Former Strauss Auto

535 4TH AVENUE
BROOKLYN, NEW YORK

Site Management Plan

NYSDEC Site Number: C224189

Prepared for:
Partners VII/535 Fourth Owner LLC
850 Third Avenue, Suite 16B
New York, New York 10022

Prepared by:
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
360 W 31st Street, New York, NY 10001
(212) 479-5400

Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

OCTOBER 6, 2016

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

CERTIFICATION STATEMENT

I Jason Hayes certify that I am currently a [NYS registered professional engineer or Qualified Environmental Professional as in defined in 6 NYCRR Part 375] and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

[P.E.]

10/6/2016 DATE

LIST OF ACRONYMS

BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	below grade surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	Certificate of Completion
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ESA	Environmental Site Assessment
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Control
NYCDEP	New York City Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PGW	Protection of Groundwater
PID	Photoionization Detector
ppm	parts per million
PRR	Periodic Review Report
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
REC	Recognized Environmental Condition
RI	Remedial Investigation
RRU	Restricted Residential Use
ROD	Record of Decision
RSO	Remedial System Optimization
SCO	Soil Cleanup Objective
SGV	Standards and Guidance Values
SMP	Site Management Plan
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
µg/L	microgram per liter
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan. These controls are applicable until targeted groundwater contaminant reduction, thereby removing the condition imposed upon the Track 1 cleanup already achieved.

Site Identification: C224189 Former Strauss Auto – 535 4th Avenue

Institutional Controls:	1. The property may only be used for restricted residential, commercial, and industrial uses provided the EC/ICs included in this SMP are employed.
	2. The property may not be used for a higher level of use, such as residential or unrestricted use, until remedial action objectives for groundwater are achieved and the Environmental Easement is extinguished, as approved by the NYSDEC.
	3. All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	4. The use of the groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the New York City Department of Health and Mental Hygiene.
	5. Vegetable gardens and farming in remaining Site soil on the property are prohibited.

Site Identification: C224189 Former Strauss Auto – 535 4th Avenue

Institutional Controls: **(continued)**	6. The remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: a. Controlled Property controls are unchanged from the previous certification or that any changes to the controls were NYSDEC-approved; and, b. 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. NYSDEC retains the right to access such Controlled Property at any time to evaluate the maintenance of any and all controls.
	7. Compliance with the Environmental Easement by the Grantor and the Grantor's successors and assigns, and compliance with this SMP by the remedial party and its successors and assigns.
	8. All ECs must be operated and maintained as specified in this SMP.
	9. All ECs on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP.
	10. Data and information pertinent to Site management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP.
Engineering Controls:	1. Vapor Barrier
	2. Sub-membrane Depressurization System

Inspections:	**Frequency:**
1. Site-wide inspection	Annually

Site Identification: C224189 Former Strauss Auto – 535 4th Avenue

2. Vapor Barrier Inspection	Annually
3. Sub-membrane Depressurization System Inspection	Annually
Maintenance:	
1. Sub-membrane Depressurization System Maintenance	As Needed
Reporting:	
1. Groundwater Monitoring Report	Quarterly during the first two years after the injection event and semi-annually thereafter
2. Site Management Report	Included in Periodic Review Report
3. Periodic Review Report	Annually
4. Remedial Site Optimization Report	If Requested by NYSDEC

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program at the former Strauss Auto located at 535 4th Avenue in Brooklyn, New York (hereinafter referred to as the "Site"). The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Brownfield Cleanup Agreement (BCA) Index #C224189-06-14, Site #C224189, which is administered by the New York State Department of Environmental Conservation (NYSDEC).

Partners VII/535 Fourth Owner LLC (the "Volunteer") executed a BCA on June 10, 2014 with the NYSDEC to investigate and remediate the Site. The Site is identified as Block 1041, Lot 1 on the New York City Tax Map and is a rectangular-shaped parcel on the western portion of Block 1041 that occupies an area of about 18,200 square feet (±0.418 acres). A Site Location Map and Site Plan are provided as Figures 1 and 2, respectively. The boundaries of the Site are described in the metes and bounds Site description that is provided in the Environmental Easement, which is included as Attachment A.

Remediation was performed in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP), dated May 6, 2015, In-situ Chlorinated VOC Treatment Plan (Treatment Plan), dated June 3, 2015, and the Remedial Action Work Plan – Addendum #1 (Addendum), dated August 24, 2015. Site remediation included the excavation of soil to development depth, and removal of soil exceeding the NYSDEC Title 6 of the New York Codes, Rules and Regulation (6NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (UU SCOs). An in-situ treatment plan (injection of enhanced zero-valent iron [EZVI] and emulsified vegetable oil [EVO]) was implemented to address residual chlorinated volatile organic compound (CVOC) impacts to groundwater. Residual CVOC-impacted groundwater and soil vapor remain at the Site and are hereafter referred to as "remaining contamination."

Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement will be granted to the NYSDEC, and recorded with the Kings County Clerk, prior to issuance of the Certificate of Completion (COC). The Environmental Easement requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage the remaining contamination until remedial action objectives for groundwater have been achieved and the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. The SMP has been approved

by the NYSDEC, and compliance with the SMP is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may be revised only with the approval of the NYSDEC, and details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the COC. Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Index #C224189-06-14, Site #C224189).

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C (Langan), on behalf of the Volunteer, in accordance with the requirements in the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the ICs and ECs required by the Environmental Easement.

1.2 Revisions

SMP revisions will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to Site conditions. In accordance with the Environmental Easement, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP retained in its files.

1.3 Notifications

Notifications will be submitted by the Volunteer to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in Site use as required under the terms of the BCA, 6NYCRR Part 375 and/or Environmental Conservation Law.

- 7-day advance notice of any field activity associated with the remedial program.

- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.

- Notice within 48-hours of any damage or defect to the foundation, structures or ECs that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

The following table includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information.

Program Manager:	Michael D. Burke (212) 479-5413
Project Manager:	Brian Gochenaur, (212) 479-5479
NYSDOH Project Manager:	Mark Sergott, (518) 402-7860
NYSDEC Project Manager:	Larry Alden, (518) 402-9767
Owner Representative:	David Schwartz, (646) 762-1429

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located at 535 4th Avenue in the Park Slope neighborhood of Brooklyn, New York and is identified as Block 1041, Lot 1 on the New York City Tax Map. The rectangular, 18,200-square-foot (±0.418 acres) parcel is bound by 14th Street to the north, 15th Street to the south, multiple-story residential buildings to the east, and 4th Avenue to the west. The Site is zoned as R8A residential with a C2-4 commercial overlay, which allows for retail use within residential areas. The boundaries of the Site are described in the metes and bounds Site description that is provided in the Environmental Easement included as Attachment A, and a Site Location Map and Site Plan are presented as Figures 1 and 2, respectively.

2.2 Physical Setting

2.2.1 Land Use

The Site is located in an urban setting characterized by residential, commercial, institutional and industrial buildings. The following is a summary of adjoining and surrounding property usage:

Direction	Adjoining Properties	Surrounding Properties
North	14th Street followed by Primary School 124	Multiple-story residential, commercial, institutional, industrial and mixed-use buildings
South	15th Street followed by a multiple-story mixed use (residential and commercial) building	
East	Multiple-story residential buildings	
West	4th Avenue followed by several multiple-story mixed use (residential and commercial) buildings	

Land use within a half mile of the Site is urbanized and includes mixed use buildings, cross streets, subway tunnels, park land, and school facilities. The nearest ecological

receptor is the Gowanus Canal, which is located approximately ½ mile to the west of the Site.

2.2.2 Geology

Soil borings completed during the remedial investigation (RI) and geotechnical study completed by Langan identified a layer of historical fill to depths up to 14 feet below grade surface (bgs). This layer generally consisted of red/brown fine to medium sand with varying amounts of silt, gravel, rock, brick, concrete, milled and crushed asphalt, ash and coal. Isolated occurrences of creosote were also identified within the historical fill matrix. Native soil underlying the Site is characterized as glacial till deposits of the Pleistocene Epoch. These layers can broadly be defined as either sand dominated "sand and silt" or clay dominated "clay and silt" sediments. Geologic cross sections are presented in Figures 3A and 3B. Bedrock was not encountered during these investigations, but is expected to be encountered at about 200 feet bgs.

2.2.3 Hydrogeology

The arrangement of sediment deposition results in a zonal distribution of hydraulic conductivity. The low conductivity clay and silts impart a high hydraulic gradient transiting the center of the clay and silt mass. The dominant sediment contrast between both sand or clay implies a relative permeability contrast. The sand and silt sediments are understood to have higher hydraulic conductivities relative to the clay and silt dominated sediments. The clay dominated sediments that were identified during the subsurface investigations are believed to underlie the Site and suggest a site wide lower confining zone.

Synoptic groundwater level measurements were collected several times a as part of the RI and during each of the three post-injection groundwater monitoring events. During the most recent monitoring event completed on May 23, 2016, groundwater elevations ranged from elevations (el) 17.94 to 24.66 feet referenced to the North American Vertical Datum 1988 (NAVD 88). The groundwater elevation is highest in the southeastern part of the Site and lowest in the northwestern portion of the Site. Groundwater flow at the Site has consistently been shown to be in a northwesterly direction. A groundwater contour map using the February 2016 groundwater elevation data is presented as Figure 4.

There are no wetlands on or immediately adjacent to the Site. Groundwater in this area of New York City is not used as a potable (drinking) water source. New York City

residents receive their drinking water supply from surface reservoirs located in upstate New York.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

2.3.1 Site History

Available records indicate the property was occupied from at least 1888 for many years by churches and religious schools. The Site was used for automotive sales, and automotive service starting sometime between 1951 and 1965. Records indicate the most recent owner of the property, Strauss Auto Center, occupied the Site from at least 1983 until 2012. Strauss ceased operations in 2012 and its facilities were demolished in August 2014. The property remained vacant until May 2015 when remediation and development activities commenced.

2.3.2 Previous Environmental Reports

The following is a list of previous environmental investigations that were completed:

- Phase I Environmental Site Assessment (ESA) dated October 2012 by STV, Inc. (STV)
- Phase II ESI dated January 2013 prepared by STV
- Phase I ESA dated March 11, 2014 by Langan
- Phase II ESI dated March 11, 2014 by Langan
- Limited Soil Vapor Survey of PS 124K dated April 17, 2013 by STV.

2.3.2.1 October 16, 2012 Phase I Environmental Site Assessment prepared by STV Inc.

This Phase I ESA for 535 4th Avenue, Brooklyn, NY conforms to ASTM Practice E1527-05 (Standard Practice for ESA: Phase I ESA Process) and provides an evaluation of recognized environmental conditions (RECs) relating to hazardous materials and wastes at the Site and surrounding properties. Additional evaluations conducted as part of this Phase I ESA included visual assessments for water damage, mold, lead-based paint (LBP), asbestos containing materials (ACM), and polychlorinated biphenyls (PCBs).

Earliest records indicate the Site was developed with a church from at least 1888; thereafter, the Site was used as an automotive sales facility including a garage.

