%

SYNONYMS: Not Applicable **CHEMICAL FAMILY NAME:** Not Applicable **FORMULA:** Not Applicable

Document Number: 50054

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
U.S. SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
BUSINESS PHONE:	1-410-228-6400 (8 a.m. to 5 p.m. U.S. EST)
General MSDS Information**:**	1-713-868-0440
Fax on Demand:	1-800-231-1366
EMERGENCY PHONE:	
Chemtrec: United States/Canada/Puerto Rico:	1-800-424-9300 [24-hours]
Chemtrec International:	1-703-527-3887 [24-hours]

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Isobutylene	115-11-7	0.0005-0.9%	There are no specific exposure limits for Isobutylene.					
Oxygen	7782-44-7	0-23.5%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless, odorless gas mixture. Releases of this gas mixture may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene, a component of this gas mixture, may cause drowsiness and other central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this gas mixture contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, Isobutylene, a component of this gas mixture, may cause drowsiness or central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

CHRONIC: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: ACUTE: Respiratory system, eyes. CHRONIC: Heart, cardiovascular system, central nervous system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	1
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For Routine Industrial Use and Handling Applications

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

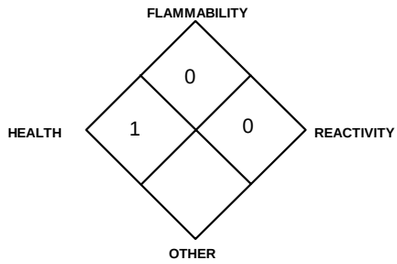
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C [70°F]). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Nitrous Oxide and Oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when oxygen levels are below 19.5%, or during emergency response to a release of this gas mixture. During an emergency situation, before entering the area, check the concentration of Methane and Oxygen. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)
BOILING POINT: -195.8°C (-320.4°F)
FREEZING/MELTING POINT @ 10 psig: -210°C (-345.8°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906
pH: Not applicable.
SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023
MOLECULAR WEIGHT: 28.01
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not applicable.
ODOR THRESHOLD: Not applicable.
SPECIFIC VOLUME (ft^3/lb): 13.8
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for Oxygen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.083 lb/cu ft (1.326 kg/m^3)
FREEZING/MELTING POINT @ 10 psig: -218.8°C (-361.8°F)
BOILING POINT: -183.0°C (-297.4°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 1.105
pH: Not applicable.
SOLUBILITY IN WATER vol/vol at 32°F (0°C) and 1 atm: 0.04.91
MOLECULAR WEIGHT: 32.00
EVAPORATION RATE (nBuAc = 1): Not applicable.
EXPANSION RATIO: Not applicable.
ODOR THRESHOLD: Not applicable.
VOLUME (ft^3/lb): 12.1
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the gas mixture.

APPEARANCE AND COLOR: This is a colorless, odorless gas mixture.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.
DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutylene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in the Nitrogen component of this gas mixture. Lithium reacts slowly with Nitrogen at ambient temperatures. The Isobutylene component of this gas mixture is also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

ISOBUTYLENE:
LC_{50} (inhalation, rat) = 620,000 mg/kg/4 hours
LC_{50} (inhalation, mouse) = 415,000 mg/kg
NITROGEN:
There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: Contact with rapidly expanding gases can be irritating to exposed skin and eyes.
SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to cause human skin or respiratory sensitization.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for the components in this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for the components in this gas mixture.
Teratogenicity: No teratogenicity effects have been described for the components in this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for the components in gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.
BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.
OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65
NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of this gas mixture on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126
MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).
SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.
Note: DOT 39 Cylinders ship in a strong outer carton (outer package). Pertinent shipping information goes on the outside of the outer package. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.
PROPER SHIPPING NAME: Compressed gases, n.o.s. (*Oxygen, Nitrogen)*or the gas component with the next highest concentration next to Nitrogen.
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126
NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:
U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.
U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas mixture. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.
U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.
U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.
OTHER U.S. FEDERAL REGULATIONS:

- No component of this gas mixture is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs).
- Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable (29 CFR 1910.119).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).