Records indicate the most recent owner of the property, Strauss Auto Center, occupied the Site from at least 1983 until 2012. The Site had been vacant since Strauss ceased operations in 2012. Adjoining property uses at the time of this report include multiple-story residential buildings, a school, and commercial buildings (including an auto repair shop and a laundromat/dry cleaner). Two other nearby dry cleaning operations and a service station with an active groundwater treatment system were identified. The following RECs were identified:

- A partially buried, concrete-encased 2,000-gallon fuel oil underground storage tank (UST) in the cellar of the Site. The NYSDEC Petroleum Bulk Storage (PBS) registration for the tank expired on January 7, 2011 and, therefore, the UST was not in compliance with NYSDEC PBS regulations.
- The Site is E-designated (E-113) for underground gasoline storage tanks testing protocol.
- The garage area:
    - Two fill ports, which were suspected to be associated with two unregistered USTs.
    - A subgrade pit containing oil.
    - Riser pipes and a vent pipe were suspected of being associated with USTs. Four sumps, two of which contained drain pipes.
    - Evidence of former hydraulic lift equipment.
- The cellar area:
    - An out of service and unregistered 250-gallon above ground storage tank (AST) was observed in the cellar of the Site.
    - A large concrete trench, which was observed to be filled with trash and debris.
- The Site was listed as a generator of tetrachloroethylene (PCE) waste in the NY Manifest database from 1995-2001. A request made to the U.S. Environmental Protection Agency (EPA) under the Freedom of Information Act (FOIA) revealed records dating to 1991 which identify the generation of various hazardous wastes, including lead, ignitable waste, spent halogenated waste, and spent non-halogenated waste.

Off-Site RECs were identified including dry cleaning facilities, active spills, gasoline storage tanks and active groundwater remediation.

Non-ASTM environmental concerns included suspected asbestos containing building material, lead-based paint, PCBs and mercury-containing materials, as well as observed containers of paint, antifreeze and other chemicals.

2.3.2.2 January 29, 2013 Phase II Environmental Site Investigation prepared by STV Inc.

This Phase II ESI was completed to evaluate potential impacts to soil, groundwater and soil vapor from the RECs identified by the previous STV Phase I ESA. The Phase II ESI included: a geophysical survey for buried structures, tanks, and utilities; installation of 11 soil borings, 4 temporary groundwater monitoring wells, and 8 soil vapor sampling points; and collection of 17 grab soil samples, 4 groundwater samples and 8 soil vapor samples.

STV's observations found that the Site is underlain by fill material consisting of silt, sand, gravel, and rock and brick fragments to a depth of approximately 5 feet bgs. Native silt and gravel underlie the fill material. Bedrock was not encountered at the maximum soil boring depth of 65 feet bgs. Depth to groundwater ranged from 49 to 54 feet bgs. Based on their review of the USGS Fact Sheet 134-97 "Water-Table Altitude in Kings and Queens Counties, New York, in March 1997", the presumed groundwater flow direction was northwesterly.

The following findings and conclusions were provided in the STV Phase II ESI:

- Potential USTs - The geophysical investigation identified the presence and locations of assumed electrical utilities, hydraulic lift lines, exhaust gas removal ports, floor drains, and plumbing. A covered waste oil pit, remote fill port and associated piping, and a UST were also identified in the garage area. Locations of drain lines associated with the partially buried cellar UST were documented. Additionally, a sidewalk-accessible vault along 15th Street containing a coal fired furnace was discovered,
- Fill/Soil – No staining, odor or elevated photoionization detector (PID) readings were observed in soil borings. Soil sampling results did not exceed UU SCOs for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCB), pesticides, and herbicides. Four metals (copper, nickel, magnesium and/or selenium) were detected in three soil samples above their UU SCOs, but did not exceed Restricted Residential Use (RRU) SCOs. Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) were detected in one sample, which was collected near the waste oil pit at a depth interval of 8 to 10 feet bgs.

- Groundwater – Four VOCs (including PCE and trichloroethylene [TCE]) were detected in three groundwater samples exceeding their respective NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Ambient Water Quality Standards (AWQS) and Guidance Values and one SVOC was detected above the respective Class GA AWQS in one groundwater sample. Two dissolved metals concentrations were above the Class GA AWQS in two groundwater samples.
- Soil Vapor – PCE was detected in each soil vapor sample at concentrations ranging from 26 to 3,400 micrograms per cubic meter (µg/m^3). TCE was detected in 4 of the 8 soil vapor samples at concentrations ranging from 12 to 180 µg/m^3.

2.3.2.3 April 17, 2013 Limited Soil Vapor Survey of PS 124K prepared by STV, Inc.

Based on the elevated concentrations of VOCs in soil vapor and groundwater at the Site, a limited soil vapor survey was conducted at PS 124K, located directly north of the Site, to determine if soil vapor had been impacted. One soil vapor sample was collected and analyzed for VOCs. Elevated concentrations of VOCs were not identified in soil vapor. Based on the results of the soil vapor survey, STV concluded that soil vapor conditions at PS 124K have not been impacted by the Site.

2.3.2.4 March 11, 2014 Phase I Environmental Site Assessment prepared by Langan

This Phase I ESA was conducted in accordance with the ASTM Practice E1527-13 (Standard Practice for ESA: Phase I ESA Process). The Phase I ESA included a review of historicaal sources including the previous Phase I and Phase II reports by STV. The Site remained vacant since the last Phase I ESA. The ESA report identified five on-Site RECs:

- CVOC-impacted groundwater and soil vapor identified at the Site during the Phase II ESI conducted in 2013 by STV.
- Historical usage of the Site for automotive repair began sometime between 1951 and 1965 and involved the storage, application and disposal of hazardous substances. Accidental releases of solvents, petroleum products, PCBs and/or other hazardous substances used at these facilities may have adversely impacted soil, groundwater, and/or soil vapor.
- Based on the Site reconnaissance and the NYSDEC PBS facility database, the following storage tanks were either present or suspected to be present:

- One 2,000-gallon, concrete encased and partially-buried UST was observed in the basement. The fill port and vent line for this tank were observed along the southern portion of the Site along 15th Street.
- An unregistered 250-gallon, metal AST was observed in the basement.
- An unregistered UST containing an unknown volume of waste oil was observed in the garage area of the Site during Site reconnaissance.
- A fill port marked "fuel oil" was observed in the service bay area of the building. This fill port did not appear to be connected to the observed ASTs or USTs, suggesting a possible fourth tank in the building.

A review of historical documents revealed the off-site RECs:

- A drycleaner located 127 feet west-northwest of the Site in 1988.
- A printing shop located 215 feet southwest of the Site from 1906 to 1951.
- A tinsmith located 230 feet southwest of the Site in 1926.
- An auto radiator and metalworking shop located 180 feet northwest of the Site in 1926.
- Two garages with gasoline tanks located over 300 feet cross-gradient or downgradient of the Site from 1926 to 1951.

The following non-ASTM Environmental Concerns were identified at the Site:

- Pursuant to City Environmental Quality Review (CEQR) conducted during the Park Slope Rezoning, the Site has been assigned a restrictive 'E' zoning designation for Underground Gasoline Storage Tanks Testing Protocol (E-113) by the New York City Planning Commission and City Council. The development of 'E'-Designated properties is subject to review and approval by the New York City Office of Environmental Remediation (OER). The receipt of New York City Department of Buildings (NYCDOB) construction permits is contingent on OER's approval.
- The Site buildings may contain ACM, LBP, and PCBs in building materials.

2.3.2.5 March 11, 2014 Phase II Environmental Site Investigation prepared by Langan

The Phase II ESI was conducted to evaluate potential impacts to soil and groundwater from the RECs identified in the Langan Phase I ESA. The Phase II ESI included installation of 12 soil borings and 6 monitoring wells, and collection of 20 grab soil samples and 6 groundwater samples.

Phase II ESI observations confirmed that the Site is underlain by historical fill material consisting predominately of fine to coarse, brown, red, and grey sand with varied amounts of brick and gravel fragments, milled and crushed asphalt, and ash. The fill was observed to a depth of about 11 feet bgs. The fill material was underlain primarily by very fine to medium red/brown sand with varying amounts of silt and clay and interspersed layers of gravel and small cobbles. A clay-dominant confining layer was observed in the deep borings at depths ranging between 40 and 60 feet bgs. Bedrock was not encountered at the maximum soil boring depth of 65 feet bgs. Depth to groundwater ranged from 31.50 to 37.68 feet bgs, corresponding to elevations ranging from el 16.78 to el 21.85 feet NAVD 88.

Based on the findings of the Phase II ESI, the following conclusions were made:

- The historical fill layer contained SVOC and metal concentrations in excess of their respective UU SCOs. A creosote-like substance was observed within the fill layer and its creosote content was confirmed by laboratory fingerprint analysis by EPA Method 8150D.
- While not detected at concentrations above the UU SCOs, several petroleum-related VOCs (ethylbenzene, xylenes) and CVOCs (PCE, cis-1,2-dichloroethylene, and methylene chloride) were detected in soil samples. Sources of these compounds include petroleum storage tanks, which are known and suspected to be present, and use of PCE during the historical automobile repair operations.
- PCE exceeding the AWQS was identified in all six of the groundwater samples. In addition, breakdown products of PCE (TCE, and cis-1,2-dichloroethylene [DCE]) were identified in groundwater samples collected from two wells at concentrations exceeding their respective Class GA AWQS.

2.3.3 Summary of Remedial Investigation Findings

Langan conducted a Phase II ESI between January 27 and February 11, 2014, followed by the implementation of a Remedial Investigation Work Plan (RIWP) between September 29 and November 2, 2014 to investigate potential impacts in soil, groundwater and soil vapor due to historical uses. These investigation phases together constitute the RI. Areas previously inaccessible during the RI within the former Site building were investigated during a Waste Characterization Study in January 2015. Collectively, the investigations consisted of geophysical surveys, soil boring advancement, monitoring well installation, and collection of soil and groundwater samples.

1. Stratigraphy: Beneath the surface cover (i.e., asphalt parking lot and concrete building slab remnants), overburden consists of a historical fill layer to depths of

up to 14 feet bgs. The historical fill generally consists of red/brown fine to medium sand with varying amounts of silt, gravel, rock, brick, concrete, milled and crushed asphalt, ash and coal. Isolated occurrences of creosote were also identified within the historical fill matrix. The fill is primarily underlain by fine grained red/brown sands with thin laminations of silty clays and gravel and cobbles. Clay and silt dominated sediments underlie the southern portion of the Site and are associated with Lake Flushing, a glacial lake that formed as a result of the glacial retreat during the Pleistocene. Sand and silt dominated deposits underlie the northern portion of the Site and are indicative of the alluvial channels that formed during the retreat of Lake Flushing. A confining clay layer was observed at approximately 40 to 60 feet bgs.

2. Hydrogeology: Synoptic groundwater level measurements were collected on February 11, 2014 for MW01 to MW06 and on October 31 and November 2, 2014 for all monitoring wells. Groundwater elevations ranged from el 18.67 to el 24.47 during the October 31, 2014 gauging event and from el 17.68 to el 24.48 during the November 2, 2014 gauging event. The groundwater elevation is generally highest in the southeastern part of the Site and lowest in the northwestern portion of the Site. Groundwater flow direction appears to trend towards the northwest.

3. Confirmed and Suspected USTs: During the Phase II ESI, a partially-buried, 2,000-gallon UST and a 250-gallon AST were observed in the basement, and a UST containing an unknown volume of waste oil was observed in the garage area of the former buildings. Hydraulic lifts were also observed in the garage area. The September 2014 geophysical survey identified two additional anomalies consistent with USTs in the garage area, a possible oil/water separator, two sumps and nine anomalies consistent with the former hydraulic lifts.

4. Soil Impacts:

    a. Historical Fill: Historical fill contains SVOC, metals and PCBs at concentrations that exceed the UU SCOs and RRU SCOs. Hexavalent chromium was detected above its UU SCO at 20 to 20.5 feet bgs in SB07. While this depth interval coincides with that of native soil, the occurrence of hexavalent chromium in soil is likely associated with historical fill.

    b. Creosote-Impacted Soil: Petroleum-like impacts (i.e., staining and discoloration) were visually observed in SB01 from 5 to 7 feet bgs and in

SB04 from 4 to 8 feet bgs. Samples were collected from these intervals and submitted to York Labs for fingerprint analysis to evaluate the nature of petroleum-like material. The results of the fingerprint analyses indicated that both samples resembled creosote. Creosote is generally used to treat wood and contains high levels of polycyclic aromatic hydrocarbons (PAH). The presence of creosote is likely associated with historical fill material, as there are no known historical Site uses in which creosote was used.

c. Tetrachloroethylene (PCE)-Impacted Soil: Soil samples collected throughout the Site contained detectable concentrations of PCE. Although soil concentrations were below the UU SCOs, historical use as an automobile repair facility with known use of PCE, as documented by the Site's listing as a RCRA generator of PCE waste, is the likely source of PCE-impacted soil.

5. Groundwater Impacts:

a. Chlorinated Volatile Organic Compounds (CVOCs): PCE was detected in all monitoring wells installed during Langan's RI. Breakdown products were also identified in four of the monitoring wells. These compounds were detected in groundwater samples collected from the parking lot and south of the Site during STV's Phase II ESI. The highest concentration of PCE was detected in a down-/cross-gradient well (MW08) near the southwest corner of the Site; however, the two nearest up-gradient monitoring wells exhibited PCE concentrations two orders of magnitude less than MW08.

b. Petroleum-related Volatile Organic Compounds (VOC): An isolated detection of benzene was identified at a concentration greater than its Class GA Ambient Water Quality Standard (AWQS) in MW09 during the supplemental investigation. Toluene was detected above its Class GA AWQS in three groundwater samples collected during STV's Phase II ESI. These constituents were not detected in Site soil above their respective UU or RRU SCOs and no visual or instrumental evidence of past releases was observed, indicating a reportable petroleum release did not occur at the Site. Based on these findings, a source of petroleum-related VOCs in groundwater is either from incidental releases associated with the historical use of the Site or an off-Site source.

c. SVOCs: SVOCs, particularly PAHs, were detected in MW06, located in the former garage area near the northwest corner of the Site. PAHs were detected in historical fill at concentrations greater than their respective UU and RRU SCOs in the vicinity of MW06 and are the likely source of PAHs in groundwater.

d. Metals: Metals, including copper, magnesium, manganese, lead, nickel and selenium, were detected in groundwater at concentrations greater than their Class GA AWQS. With the exception of selenium, these metals were detected also in historical fill. These metals in groundwater are consistent with an urban environment and the source may be attributed to historical fill.

6. Soil Vapor Impacts: Soil vapor sampling results indicated the presence of several VOCs, including CVOC and petroleum-related VOCs, above the range of ambient air concentrations. PCE was detected in each soil vapor sample at concentrations ranging from 26 to 3,400 µg/m^3. TCE was detected in 4 of the 8 soil vapor samples at concentrations ranging from 12 to 180 µg/m^3. The highest concentrations of PCE and TCE were identified in the garage area. Petroleum-related VOCs (xylenes) also were detected in soil vapor samples collected across the Site. These constituents were not detected in Site soils above UU or RRU SCOs; however CVOCs were detected in all the groundwater samples collected from Site monitoring wells. VOC impacts to soil vapor may be due to historical releases of petroleum and chlorinated solvents originating from former on-Site operations or off-Site sources.

7. Sufficient analytical data was gathered during the RI to establish soil cleanup levels and to develop a remedy for the Site. The remedy addresses removal and closure of known and unknown USTs; removal of historical fill impacted with SVOCs, metals, creosote, and PCBs; treatment of groundwater impacted with CVOCs; and the mitigation for potential soil vapor intrusion.

2.4 Remedial Action Objectives

Objectives for the remedial program were established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program was to restore the Site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the Site through the proper application of

scientific and engineering principles. The remedial action objectives for this Site as listed in the Decision Document dated May 2015 are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

2.4.1 Remedial Action Implementation

The following remedial actions were performed in accordance with these documents:

1. Decommissioning, closure, and removal of two registered ASTs (PBS No. 2-508594)
2. Decommissioning, closure, and removal of 13 USTs and associated grossly-impacted soils encountered during remedial excavation
3. Excavation and off-Site disposal of historical fill and native soil exceeding UU SCOs
4. Collection and analysis of confirmation soil samples to confirm Track 1 SCOs (UU SCOs) have been achieved, with over-excavation as required

5. Implementation of an in-situ remedy using enhanced zero-valent iron (EZVI) and emulsified vegetable oil (EVO) via direct-push injection to reduce residual CVOC concentrations in groundwater to asymptotic levels
6. Backfilling of remedial excavations, as necessary
7. Installation of a vapor barrier and sub-membrane depressurization system (SMDS)
8. Development and execution of a HASP and CAMP for the protection of on-Site workers, the general public, and the environment during remediation and construction activities
9. Implementation of Institutional Controls in the form of an SMP and an Environmental Easement

Superstructure construction is ongoing and the above-slab components of the SMDS (i.e., risers and blowers) have not been installed. All other remedial activities were complete as of December 2015.

2.4.2 Removal of Contaminated Materials from the Site

Excavation was completed and endpoint samples confirmed that Track 1 SCOs (UU SCOs) were achieved. The UU SCOs are listed in Table 1. Historical fill and native soil with contaminants at concentrations above UU SCOs were excavated to depths of about 17 feet bgs, with deeper excavations to 25 feet bgs for an elevator pit. Approximately 22,298 tons of historical fill and native soil were transported to the Capitol Development Facility in Bangor, Pennsylvania.

Following the excavation and removal of historical fill and native soils to development depth, confirmation soil samples were collected to confirm Track 1 SCOs were achieved. Per the requirements of the RAWP and DER-10, confirmation samples were collected from the excavation bottom for every 900 square feet of bottom area. Sidewall samples were not collected due to the presence of support of excavation structures. Confirmation soil samples showed that soil did not contain concentrations of contaminants above UU SCOs.

2.4.3 Removal of Underground Storage Tanks

Two registered tanks (PBS No. 2-508594), which included one 275-gallon and one 2,000 gallon No. 2 fuel oil AST, were removed on January 20, 2015 prior to building demolition and were administratively closed. Thirteen USTs were removed from the Site during remedial excavation between June 4 and August 20, 2015. The tanks included:

- One 550-gallon heating oil UST

- One 550-gallon motor fuel UST
- Six 30-gallon and three 45-gallon hydraulic oil USTs
- Two 275-gallon fuel oil USTs

The removal of the 13 USTs was completed in accordance with applicable federal, state, and local regulations. The contents of the USTs were disposed off-Site at Enviro Waste Oil Recovery, LLC in Mahopac, New York and the cleaned tanks were disposed of at TNT Scrap in Brooklyn, New York.

A release of petroleum product was observed during the removal of the 275-gallon tank on August 10, 2015. The product was contained on poly sheeting; however, due to weather conditions, the poly sheeting was compromised and petroleum product impacted the soil beneath. A spill was reported to the NYSDEC and Spill No. 1505072 was assigned to the Site. Approximately four tons of petroleum-impacted soil was excavated and disposed of at Clean Water of New York in State Island, New York.

2.4.4 Groundwater Treatment

Based on the conceptual Site model, in-situ enhanced bioremediation (ISEB) in conjunction with in-situ chemical reduction (ISCR) was chosen as the remedy to treat residual CVOC-impacted groundwater. ISCR using EZVI was the primary remedy. To ensure high effectiveness of the remedy, the application of the bioaugmentation culture SDC-9™ used to enhance the performance of the EZVI.

The mixture of EVO, EZVI, and SDC-9™ was based on the Site's geological and hydrogeological conditions, the appropriate longevity, and feasibility. Based on the Site conceptual model, three targeted treatment areas (Areas A, B and C), varied by injection depths and substrate concentrations, were planned at the Site.. The injection volume was determined by the number of injection points and the injection interval. The EZVI and SDC-9™ mixture was injected into the subsurface using a direct-push drill rig (Geoprobe). Approximately 9,615 gallons of EZVI were injected into the subsurface between July 16 and August 5, 2015.

Five performance monitoring wells were installed on-Site to monitor groundwater conditions following injections. Both off-Site wells (MW05 and MW07) installed during the RI also will be used to evaluate up-gradient groundwater conditions. Performance-monitoring well locations are shown on Figure 5 and a summary of well construction details are presented on Table 2. Well construction logs are provided in Attachment B.

2.5 Remaining Contamination

2.5.1 Soil

None: Site soil meets Track 1 Unrestricted Use SCOs.

2.5.2 Groundwater

Three quarterly post-injection performance monitoring events have been completed to date. A summary of analytical results is presented in Table 3 and Figure 5. The following CVOCs were detected in groundwater during post-injection monitoring events at concentrations above their respective AWQS:

- Cis-1,2-dichloroethene was detected at concentrations ranging from non-detect to 76 micrograms per liter (µg/L)
- PCE was detected at concentrations ranging from non-detect to 62 µg/L
- TCE was detected at concentrations ranging from non-detect to 13 µg/L

2.5.3 Soil Vapor

Soil vapor sampling results from previous environmental investigations performed prior to implementation of the RAWP indicate the presence of several VOCs, including CVOC and petroleum-related VOCs, above the range of ambient air concentrations. Soil vapor concentrations exceeding the NYSDOH Air Guideline Values (AGVs) are listed below:

- PCE was detected in each soil vapor sample at concentrations ranging from 26 to 3,400 micrograms per cubic meter (µg/m^3).
- TCE was detected in 4 of the 8 soil vapor samples at concentrations ranging from 12 to 180 µg/m^3.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This IC/EC plan provides:

- A description of all EC/ICs on the Site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the Site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the RAWP and Decision Document to:

1. Implement, maintain and monitor EC systems;
2. Prevent future exposure to remaining contamination by controlling subsurface disturbances; and,
3. Limit the use and development of the Site to restricted residential, commercial, and industrial uses only.

Adherence to these ICs is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. These ICs are:

- The Site may be used for Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(iii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv);

- All Engineering Controls must be operated and maintained as specified in the SMP;
- All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site management of the Site must be reported at the frequency and in a manner defined in the SMP;
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the Volunteer and property owner to ensure compliance with the restrictions identified by this Environmental Easement;
- The Site shall not be used for Residential purposes as defined in 6 NYCRR 375-1.8(g)(2)(i), and the engineering controls described in the following section may not be discontinued without extinguishing the Environmental Easement;
- Vegetable gardens and farming on the site are prohibited;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated;

- The SMP describes obligations the Volunteer assumes on behalf of Volunteer, its successors and assigns. The Volunteer's assumption of the obligations contained in the SMP, which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the NYSDEC's determination the Site is safe for specific uses, but not all uses. The SMP may be modified in accordance with the NYSDEC's statutory and regulatory authority. The Volunteer and all successors and assigns assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

  NYSDEC
  Division of Environmental Remediation
  Site Control Section
  625 Broadway
  Albany, New York 12233
  Phone: (212) 402-9553

- The Volunteer must provide all persons who acquire any interest in the Site a true and complete copy of the SMP the NYSDEC approves for the Site and all NYSDEC-approved amendments to that SMP;

- The Volunteer has covenanted and agreed that, until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Site shall state in at least fifteen-point bold-faced type: This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law;

- The Grantor has covenanted and agreed that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Site;

- The Volunteer covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the NYSDEC may require, that:

  - the inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(d).