15. REGULATORY INFORMATION (continued)

- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Isobutylene is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,554 kg) or greater.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen.
Florida - Substance List: Oxygen, Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: : No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this gas mixture is on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL/NDSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.
CANADIAN WHMIS REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

AIR LIQUIDE™

This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of CALGAZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

APPENDIX F

Accident Report Form

☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**
(Check applicable company name)

ACCIDENT REPORT

Joe Gentile, Corporate Health and Safety Manager
Cell: (610) 844-6911; Office: (856) 423-8800; Office FAX: (856) 423-3220; Home: (484) 373-0953

PART 1: ADMINISTRATIVE INFORMATION

Project #: _____
Project Name: _____
Project Location (street address/city/state)**:**
_____
_____
Client Corporate Name / Contact / Address / Phone #:
_____
_____
_____
_____
_____

Immediate Verbal Notifications Given To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No
Client Contact	☐Yes	☐No

REPORT STATUS (time due):
☐ Initial (24 hr) ☐ Final (5-10 days)
Date: _____ Date: _____

Accident Report Delivered To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No

REPORT TYPE: ☐ Loss ☐ Near Loss Estimated Costs: $ _____

OSHA CASE # Assigned by Corporate Health & Safety if Applicable: _____

Corporate Health & Safety Confirmed Final Accident Report
☐Yes ☐No

DATE OF INCIDENT: _____

TIME INCIDENT OCCURRED: _____ ☐AM ☐PM

INCIDENT LOCATION – City, State, and Country (If outside U.S.A.)
_____

INCIDENT TYPES: (Select most appropriate if Loss occurred.)
From lists below, please select the option that best categories the incident. When selecting an injury or illness, also indicate the severity level.

☐**INJURY** ☐**ILLNESS**

----------Severity Level----------

☐Fatality ☐First Aid ☐Medical Treatment
☐Restricted Work ☐Lost Time

OTHER INCIDENT TYPES

☐Spill / Release
Material involved: _____
Quantity (U.S. Gallons): _____

☐Misdirected Waste ☐Consent Order ☐NOV
☐Property Damage ☐Exceedance
☐Motor Vehicle ☐Fine / Penalty

ACTIVITY TYPE (Check most appropriate one.)

☐Decommissioning	☐Geoprobe	☐Sampling
☐Demolition	☐Motor Vehicle	☐System Start-up
☐Dewatering	☐Operations/	☐Trenching
☐Drilling	Maintenance	☐AST/UST Removal
☐Excavation	☐Pump/Pilot Test	☐Other_____
☐Gauging	☐Rigging/Lifting	

INJURY TYPE (Check all applicable.)

☐Abrasion	☐Occupational Illness
☐Amputation	☐Puncture
☐Burn	☐Rash
☐Cold/Heat Stress	☐Repetitive Motion
☐Inflammation	☐Sprain/Strain
☐Laceration	☐Other_____

BODY PART AFFECTED (Check all applicable.)

☐Respiratory	☐Shoulder	☐Face
☐Neck	☐Arm	☐Leg
☐Chest	☐Wrist	☐Knee
☐Abdomen	☐Hand/Fingers	☐Ankle
☐Groin	☐Eye	☐Foot/Toes
☐Back	☐Head	☐Other_____

I. PERSON(S) DIRECTLY / INDIRECTLY INVOLVED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Directly/Indirectly Involved in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:
1)				
2)				

II. PERSONS INJURED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Injured in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:	Description of Injury:
1)					
2)					

III. PROPERTY DAMAGED IN INCIDENT (Attach additional information as necessary/applicable.)

Property Damaged:	Property Location:	Owner Name, Address & Phone #:	Description of Damage:	Estimated Cost:
1)				$

2)				$

IV. WITNESSES TO INCIDENT (Attach additional information as necessary/applicable.)

Witness Name:	Address:	Phone #:
1)		
2)		

PART 2: WHAT HAPPENED AND INCIDENT DETAILS

PROVIDE FACTUAL DESCRIPTION OF INCIDENT (e.g., describe loss/near loss, injury, response / treatment).

I. AUTHORITIES/GOVERNMENTAL AGENCIES NOTIFIED (Attach additional information as necessary/applicable.)

Authority/Agency Notified:	Name/Phone #/Fax # of Person Notified:	Address of Person Notified:	Date & Time of Notification:	Exact Information Reported/Provided:

II. PUBLIC RESPONSES TO INCIDENT (if applicable)

Response/Inquiry By: (check one)	Entity Name:	Name/Phone # of Respondent/ Inquirer:	Address of Entity/Person:	Date & Time of Response/Inquiry:
☐Newspaper ☐Television ☐Community Group ☐Neighbors ☐Other _____				

Describe Response/Inquiry:

Roux/Remedial Response:

(Check all that apply.) (Attach photos, drawings, etc. to help illustrate the incident.)

ATTACHED INFORMATION: ☐Photo ☐Sketches ☐Vehicle Acord Form ☐Police Report ☐Other

Name(s) of person(s) who prepared Initial and Final Report:	**Title(s):**	**Phone number(s):**

PART 3: INVESTIGATION TEAM ANALYSIS

CONCLUSION: WHY IT HAPPENED (LIST CAUSAL FACTORS AND CORRESPONDING ROOT CAUSES)

(Root Causes: Lack of knowledge or skill, Doing the task according to procedures or acceptable practices takes more time or effort, Short-cuts or not following acceptable practices is reinforced or tolerated, Not following procedures or acceptable practices did not result in an accident, Lack of or inadequate procedures, Inadequate communications of expectations regarding procedures or acceptable practices, Inadequate tools or equipment, External Factors)

ROOT CAUSE(S) AND SOLUTION(S): HOW TO PREVENT INCIDENT FROM RECURRING

CAUSAL FACTOR	ROOT CAUSE		SOLUTION(S) [Must Match Root Cause(s)]		PERSON RESPONSIBLE	AGREED DUE DATE	ACTUAL COMPLETION DATE
			#	Solution(s)			
			1				
			2				
			3				

INVESTIGATION TEAM:

PRINT NAME	JOB POSITION	DATE	SIGNATURE

No One Gets Hurt!

APPENDIX G

Acord Form

AUTOMOBILE LOSS NOTICE

DATE (MM/DD/YYYY)

AGENCY	INSURED LOCATION CODE	DATE OF LOSS AND TIME
The Treiber Group AJ Gallagher Risk Mgmt Svcs 377 Oak Street Garden City, NY 11530		☐ AM ☐ PM
CONTACT NAME: Teresa Garzia	CARRIER: Great Divide Insurance Company	NAIC CODE: 25224
PHONE (A/C, No, Ext): 516.622.2418	POLICY NUMBER: BAP1549799-10	
FAX (A/C, No): 516.622.2618	POLICY TYPE: Commercial Automobile	
E-MAIL ADDRESS: teresa_garzia@ajg.com		
CODE: SUBCODE:		
AGENCY CUSTOMER ID: ROUXASSO		

INSURED

NAME OF INSURED (First, Middle, Last)	INSURED'S MAILING ADDRESS
Roux Associates, Inc.	Susan Sullivan, General Counsel, Roux Associates, Inc. 209 Shafter Street Islandia, NY 11749
DATE OF BIRTH: / FEIN (if applicable): 11-2579482 / MARITAL STATUS / CIVIL UNION (if applicable):	
PRIMARY PHONE # ☐ HOME ☑ BUS ☐ CELL: 631.232.2600	SECONDARY PHONE # ☐ HOME ☐ BUS ☐ CELL:
	PRIMARY E-MAIL ADDRESS: LegalDept@rouxinc.com
	SECONDARY E-MAIL ADDRESS: Fax Notice of Loss to: 631.232.1525

CONTACT

☐ CONTACT INSURED

NAME OF CONTACT (First, Middle, Last)	CONTACT'S MAILING ADDRESS
Susan Sullivan, General Counsel	Susan Sullivan, General Counsel, Roux Associates, Inc. 209 Shafter Street Islandia, NY 11749
PRIMARY PHONE # ☐ HOME ☑ BUS ☐ CELL: 631.232.2600 / SECONDARY PHONE # ☐ HOME ☐ BUS ☐ CELL:	
WHEN TO CONTACT	PRIMARY E-MAIL ADDRESS: LegalDept@rouxinc.com
	SECONDARY E-MAIL ADDRESS: Fax Notice of Loss to: 631.232.1525

LOSS

LOCATION OF LOSS STREET:	POLICE OR FIRE DEPARTMENT CONTACTED
CITY, STATE, ZIP:	REPORT NUMBER
COUNTRY:	