- the institutional controls and/or engineering controls employed at such Site:
  - are in-place; and
  - are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the NYSDEC-approved format;
- nothing has occurred that would impair the ability of such controls to protect the public health and environment
- the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;
- nothing has occurred that would constitute a violation or failure to comply with any Site management plan for such controls;
- the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;
- to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program, and generally accepted engineering practices; and
- the information presented is accurate and complete.

3.3 Engineering Controls

Engineering controls installed at the Site, include a soil vapor barrier and SMDS, to prevent the intrusion of residual soil vapor concentrations into the Site building. Once construction of the site building is complete, a vapor intrusion evaluation will be completed to determine if an active SMDS will be required. Details of the vapor intrusion evaluation are summarized in Section 4.4.1. If active mitigation is required, a Track 1 cleanup can only be achieved if the mitigation system can be shut down within 5 years of the date of the COC. Locations of ECs are shown on Figure 6.

3.3.1 Vapor barrier

Exposure to potential soil vapor intrusion is prevented by a seamless vapor barrier membrane, which was installed as a contingency measure to prevent vapor intrusion. A seamless vapor barrier membrane was installed beneath the entire cellar floor slab and along the cellar level walls in accordance with the RAWP and RAWP Addendum. Grace

Preprufe 160R and Bituthene 4000 were installed along the northern, southern and western cellar level exterior walls. Grace Preprufe 300 was installed along the eastern cellar level walls and beneath and along the walls of the sump pit and elevator pit. Raven VaporBlock Plus 20 was installed beneath the remainder of the cellar level floors. Vapor barrier manufacturer's details are provided in Attachment C. The Excavation Work Plan (EWP), included in Attachment E, outlines the procedures required to be implemented in the event the vapor barrier membrane is breached, penetrated or temporarily removed. Procedures for the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4.0 of this SMP.

3.3.2 Sub-membrane Depressurization System

Procedures for system start-up, operation and maintenance of the SMDS are included in the Monitoring and Sampling Plan (Section 4.0 of this SMP) and the Operation and Maintenance Plan (Section 5.0 of this SMP). The Monitoring Plan also specifies inspections in the event that a severe weather condition, which may affect controls at the Site, occurs.

The SMDS consists of horizontal, interconnected, 4-inch diameter perforated high density polyethylene (HDPE) piping placed in a minimum of an 8-inch layer of clean ¾-inch stone. The stone was obtained from a Tilcon-operated quarry located in Wharton, New Jersey. The system underlies the vapor barrier membrane only beneath portions of the cellar that are not occupied by a ventilated parking garage. The horizontal piping will be connected to a vertical, sub-grade vapor collection pipe located in the northern and southeastern portion of the Site. These vertical pipes will extend through the cellar slab, along the interior of the building, to the roof where it will connect with a roof-mounted regenerative blower unit (if required based on the soil vapor intrusion evaluation) upon completion of construction. The riser includes a sample port above the floor slab. The SMDS piping layout plan is provided as Figure 6. The as-built drawing of the sub-membrane portion of the SMDS system is provided as Attachment E.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when effectiveness monitoring indicates the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.3.1 Vapor Barrier Membrane

The seamless vapor barrier membrane is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

3.3.3.2 SMDS

If the initial vapor intrusion evaluation determines that an active SMDS is required, the system will remain in operation until monitoring data demonstrates that the active system is no longer required. The active system will not be discontinued without prior written approval is granted by the NYSDEC. If future vapor intrusion evaluation testing demonstrates that the active system is no longer required, a proposal to discontinue the active SMDS will be submitted by the Volunteer to the NYSDEC and NYSDOH. In the event the active SMDS is discontinued, a passive SMDS and the seamless vapor barrier membrane would mitigate the potential for soil vapor intrusion.

3.3.3.3 Monitoring Wells Associated With Groundwater Treatment

Groundwater monitoring to assess CVOC concentrations in groundwater will continue, as determined by the NYSDEC with consultation with NYSDOH, until residual groundwater concentrations are found to have become asymptotic at an acceptable level over an extended period. As the In-situ CVOC Groundwater Treatment Plan states, it is anticipated the following remedial objectives could be attained within two years following the injection event:

- Reduction of 90% of contaminant concentrations in monitoring wells.
- Reduction of 90% contaminant mass in the groundwater plume on Site.

In the event monitoring data indicates monitoring for CVOCs may no longer be required, a proposal to discontinue the system will be submitted by the Volunteer. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may be revised only with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of Site management for the Site are included in the Quality Assurance Project Plan (QAPP) (Attachment F).

This Monitoring and Sampling Plan describes the methods to be used for evaluating Site information periodically to confirm the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Designed monitoring systems; and
- Annual inspection and periodic certification.

4.2 Site-Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of inspections will require approval from NYSDEC. Site-wide inspections will be performed also after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, inspection forms will be completed (Appendix G). The forms will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;
- The Site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;
- Compliance with permits and schedules included in the Operation and Maintenance Plan; and
- Whether Site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive Site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If Site records are complete and up to date.

Inspections will be performed also in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public, must be provided to the NYSDEC within 7 days of the event.

4.3 Engineering Control Monitoring

Monitoring/Inspection Schedule

Monitoring Program	Frequency*	Analysis
SMDS Inspections	Quarterly during the first year of operation, then annually thereafter	Visual inspection of above-ground system components and alarm testing
Performance Monitoring	Quarterly during the first two years after the injection event and semi-annually thereafter	VOCs, geochemical parameters including total and dissolved iron, total organic carbon (TOC), sulfate, nitrite, chloride, dissolved gases (including methane, ethane, and ethane), dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductivity, pH, temperature, turbidity, salinity and alkalinity, and dehalococcoides quantification
Site-wide Inspections	Annually	Visual inspection of general Site conditions and ECs

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

4.3.1 SMDS Monitoring

Inspections will be conducted on a quarterly basis during the first year after startup to establish it is operational and performing within the design specifications. Thereafter, the frequency will be determined by NYSDEC and NYSDOH, but is assumed to be annually. A visual inspection of the above-ground system components will be conducted during the monitoring event. SMDS components to be monitored include, but are not limited to the following:

- Vacuum blower
- General system piping

A complete list of components to be checked is provided in the Inspection Checklist, included in Attachment G. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, applicable maintenance and repairs will be conducted per the Operation and Maintenance Plan, and the SMDS will be restarted.

This Plan may be modified only with the approval of NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the SMDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the SMDSs are in Section 7.0 of this SMP.

4.4 Post-Remediation Monitoring and Sampling

4.4.1 Soil Vapor Intrusion Evaluation Sampling

Soil vapor intrusion sampling will be performed following completion of the building to determine whether active mitigation is required via the SMDS. Should the vapor intrusion evaluation determine that an active system is required, the system will remain in operation until monitoring data demonstrates that the active system is no longer required.

The vapor intrusion evaluation will be completed in the basement level in areas that are not ventilated by other means (e.g., mechanically ventilated parking garage). The evaluation will be completed in accordance with applicable guidelines in the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006. The investigation will include:

- Completion of a pre-sampling inspection
- Collection of two soil vapor samples from the sampling ports at the base of the SMDS riser pipe
- Collection of two indoor air samples collocated directly adjacent to the soil vapor samples, and two additional indoor air samples collected in other selected basement locations
- Collection of one ambient air sample (AA) for quality assurance and quality control (QA/QC) purposes

Vapor intrusion evaluation sampling locations are shown on Figure 7.

Samples will be collected into laboratory-supplied, batch-certified 6-Liter Summa® canisters calibrated for an 8-hour sampling period and transported via courier following standard chain-of-custody protocols to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. All samples will analyzed for VOCs via United States Environmental Protection Agency (USEPA) Method TO-15. Sample results will be compared to the NYSDOH AGVs and Guidance Document decision matrices to determine if further action is required.

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Groundwater Sampling

Groundwater samples will be collected quarterly for the first two years after the injection event and semi-annually thereafter from the performance monitoring wells to assess the performance of the in-situ groundwater remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC. Detailed sample collection and analytical procedures and protocols are provided in the following sections.

The performance monitoring wells have been installed to monitor up-gradient, on-Site and down-gradient groundwater conditions at the Site. Performance-monitoring well locations are presented on Figure 5, and well construction details are provided on Table 2. Monitoring well construction logs are included in Attachment B.

4.4.2.1 Groundwater Sampling Protocol

Monitoring well sampling activities will be recorded in a field book and a groundwater-sampling log presented in Attachment H. Other observations (e.g., well condition, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

Each monitoring well will be purged and sampled using low-flow sampling techniques. Purging will consist of pumping, at minimum, the stabilized drawdown volume plus the pump's tubing volume, and until the physical and chemical parameters (e.g., temperature, DO, ORP, turbidity) stabilize within the ranges specified in the EPA's Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells, Dated July 30, 1996 and Revised January 19, 2010. Samples will be collected with a submersible pump and dedicated polyethylene tubing. The pump will be decontaminated with Alconox® and water between each sample location.

Groundwater samples will be submitted to a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory for the following analyses:

Sampling Requirements/ Schedule

Sampling Location	Analytical Parameters*			Schedule*
	VOCs (EPA Method 8260)	Geochemical** parameters	Dehalococcoides quantification analysis	
Performance Monitoring Wells MW-12, MW-13, MW-14, MW-15 & MW-16	X	X	X	Quarterly during the first two years after the injection event and semi-annually thereafter

* The frequency of sampling events and analytical parameters will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

** Geochemical parameters include total and dissolved iron, total organic carbon (TOC), sulfate, nitrite, chloride, dissolved gases (including methane, ethane, and ethane), DO, ORP, specific conductivity, pH, temperature, turbidity, salinity and alkalinity

Samples will be collected in accordance with the HASP and QAPP provided as Appendices I and F, respectively. The performance monitoring wells will be gauged and sampled quarterly for the two years after the injection event, and semi-annually thereafter. The sampling frequency may be modified with the approval NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

4.4.2.1 Monitoring Well Repairs, Replacement And Decommissioning

If biofouling or silt accumulation occurs in the on-Site and/or off-Site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are

decommissioned because they have been rendered unusable will be replaced in the nearest available location, unless otherwise approved by the NYSDEC.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 Introduction

This Operation and Maintenance (O&M) Plan describes the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This O&M Plan includes:

- Procedures for SMDS start-up and testing
- Steps necessary to allow individuals unfamiliar with the Site to operate and maintain the SMDS
- An operation and maintenance contingency plan

The O&M Plan will be updated periodically to reflect changes in Site conditions or the manner in which the SMDS is operated and maintained.