DESCRIBE LOCATION OF LOSS IF NOT AT SPECIFIC STREET ADDRESS:

DESCRIPTION OF ACCIDENT (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

INSURED VEHICLE

VEH #	YEAR	MAKE:	BODY TYPE:	PLATE NUMBER	STATE
		MODEL:	V.I.N.:		

OWNER'S NAME AND ADDRESS ☐ (Check if same as insured)	PRIMARY PHONE # ☐ HOME ☐ BUS ☐ CELL / SECONDARY PHONE # ☐ HOME ☐ BUS ☐ CELL
	PRIMARY E-MAIL ADDRESS:
	SECONDARY E-MAIL ADDRESS:
DRIVER'S NAME AND ADDRESS ☐ (Check if same as owner)	PRIMARY PHONE # ☐ HOME ☐ BUS ☐ CELL / SECONDARY PHONE # ☐ HOME ☐ BUS ☐ CELL
	PRIMARY E-MAIL ADDRESS:
	SECONDARY E-MAIL ADDRESS:

RELATION TO INSURED (Employee, family, etc.)	DATE OF BIRTH	DRIVER'S LICENSE NUMBER	STATE	PURPOSE OF USE	USED WITH PERMISSION? (Y/N)
					☐

DESCRIBE DAMAGE

1. WAS A STANDARD CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) INSTALLED IN THE VEHICLE AT THE TIME OF THE ACCIDENT?	☐ Y / N
2. WAS THE CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) IN USE BY A CHILD DURING THE TIME OF THE ACCIDENT?	☐ Y / N
3. DID THE CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) SUSTAIN A LOSS AT THE TIME OF THE ACCIDENT?	☐ Y / N

ESTIMATE AMOUNT:	WHERE CAN VEHICLE BE SEEN?:	WHEN CAN VEHICLE BE SEEN?:
OTHER INSURANCE ON VEHICLE - CARRIER:		POLICY NUMBER:

OTHER VEHICLE / PROPERTY DAMAGED **NON - VEHICLE?** ☐ **AGENCY CUSTOMER ID:** ROUXASSO

VEH #	YEAR	MAKE:	BODY TYPE:	PLATE NUMBER	STATE
		MODEL:	V.I.N.:		

DESCRIBE PROPERTY (Other Than Vehicle) **OTHER VEH/PROP INS? (Y/N)** ☐

CARRIER OR AGENCY NAME	NAIC CODE	POLICY NUMBER

OWNER'S NAME AND ADDRESS

PRIMARY PHONE # ☐ HOME ☐ BUS ☐ CELL **SECONDARY PHONE #** ☐ HOME ☐ BUS ☐ CELL

PRIMARY E-MAIL ADDRESS:

SECONDARY E-MAIL ADDRESS:

DRIVER'S NAME AND ADDRESS ☐ **(Check if same as owner)**

PRIMARY PHONE # ☐ HOME ☐ BUS ☐ CELL **SECONDARY PHONE #** ☐ HOME ☐ BUS ☐ CELL

PRIMARY E-MAIL ADDRESS:

SECONDARY E-MAIL ADDRESS:

DESCRIBE DAMAGE

ESTIMATE AMOUNT	WHERE CAN DAMAGE BE SEEN?	

INJURED

NAME & ADDRESS	PHONE (A/C, No)	PED	INS VEH	OTH VEH	AGE	EXTENT OF INJURY
		☐	☐	☐		
		☐	☐	☐		
		☐	☐	☐		
		☐	☐	☐		

WITNESSES OR PASSENGERS

NAME & ADDRESS	PHONE (A/C, No)	INS VEH	OTH VEH	OTHER (Specify)
		☐	☐	
		☐	☐	
		☐	☐	

REPORTED BY	REPORTED TO

REMARKS (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

APPLICABLE IN ALASKA

A person who knowingly and with intent to injure, defraud, or deceive an insurance company files a claim containing false, incomplete, or misleading information may be prosecuted under state law.

APPLICABLE IN ARIZONA

For your protection, Arizona law requires the following statement to appear on this form. Any person who knowingly presents a false or fraudulent claim for payment of a loss is subject to criminal and civil penalties.

APPLICABLE IN ARKANSAS, DELAWARE, KENTUCKY, LOUISIANA, MAINE, MICHIGAN, NEW JERSEY, NEW MEXICO, NORTH DAKOTA, PENNSYLVANIA, RHODE ISLAND, SOUTH DAKOTA, TENNESSEE, TEXAS, VIRGINIA, AND WEST VIRGINIA

Any person who knowingly and with intent to defraud any insurance company or another person, files a statement of claim containing any materially false information, or conceals for the purpose of misleading, information concerning any fact, material thereto, commits a fraudulent insurance act, which is a crime, subject to criminal prosecution and civil penalties. In LA, ME, TN, and VA, insurance benefits may also be denied.

APPLICABLE IN CALIFORNIA

For your protection, California law requires the following to appear on this form: Any person who knowingly presents a false or fraudulent claim for payment of a loss is guilty of a crime and may be subject to fines and confinement in state prison.

APPLICABLE IN COLORADO

It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance, and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policy holder or claimant for the purpose of defrauding or attempting to defraud the policy holder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado Division of Insurance within the Department of Regulatory Agencies.

APPLICABLE IN THE DISTRICT OF COLUMBIA

Warning: It is a crime to provide false or misleading information to an insurer for the purpose of defrauding the insurer or any other person. Penalties include imprisonment and/or fines. In addition, an insurer may deny insurance benefits, if false information materially related to a claim was provided by the applicant.

APPLICABLE IN FLORIDA

Pursuant to S. 817.234, Florida Statutes, any person who, with the intent to injure, defraud, or deceive any insurer or insured, prepares, presents, or causes to be presented a proof of loss or estimate of cost or repair of damaged property in support of a claim under an insurance policy knowing that the proof of loss or estimate of claim or repairs contains any false, incomplete, or misleading information concerning any fact or thing material to the claim commits a felony of the third degree, punishable as provided in S. 775.082, S. 775.083, or S. 775.084, Florida Statutes.

APPLICABLE IN HAWAII

For your protection, Hawaii law requires you to be informed that presenting a fraudulent claim for payment of a loss or benefit is a crime punishable by fines or imprisonment, or both.

APPLICABLE IN IDAHO

Any person who knowingly and with the intent to injure, defraud, or deceive any insurance company files a statement of claim containing any false, incomplete or misleading information is guilty of a felony.

APPLICABLE IN INDIANA

A person who knowingly and with intent to defraud an insurer files a statement of claim containing any false, incomplete, or misleading information commits a felony.

APPLICABLE IN KANSAS

Any person who, knowingly and with intent to defraud, presents, causes to be presented or prepares with knowledge or belief that it will be presented to or by an insurer, purported insurer, broker or any agent thereof, any written statement as part of, or in support of, an application for the issuance of, or the rating of an insurance policy for personal or commercial insurance, or a claim for payment or other benefit pursuant to an insurance policy for commercial or personal insurance which such person knows to contain materially false information concerning any fact material thereto; or conceals, for the purpose of misleading, information concerning any fact material thereto commits a fraudulent insurance act.

APPLICABLE IN MARYLAND

Any person who knowingly and [or]* willfully presents a false or fraudulent claim for payment of a loss or benefit or who knowingly and [or]* willfully presents false information in an application for insurance is guilty of a crime and may be subject to fines and confinement in prison. * [or] effective 01-01-2013

APPLICABLE IN MINNESOTA

A person who files a claim with intent to defraud or helps commit a fraud against an insurer is guilty of a crime.

APPLICABLE IN NEVADA

Pursuant to NRS 686A.291, any person who knowingly and willfully files a statement of claim that contains any false, incomplete or misleading information concerning a material fact is guilty of a felony.

APPLICABLE IN NEW HAMPSHIRE

Any person who, with purpose to injure, defraud or deceive any insurance company, files a statement of claim containing any false, incomplete or misleading information is subject to prosecution and punishment for insurance fraud, as provided in RSA 638:20.

APPLICABLE IN NEW YORK

Any person who knowingly and with intent to defraud any insurance company or other person files an application for commercial insurance or a statement of claim for any commercial or personal insurance benefits containing any materially false information, or conceals for the purpose of misleading, information concerning any fact material thereto, and any person who in connection with such application or claim knowingly makes or knowingly assists, abets, solicits or conspires with another to make a false report of the theft, destruction, damage or conversion of any motor vehicle to a law enforcement agency, the Department of Motor Vehicles or an insurance company, commits a fraudulent insurance act, which is a crime, and shall also be subject to a civil penalty not to exceed five thousand dollars and the value of the subject motor vehicle or stated claim for each violation.