Information on non-mechanical ECs (i.e., vapor barrier) is provided in Section 3.0 - Institutional and Engineering Control Plan. A copy of this O&M Plan, along with the complete SMP, will be kept at the Site. This O&M Plan is not to be used as a stand-alone document, but as a component document of the SMP.

5.2 SMDS Operation and Maintenance

5.2.1 Scope

This section provides operation and maintenance requirements for the SMDS. The Operation and Maintenance Program has been prepared based on the NYSDOH Guidance and EPA guidance document EPA/625/R-92/016 concerning active depressurization of large buildings and schools (June 1994).

Details of the SMDS design and layout are provided in the Institutional and Engineering Control Plan section of the SMP. An SMDS layout plan is provided as Figure 6.

5.2.2 System Start-Up and Testing

Prior to initial start-up of the SMDS, all accessible SMD components will be inspected. The equipment then will be started in accordance with the manufacturer's recommendations. The system component manuals are included as Attachment J. After installation is completed, a Mitigation System Installation Record form (included in Attachment G) will be completed and included as an attachment to the subsequent Periodic Review Report. System testing following the initial system start-up will be performed as follows:

- While the system is operating, smoke tubes will be used to check for leaks through concrete cracks, floor joints, and at the suction points. Any leaks identified then will be properly sealed.
- Riser pipe sampling ports will be tested with a magnehelic to demonstrate that a negative pressure is being maintained.
- The blower-malfunction warning device will be tested.
- Shortly after installation of the system and completion of building construction, indoor air and SMDS sample port samples will be collected. Samples will be analyzed for the constituents of concern (i.e., VOCs) to confirm concentrations in indoor air are below the air guideline values derived by the NYSDOH, and to test sub-membrane air concentrations. If the sampling results indicate a concentration in indoor air above the air guideline values, the source or cause (e.g., indoor or outdoor sources, improper operation of the SMDS, etc.) will be identified and corrected as necessary.

The system testing described above will be conducted if, in the course of the SMDS lifetime, significant changes are made to the system and the system is restarted.

5.2.3 System Operation

5.2.3.1 Routine Operating Procedures

The vacuum blowers will operate continuously after initial startup. All equipment will be operated in accordance with manufacturer's recommendations (see Attachment J).

5.2.3.2 Trouble Shooting

During the course of operation for the active SMDS, especially immediately after start-up, some technical difficulties may be encountered and the SMDS may not operate within design specifications. Any required maintenance, adjustments, or repairs to the system will be conducted as per manufacturer's recommendations and Section 5.2.4 of this O&M Plan.

5.2.4 System Maintenance

5.2.4.1 Routine Maintenance

Routine equipment maintenance (e.g., replacing vent fans), repairs, and/or adjustments will be determined based on the life expectancy and warranty for the specific part as well as visual observations over time. The need for repairs and/or adjustments will depend upon the results of a specific activity compared to the results obtained when

system operations were initiated. Routine maintenance activities and minimum schedules are provided in the SMDS manual (Attachment J). Routine maintenance of the accessible, non-mechanical SMDS components (i.e., riser) is not anticipated.

5.2.4.2 Non-routine Maintenance

Non-routine maintenance may also be required during the operation of the SMDS, including the following situations:

- The building's owner or occupants report the warning device indicates the SMDS is not operating properly;
- The SMDS becomes damaged; or
- The building has undergone renovations that may reduce the effectiveness of the SMDS.

Activities conducted during non-routine maintenance visits will vary. NYSDEC will be informed of SMDS failure by noon of the following day. Repairs or adjustments will be made to the system as appropriate and as per manufacturer guidelines within 7 days of the equipment failure, whenever possible (i.e., pending availability of parts). If necessary, the system will be redesigned and restarted.

5.3 SMDS Performance Monitoring

Performance monitoring will be conducted to determine whether the SMDS is operating as designed.

5.3.1 Monitoring Schedule

A baseline inspection of the blower and other equipment will be conducted within 24 hours following initial start-up of the system. Inspections will be conducted on a quarterly basis during the first year of implementation to establish it is operational and performing within the design specifications. Thereafter, inspections will be conducted on an annual basis. Inspection frequency is subject to change with the approval of the NYSDEC and NYSDOH. Unscheduled inspections or sampling may take place when a suspected failure of the SMDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SMDS monitoring deliverables are specified in Section 5.4.

5.3.2 General Equipment Monitoring

A visual inspection of the above-ground components of the SMDS will be conducted during the monitoring event. SMDS components to be monitored include, but are not limited to, the following:

- Vacuum blower
- Pressure gauges
- Rate of discharge
- General system piping

A complete list of components to be checked is provided in the Inspection Checklist, presented in Attachment G. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the O&M Plan are required immediately, and the SMDS restarted.

5.3.3 Sampling Event Protocol

Based on the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), air monitoring is not necessary once the SMDS has been properly installed and is maintaining a vacuum underneath the depressed portions of the slab (i.e., areas that are not overlain by a ventilated parking garage). However, some repairs and adjustments will be made during the lifetime of the SMDS. SMDS testing, as outlined in Section 5.2 of the Operation and Maintenance Plan, will be conducted in case of redesign and start-up, or to determine the need to continue SMDS operation.

5.4 Maintenance and Performance Monitoring Reporting Requirements

Maintenance reports and any other information generated during regular operations will be filed on-Site. Reports, forms, and other relevant information generated will be available to the NYSDEC and submitted as part of the Periodic Review Report, as specified in the Section 7.0 of this SMP.

5.4.1 Routine Maintenance Reports

Checklists or forms (see Attachment G) will be completed during each routine maintenance event. Checklists and forms will include the following information:

- Date
- Name, company, and position of person(s) conducting maintenance activities

- Maintenance activities conducted
- Any modifications to the system
- Photographs or sketches showing the approximate location of any problems or incidents noted
- Other relevant documentation (e.g., maintenance invoices, replacement equipment receipts, contractor logs, etc.)

5.4.2 Non-Routine Maintenance Reports

Completed non-routine maintenance forms will include the following information:

- Date
- Name, company, and position of person(s) conducting non-routine maintenance or repair activities
- Presence of leaks
- Date of leak repair
- Other repairs or adjustments made to the system
- Photographs or sketches showing the approximate location of any problems or incidents noted
- Other relevant documentation (e.g., maintenance invoices, replacement equipment receipts, contractor logs, etc.)

6.0 PERIODIC ASSESSMENTS/EVALUATION

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site, and briefly summarizes the vulnerability of the Site and/or engineering controls to severe storms/weather events and associated flooding.

As stated in Section 4.2, Site-wide inspections, including inspections of all ECs, will be performed after severe weather events. The Site is located in an area with 0.2% annual chance flood hazard. In the event of a power loss, SMDS operation would be disrupted, and prevention of soil vapor intrusion is anticipated to be maintained by the vapor barrier/waterproofing membrane until power is restored.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

Should the vapor intrusion evaluation determine that an active SMDS is not required, or should the active system, if needed, be decommissioned in the future, then enrgy use for mitigation will be greatly reduced.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the Volunteer requests such an evaluation of the remedy. An RSO may be appropriate if any of the following occur:

- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the Site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

Site management inspection, maintenance and monitoring events will be recorded on the appropriate Site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

Applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of the table below and summarized in the Periodic Review Report.

Schedule of Monitoring/Inspection Reports

Monitoring Program	Reporting Frequency*
SMDS Inspections	Quarterly in the first year of operation and annually thereafter
Vapor Intrusion Evaluation	Prior to building occupancy
Groundwater Performance Monitoring	Quarterly during the first two years after the injection event and semi-annually thereafter
Site-wide Inspections	Annually

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);

- Observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance;
- Description of maintenance performed;
- System modifications;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc. (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen months after the COC is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as

may be required by the Department. In the event the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in Appendix A – Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual Site inspections and severe condition inspections, if applicable.
- Applicable Site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC.
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the Site-specific RAWP or Decision Document;
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
    - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;

- Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document; and
- The overall performance and effectiveness of the remedy.

7.2.1 Certification of Engineering and Institutional Controls

After the last inspection of the reporting period, a New York State-licensed Professional Engineer will include in the PRR the following certification per NYSDEC DER-10:

For each institutional or engineering control identified for the Site, I certify that to the best of my knowledge all of the following statements are true:

- The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the Site is compliant with the environmental easement;
- The engineering control systems are performing as designed and are effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and
- The information presented in this report is accurate and complete.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I, Jason Hayes, P.E., of Langan, have been authorized and designated by the Volunteer to sign this certification for the Site.

Every five years the following certification will be added:

- The assumptions made in the qualitative exposure assessment remain valid;

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Plan

If any remedial component fails, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for correcting the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until NYSDEC approval.

7.4 Remedial Site Optimization Report

In the event an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. The RSO report will document the research/ investigation and data gathering conducted, evaluate the results and facts obtained, present a revised conceptual Site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs, etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP also may be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

1) 6NYCRR Part 375, Environmental Remediation Programs, dated December 14, 2006.

2) STV, Phase I Environmental Site Assessment, dated October 16, 2012.

3) STV, Phase II Environmental Site Investigation, dated January 29, 2013.

4) Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., Phase I Environmental Site Assessment, dated March 11, 2014.

5) Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., Phase II Environmental Site Investigation, dated March 11, 2014.

6) Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., Geotechnical Engineering Report, dated July 25, 2014.

7) Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., Remedial Investigation Report, dated March 2015.

8) Langan Engineering, Environmental, Surveying, and Landscape Architecture, D.P.C., Remedial Action Work Plan, dated July 7, 2015.

9) NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

10) NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

TABLES

Table 1
Unrestricted Use SCOs
535 4th Avenue
Brooklyn, New York
Langan Project No. 170264501

VOCS (mg/kg)	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethylene	0.33
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
cis-1,2-Dichloroethene	0.02
trans-1,2-Dichloroethene	0.25
1,3-Dichlorobenzene	0.19
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
2-Butanone	0.12
Acetone	0.05
Benzene	0.06
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
Ethyl Benzene	1
Hexachlorobenzene	0.33
Methyl tert-butyl ether (MTBE)	0.93
Methylene chloride	0.05
n-Propylbenzene	3.9
sec-Butylbenzene	11
tert-Butylbenzene	5.9
Tetrachloroethylene	1.3
Toluene	0.7
Trichloroethylene	0.47
1,2,4-Trimethylbenzene	3.6
1,3,5-Trimethylbenzene	8.4
Vinyl Chloride	0.02
Xylenes, Total	0.26
Metals (mg/kg)	
Arsenic	13
Barium	350
Beryllium	7.2
Cadmium	2.5
Chromium, hexavalent	1
Chromium, trivalent	30
Copper	50
Total Cyanide	27
Lead	63
Manganese	1600
Mercury	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109

SVOCS (mg/kg)	
Acenaphthene	20
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	0.8
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	30
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	0.33
Naphthalene	100
o-Cresol	0.33
p-Cresol	0.33
Pentachlorophenol	0.8
Phenanthrene	100
Phenol	0.33
Pyrene	100
PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	0.0033
4,4'-DDT	0.0033
4,4'-DDD	0.0033
Aldrin	0.005
alpha-BHC	0.02
beta-BHC	0.036
Chlordane (alpha)	0.094
delta-BHC	0.04
Dibenzofuran	7
Dieldrin	0.005
Endosulfan I	2.4
Endosulfan II	2.4
Endosulfan sulfate	2.4
Endrin	0.014
Heptachlor	0.042
Lindane	0.1
Polychlorinated biphenyls	0.1

Notes:
SCO: Soil Cleanup Objective
SVOC: semivolatile organic compound
VOC: volatile organic compound
PCB: polychlorinated biphenyl
mg/kg: milligram per kilogram

Table 2
Well Construction Details
535 4th Avenue
Brooklyn, New York 11215
Langan Project No. 170264501

Well ID	Installation Date	Equipment Used	Associated Soil Boring	Inner Well Diameter (inches)	Total Depth (feet bgs)	Screened Interval (feet bgs)	Screen Length (feet)	Screen Material	Riser Interval (feet bgs)	Riser Material	Sand Pack Interval (feet bgs)	Bentonitie Seal Interval (feet bgs)	Top of Riser Elevation (NAVD88)
MW05	2/11/2014	Compact Rotosonic 17-C	SW05	2	41	19 - 39	20	0.020-inch slotted PVC	0 - 19	PVC	17 - 45	2 - 17	53.35
MW07	10/24/2014	Geoprobe 8140LC Roto-sonic	SB07	2	40	28 - 38	10	0.020-inch slotted PVC	0 - 28	PVC	26 - 40	24 - 26	56.71
MW12	4/4/2015	Geoprobe 7822 DT	MW12	2	37	27 - 37	10	0.020-inch slotted PVC	0 - 27	PVC	25 - 37	2 - 25	39.5
MW13	9/8/2015	Geoprobe 7822 DT	MW13	2	41	31 - 41	10	0.020-inch slotted PVC	0 - 31	PVC	29 - 41	2 - 29	39.7
MW14	9/8/2015	Geoprobe 7822 DT	MW14	2	29	13 - 23	10	0.020-inch slotted PVC	0 - 13	PVC	11 - 29	2 - 11	39.59
MW15	9/9/2015	Geoprobe 7822 DT	MW15	2	38	28 - 38	10	0.020-inch slotted PVC	0 - 28	PVC	26 - 38	2 - 26	39.29
MW16	9/8/2015	Geoprobe 7822 DT	MW16	2	41	31 - 41	10	0.020-inch slotted PVC	0 - 31	PVC	29 - 41	2 - 29	39.61

Notes:

1. PVC = Polyvinyl Chloride
2. bgs = below ground surface
3. NAVD88 = North American Vertical Datum of 1988
4. Top of riser elevations were based on surveys performed on February 25, 2014, and October 29, 2014.

Table 3
Groundwater Analytical Results
Site Management Plan
535 4th Avenue
Brooklyn, New York
Langan Project No. 170264501

Sample Location	NYSDEC TOGS	MW05			MW07			MW12			MW13		
Sample ID	Standards and	MW05_021114	MW05_100914	MW05_022416	MW07_110214	MW07_022416	MW07_052316	MW12_112015	MW12_022316	MW12_052416	MW13_112015	MW13_022316	MW13_052416
Lab Sample ID	Guidance Values -	14B0261-04	14J0446-05	16B0816-03	14K0070-02	16B0816-04	16E0944-03	15K0769-03	16B0761-03	16E1019-03	15K0769-04	16B0761-05	16E1019-02
Sample Date	GA	2/11/2014	10/9/2014	2/24/2016	11/2/2014	2/24/2016	5/23/2016	11/20/2015	2/23/2016	5/24/2016	11/20/2015	2/23/2016	5/24/2016
Volatile Organic Compounds (µg/l)				Q2	Initial	Q2	Q3	Q1	Q2	Q3	Q1	Q2	Q3
1,1,1-Trichloroethane	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,1-Dichloroethane	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,1-Dichloroethene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,2,4-Trimethylbenzene	5	0.2 U	0.2 U	0.2 U	0.24 J	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,2-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,2-Dichloroethane	0.6	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,3,5-Trimethylbenzene (Mesitylene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,3-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
1,4-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 U	0.2 U	0.38 J	20 U	10 U	0.4 U	4 U	2 U
1,4-Dioxane (P-Dioxane)	~	40 U	40 U	80 U	40 U	80 U	40 U	40 U	4000 U	2000 U	80 U	800 U	400 U
Acetone	50	9.8	1 U	1 U	4.2 U	1 U	1 U	**21000** D	**6900** D	**5900** BD	**240** D	**1200** DE	**1100** D
Benzene	1	0.2 U	0.2 U	0.2 U	0.3 J	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Carbon Tetrachloride	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Chlorobenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Chloroform	7	0.27 J	0.2 U	4.5	0.45 J	1	0.37 J	0.35 J	20 U	10 U	0.46 JD	4 U	2 U
cis-1,2-Dichloroethylene	5	0.66	0.44 J	0.2 U	0.28 J	0.2 U	0.2 U	**20**	**90** D	**14** JD	**29** D	**270** D	**55** D
Ethylbenzene	5	0.2 U	0.2 U	0.2 U	0.22 J	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
m,p-Xylene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	25 U	1 U	10 U	5 U
Methyl Ethyl Ketone (2-Butanone)	50	1.1	0.2 U	0.2 U	1.8	0.2 U	0.2 U	**240** D	**210** D	**230** D	0.4 U	**110** D	**55** D
Methylene Chloride	5	1 U	1 U	1 U	8.8 U	1 U	1 U	1 U	100 U	50 U	2 U	20 U	10 U
Naphthalene	10	NT	NT	1 U	NT	1 U	1 U	1 U	100 U	50 U	2 U	20 U	10 U
n-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
n-Propylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
o-Xylene (1,2-Dimethylbenzene)	5	0.2 U	0.2 U	0.2 U	0.35 J	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
sec-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
tert-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Tert-Butyl Methyl Ether (MTBE)	10	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Tetrachloroethylene(PCE)	5	**37**	**45** D	**34**	**11**	**35**	**21** J	**140**	20 U	10 U	**270** D	**63** D	3.7 J
Toluene	5	0.2 U	0.2 U	0.2 U	1.4	0.2 U	0.2 U	0.52	20 U	10 U	0.4 U	4 U	2 U
trans-1,2-Dichloroethene	5	0.2 U	0.26 J	0.2 U	0.2 U	0.25 J	0.2 U	0.2 U	20 U	10 U	0.4 U	4 U	2 U
Trichloroethylene (TCE)	5	1.1	1.1	0.52	0.23 J	0.76	0.56	**42**	20 U	10 U	**9.6** D	**21** D	2 U
Vinyl Chloride	2	0.5 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 J	20 U	10 U	0.4 U	4 U	**11** D
Xylenes, Total	5	0.6 U	0.6 U	0.6 U	0.84 J	0.6 U	0.6 U	0.6 U	60 U	30 U	1.2 U	12 U	6 U

Notes:

1. Groundwater samples analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) and Guidance Values.
2. µg/l = micrograms per liter
3. Groundwater sample analysis results exceeding NYSDEC TOGS AWQS are highlighted and in bold.
4. Q1 = First quarter of groundwater sampling
5. Q2 = Second quarter of groundwater sampling
6. Q3 = Third quarter of groundwater sampling
6. NT = Sample not tested for constituent
7. U = The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.
8. J = The analyte was detected above the Method Detection Limit (MDL), but below the Reporting Limit (RL); therefore, the result is an estimated concentration.
9. D = Concentrations of analyte was quantified from diluted analysis.
10. B = The analyte was detected above the reporting limit in the associated method blank.
11. E = Concentrations of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

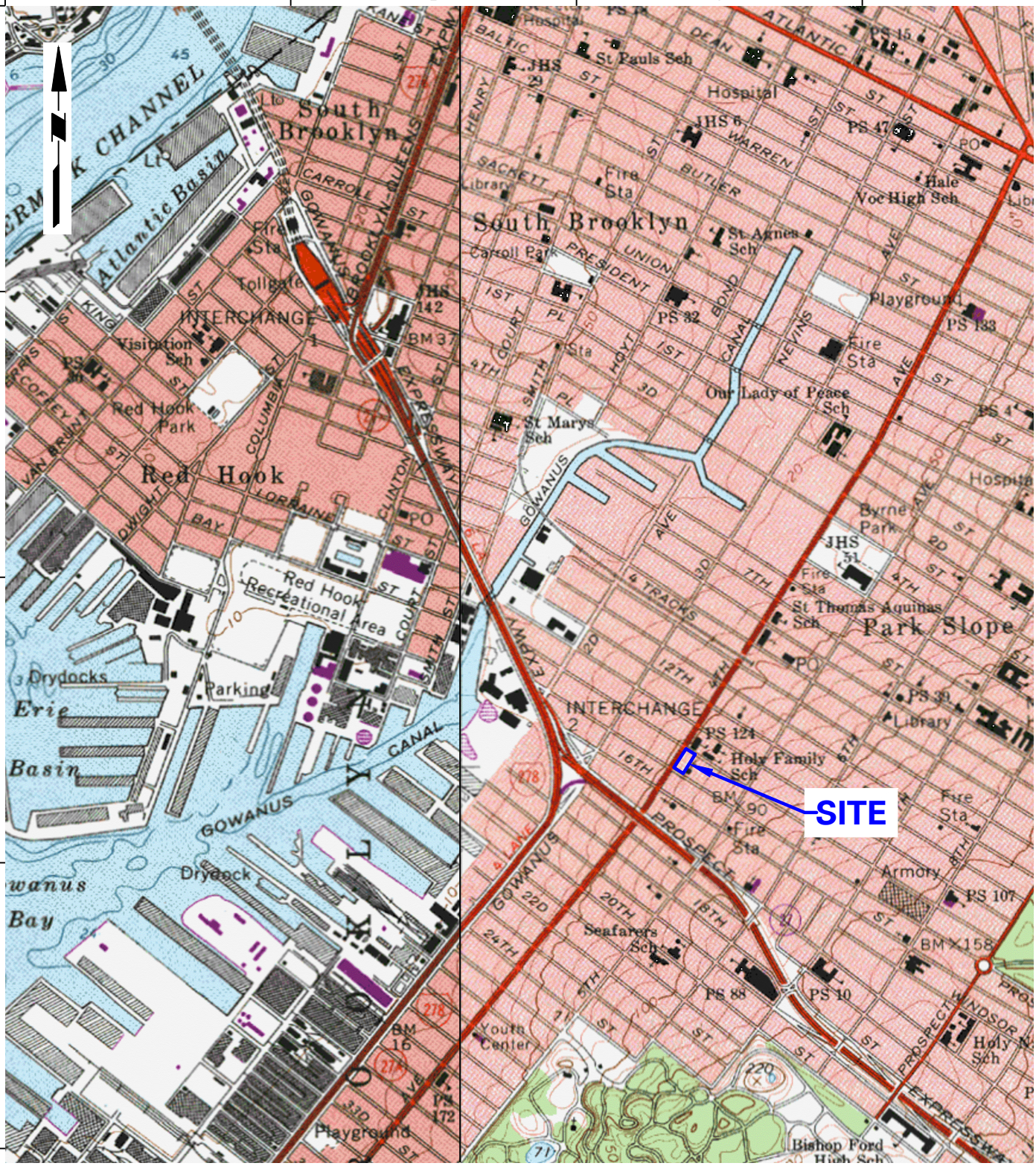
Table 3
Groundwater Analytical Results
Site Management Plan
535 4th Avenue
Brooklyn, New York
Langan Project No. 170264501