APPLICABLE IN OHIO

Any person who, with intent to defraud or knowing that he/she is facilitating a fraud against an insurer, submits an application or files a claim containing a false or deceptive statement is guilty of insurance fraud.

APPLICABLE IN OKLAHOMA

WARNING: Any person who knowingly and with intent to injure, defraud or deceive any insurer, makes any claim for the proceeds of an insurance policy containing any false, incomplete or misleading information is guilty of a felony.

APPLICABLE IN WASHINGTON

It is a crime to knowingly provide false, incomplete, or misleading information to an insurance company for the purpose of defrauding the company. Penalties include imprisonment, fines and denial of insurance benefits.

APPENDIX H

Concentra Authorization for Medical Services Forms

Concentra™

(Patient Must Present Photo ID at Time of Service)

Authorization for Examination or Treatment

Patient Name: _____ Social Security Number: _____

Employer: _____ Date of Birth: _____

Street Address: _____ Location Number: _____

Temporary Staffing Agency: _____

Work Related

❑ Injury ❑ Illness

Date of Injury _____

Substance Abuse Testing★ (check all that apply)

❑ Regulated drug screen ❑ Breath alcohol

❑ Collection only ❑ Hair collect

❑ Non-regulated drug screen ❑ Rapid drug screen

❑ Other _____

Type of Substance Abuse Testing

❑ Preplacement ❑ Reasonable cause

❑ Post-accident ❑ Random

❑ Follow-up

Physical Examination

❑ Preplacement ❑ Baseline ❑ Annual ❑ Exit

DOT Physical Examination

❑ Preplacement ❑ Recertification

Special Examination

❑ Asbestos ❑ Respirator ❑ Audiogram

❑ Human Performance Evaluation★

❑ HAZMAT ❑ Medical Surveillance

❑ Other _____

Billing (check if applicable)

❑ Employee to pay charges

Special instructions/comments: _____

_____

_____

_____

★ Due to the nature of these specific services, only the patient and staff are allowed in the testing/treatment area. Please alert your employee so that they can make arrangements for children or others that might otherwise be accompanying them to the medical center.

Authorized by: _____ Title: _____

Please print

Phone: (_____) _____ _____

Date

Concentra now offers urgent care services for non-work related illness and injury. We accept many insurance plans.

(Copies of this form are available at www.concentra.com)

Concentra®

Improving America's health, one patient at a time.

Patient Information

The Reason for Today's Visit

❑ Physical exam ❑ Drug Screen ❑ Physical and Drug Screen ❑ Injury
❑ DOT (CDL) certification ❑ Other: _____

Patient

Last name: _____ First name: _____ M.I.: _____
Social Security #: _____ Date of birth (MM/DD/YYYY): _____
Address: _____ Apt. # _____ City: _____ ST: _____ ZIP: _____
Contact phone (home or cell): _____ Work phone: _____ ❑ Female ❑ Male
Occupation _____ ❑ Single ❑ Married

Employer

Employer Requesting Services

Name: _____ Location/store number: _____
Contact name: _____ Contact phone: _____
Address: _____ City: _____ ST: _____ ZIP: _____
Is your employment arranged through a temporary hire agency? ❑ Yes ❑ No Name of agency: _____ Agency phone: _____

The information provided is correct to the best of my knowledge. I will not hold Concentra, its health providers, or its employees responsible for any errors or omissions that I may have made in completing the information on this form. You may contact my employer to verify the purpose of my visit, if necessary.

Signature: _____ **Date:** _____

Notice of Privacy Practices

Your name and signature below indicate that you have received a copy of Concentra's Notice of Privacy Practices on the date and time indicated. If you have any questions regarding the information in Concentra's Notice of Privacy Practices, contact Concentra's Privacy Office at 800-819-5571 or PrivacyOffice@concentra.com.