Sample Location	NYSDEC TOGS	MW14			MW15			MW16							
Sample ID	Standards and	MW14_112315	MW14_022416	MW14_052316	MW15_112315	MW15_022416	MW15_052416	MW16_112015	DUP01_112015	MW16_022316	DUP01_022316	MW16_052316	DUP01_052316
Lab Sample ID	Guidance Values -	15K0828-02	16B0816-01	16E0944-02	15K0828-03	16B0816-02	16E1019-01	15K0769-05	15K0769-06	16B0761-01	16B0761-02	16E0944-01	16E0944-04
Sample Date	GA	11/23/2015	2/24/2016	5/23/2016	11/23/2015	2/24/2016	5/24/2016	11/20/2015	11/20/2015	2/23/2016	2/23/2016	5/23/2016	5/23/2016
Volatile Organic Compounds (µg/l)		Q1	Q2	Q3	Q1	Q2	Q3	Q1		Q2		Q3	
1,1,1-Trichloroethane	5	0.2 U	2.8	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,1-Dichloroethane	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,1-Dichloroethene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.29 J	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,2,4-Trimethylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,2-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,2-Dichloroethane	0.6	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,3,5-Trimethylbenzene (Mesitylene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,3-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,4-Dichlorobenzene	3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
1,4-Dioxane (P-Dioxane)	~	40 U	80 U	40 U	40 U	80 U	40 U	40 U	40 U	800 U	800 U	80 U	80 U
Acetone	50	1 U	1 U	1 U	1 U	1 U	1 U	2.3	1.1 J	**1200** D	**1200** D	**410** D	**370** D
Benzene	1	0.2 UJ	0.2 U	0.2 U	0.29 J	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Carbon Tetrachloride	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Chlorobenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Chloroform	7	0.94	0.32 J	0.28 J	0.2 U	0.33 J	0.38 J	2.6	2.5	4 U	4 U	0.4 U	0.4 U
cis-1,2-Dichloroethylene	5	**62**	**98**	**76**	0.2 U	0.2 U	0.2 U	1.1	1.1	**41** D	**38** D	**20** D	**20** D
Ethylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
m,p-Xylene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	1 U	1 U
Methyl Ethyl Ketone (2-Butanone)	50	0.2 U	0.2 U	0.2 U	0.2 U	0.66	0.2 U	0.2 U	0.2 U	**62** D	**59** D	22 D	20 D
Methylene Chloride	5	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	20 U	2 U	2 U
Naphthalene	10	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	20 U	20 U	2 U	2 U
n-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
n-Propylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
o-Xylene (1,2-Dimethylbenzene)	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
sec-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
tert-Butylbenzene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Tert-Butyl Methyl Ether (MTBE)	10	0.99	1.1	1.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Tetrachloroethylene(PCE)	5	**52**	**63**	**43** J	**5.7**	**25**	**31** J	**110**	**120**	**62** D	**58** D	**62** J	**65** J
Toluene	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
trans-1,2-Dichloroethene	5	0.47 J	0.55	1.2	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Trichloroethylene (TCE)	5	**14**	**17**	**13**	0.2 U	0.32 J	0.44 J	2.4	2.4	4.6 JD	4 U	3.6 D	3.6 D
Vinyl Chloride	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	4 U	4 U	0.4 U	0.4 U
Xylenes, Total	5	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	12 U	12 U	1.2 U	1.2 U

Notes:

1. Groundwater samples analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) and Guidance Values.
2. µg/l = micrograms per liter
3. Groundwater sample analysis results exceeding NYSDEC TOGS AWQS are highlighted and in bold.
4. Q1 = First quarter of groundwater sampling
5. Q2 = Second quarter of groundwater sampling
6. Q3 = Third quarter of groundwater sampling
6. NT = Sample not tested for constituent
7. U = The analyte was analyzed for, but was not detected at a level greater than or equal to the RL; the value shown in the table is the RL.
8. J = The analyte was detected above the Method Detection Limit (MDL), but below the Reporting Limit (RL); therefore, the result is an estimated concentration.
9. D = Concentrations of analyte was quantified from diluted analysis.
10. B = The analyte was detected above the reporting limit in the associated method blank.
11. E = Concentrations of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

FIGURES



SOURCE: USGS 7.5-MINUTE BROOKLYN AND JERSEY CITY TOPOGRAPHIC QUADRANGLE MAPS, DATED 1967, REVISED 1979

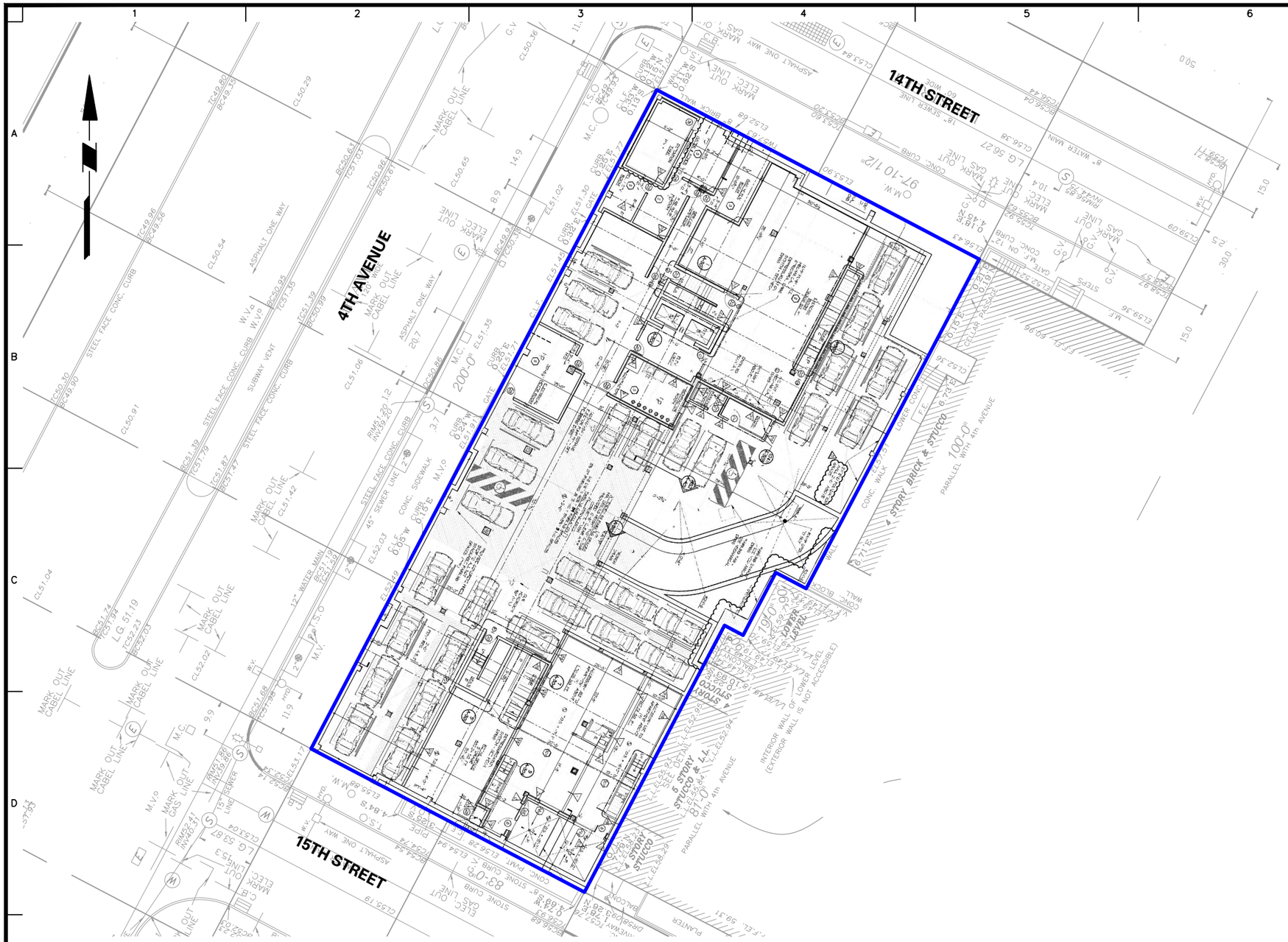
LANGAN

21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project	535 4TH AVENUE BLOCK No. 1041, LOT No. 1 BROOKLYN KINGS NEW YORK
Figure Title	SITE LOCATION MAP
Project No.	170264501
Date	1/20/2016
Scale	1"=1,500'
Drawn By	AT
Checked By	–
Submission Date	–
Figure No.	1
Sheet	1 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 1 - Site Location Map_SMP.dwg Date: 1/25/2016 Time: 09:50 User: aschmiedicke Style Table: Langan.stb Layout: Site Location Map



LEGEND:

SITE BOUNDARY

NOTES:

1. BASE MAP IS TAKEN FROM TOPOGRAPHICAL SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 29, 2014
2. BASE PLAN IS TAKEN FROM CELLAR PLAN, PREPARED BY AUFGANG ARCHITECTS, DATED AUGUST 5, 2015.