Name (please print): _____
Signature: _____
Date and time Notice received: _____

If you are here for an ***injury****, please complete the section below.*

Injury date: _____ Injury time: _____

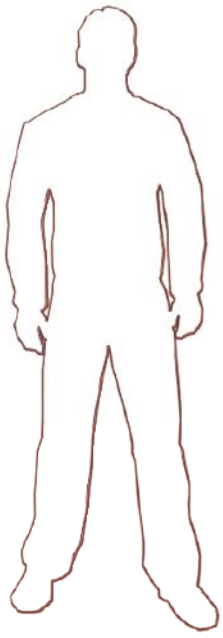
Where were you when the injury occurred?: _____

How did the injury happen? _____

What part of your body is injured? _____

Please check which side of your body is injured. ❑ Right ❑ Left ❑ Both

Using the figure at right, please circle the areas where you are injured. ➲



You may be contacted by Westgate Research, acting on behalf of Concentra, to participate in a satisfaction survey about this visit. We rely on your feedback to help us improve.

Concentra®

Mejorando la salud de los Estados Unidos, un paciente a la vez.

Información del Paciente

La razón para la consulta de hoy

❑ Examen físico ❑ Chequeo de drogas ❑ Examen físico y chequeo de drogas ❑ Lesión
❑ Certificación DOT (CDL) ❑ Otro: _____

Paciente

Apellido: _____ Nombre: _____ Inicial Seg. Nombre: _____
Seguro Social: _____ Fecha de Nacimiento (MM/DD/AAAA): _____
Dirección: _____ Apt. # _____ Ciudad: _____ Estado _____ Cód. Postal: _____
Teléfono de contacto (casa o celular): _____ Teléfono trabajo: _____ ❑ Mujer ❑ Hombre
Ocupación: _____ ❑ Soltero(a) ❑ Casado(a)

Empleador

Empleador Solicitando los Servicias

Nombre: _____ Ubicación/Tienda Número: _____
Nombre del Contacto: _____ Teléfono del Contacto: _____
Dirección: _____ Apt. # _____ Ciudad: _____ Estado _____ Cód. Postal: _____
¿Su empleo está contratado a través de una agencia de empleos temporales? ❑ Sí ❑ No
Nombre de la agencia: _____ Teléfono de la agencia: _____

La información provista es correcta hasta donde yo sé. Yo no haré responsable a Concentra, sus proveedores de la salud, o sus empleados por cualquier error u omisión que yo haya hecho al llenar la información en este formulario. Si es necesario, usted puede contactar a mi empleador para verificar el propósito de mi consulta.

Firma: _____ **Fecha:** _____

Aviso de las Politicos de Privacidad

Su nombre y firma abajo indican que usted ha recibido una copia de la Notificación de Politicas de Privacidad de Concentra en la fecha y hora indicados. Si usted tiene cualquier pregunta en relación con la Notificación de Prácticas de Privacidad de Concentra, por favor contacte al Oficial de Privacidad y Seguridad de Concentra al 800-819-5571 o PrivacyOffice@concentra.com.

Nombre (letra imprenta por favor) _____
Firma: _____
Fecha y hora de recibida la notificación: _____

Si usted está aquí por una ***lesión****, por favor llenela sección de abajo.*

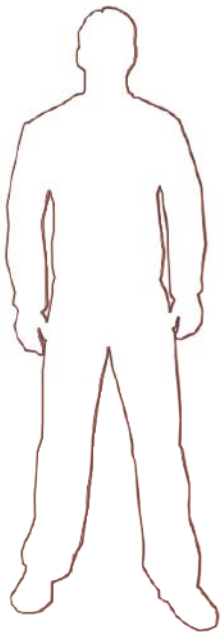
Fecha de la lesión: _____ Hora de la lesión: _____

¿Dónde estaba cuando ocurrió la lesión? _____

¿Cómo ocurrió la lesión? _____

¿Qué parte de su cuerpo está lesionada? _____

Por favor indique cuál lado de su cuerpo está lesionado ❑ Derecho ❑ Izquierdo ❑ Ambos
Utilizando el dibujo a la derecha, por favor marque con un círculo las áreas que están lesionadas ➲



Puede que lo contacter de Westgate Research, en representación de Concentra para que participe en una encuesta de satisfacción acerca de su consulta Nosotros contamos con esta información, la cual nos ayuda a mejorar.