30 0 15 30

SCALE IN FEET

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC

Collectively known as Langan

Project

535 4TH AVENUE

BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title

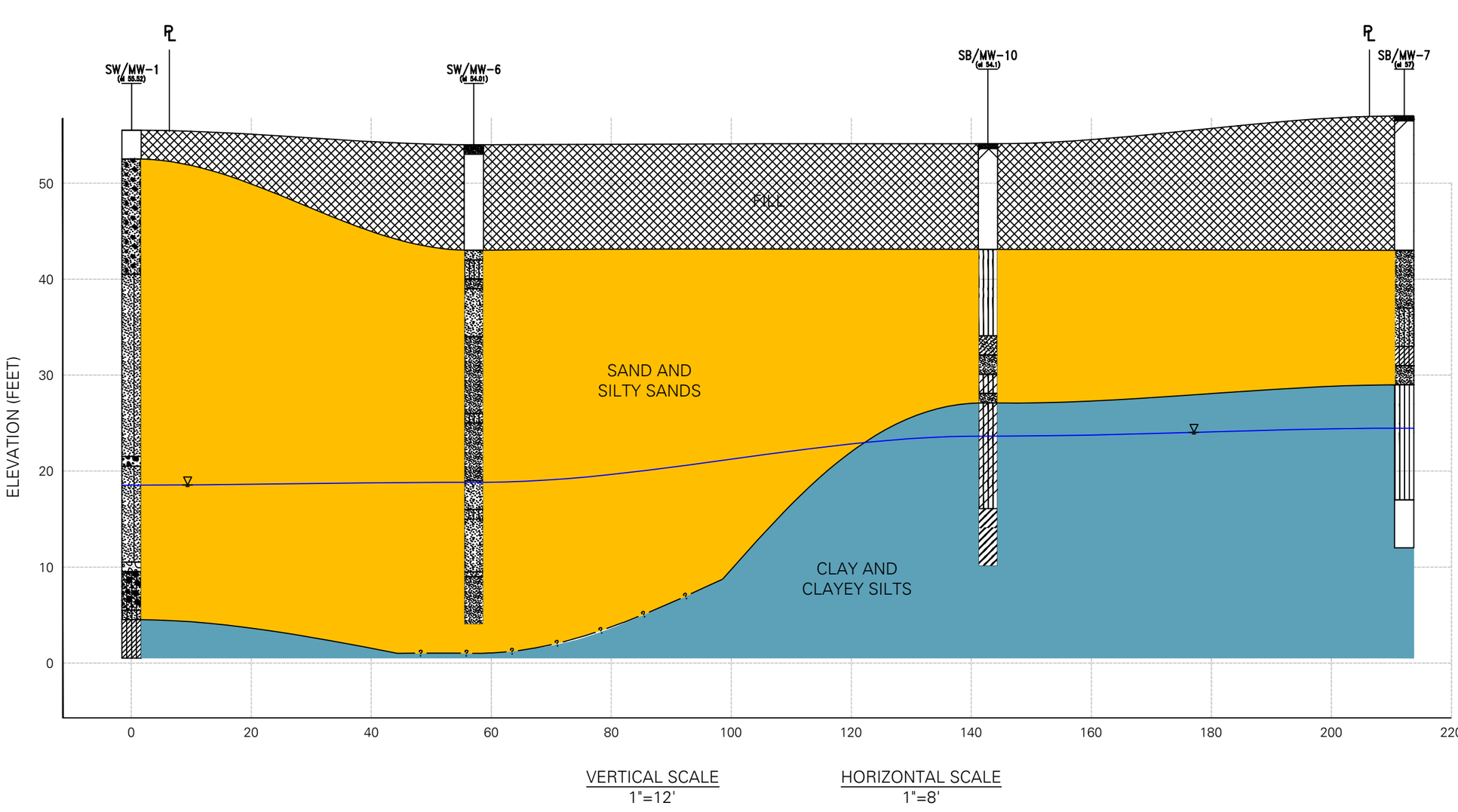
SITE PLAN

Project No. 170264501	Figure No. 2
Date 1/21/2016	
Scale 1" = 30'	
Drawn By AS / Checked By MNG	
Submission Date	Sheet 2 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 2 - Site Plan_SMP.dwg Date: 1/25/2016 Time: 10:02 User: aschmiedicke Style Table: Langan.stb Layout: ANSIB-BL

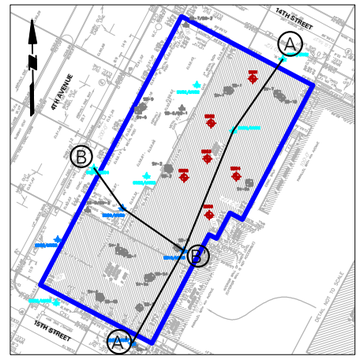
SECTION A-A'

FACING EAST



VERTICAL SCALE
1"=12'

HORIZONTAL SCALE
1"=8'



LEGEND:

- FILL
- SAND AND SILTY SANDS
- CLAY AND CLAYEY SILTS
- GROUNDWATER CONTOUR LINE

SW/MW-1 (el. xx) — Borehole Number (elevation)

Water Level Reading from well gauging

GENERAL NOTES:

1. BASE MAP TAKEN FROM TOPOGRAPHICAL SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 29, 2014.
2. ALL ELEVATIONS SHOWN ON THE PLAN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

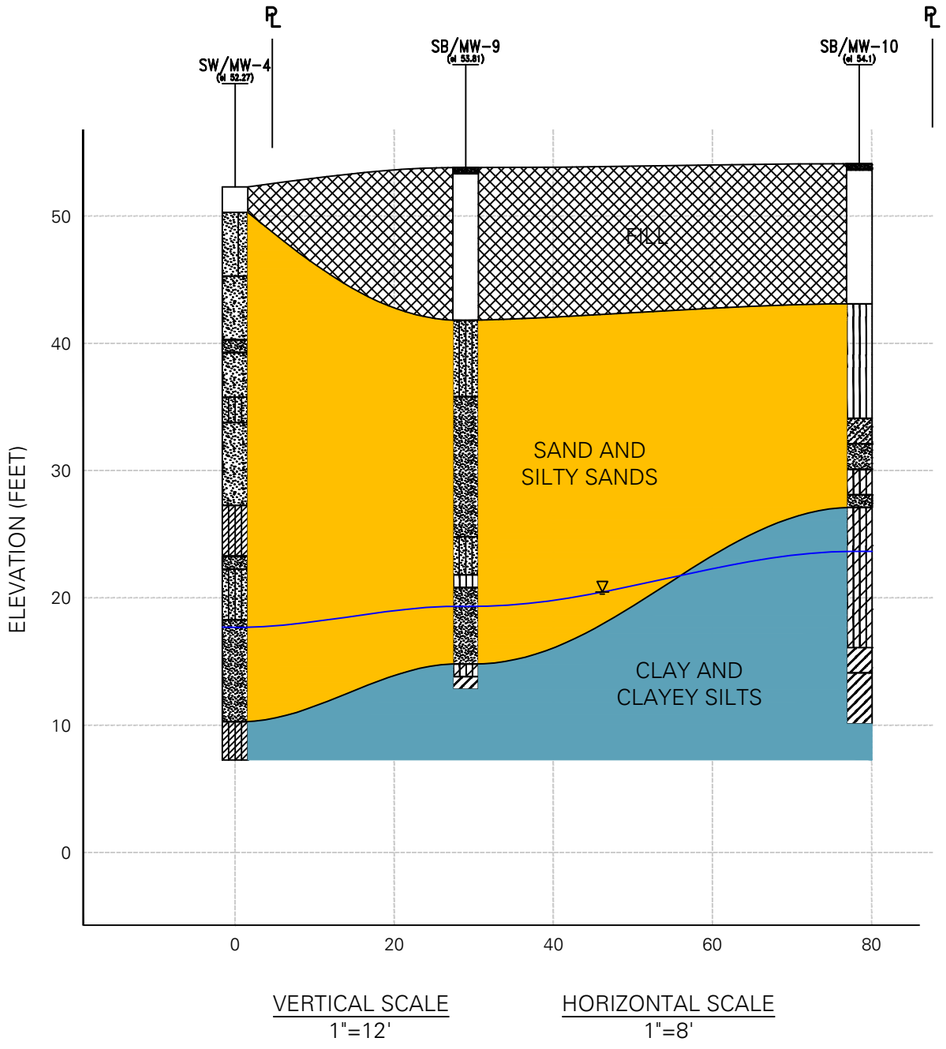
Figure Title
SUBSURFACE PROFILE A-A'

Project No. 170264501	Figure No. 3A
Date 1/25/2016	
Scale AS SHOWN	
Drawn By AT / Checked By MNG	
Submission Date	Sheet 3 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 3A-B - Subsurface Profiles_SMP.dwg Date: 1/25/2016 Time: 10:15 User: aschmiedicke Style Table: Langan.stb Layout: Profile A-A'

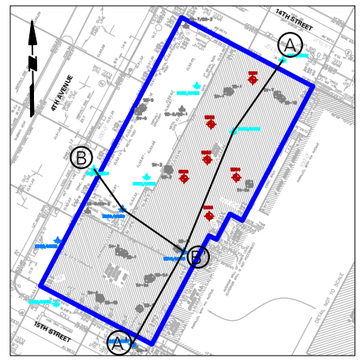
SECTION B-B'

FACING NORTH



VERTICAL SCALE
1"=12'

HORIZONTAL SCALE
1"=8'



LEGEND:

- FILL
- SAND AND SILTY SANDS
- CLAY AND CLAYEY SILTS
- GROUNDWATER CONTOUR LINE

SW/MW-1 (el. xx) — Borehole Number (elevation)

Water Level Reading from well gauging

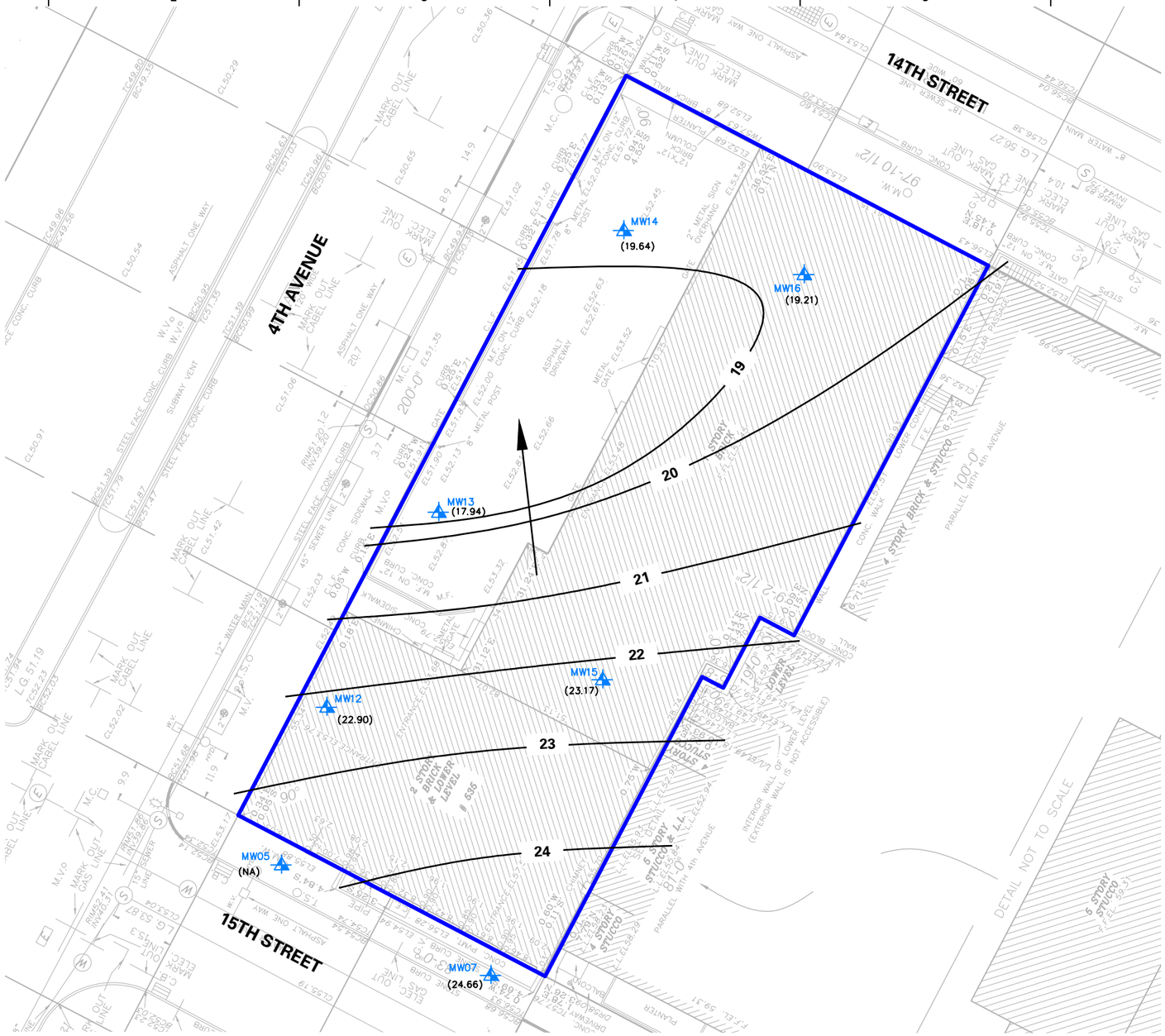
GENERAL NOTES:

1. BASE MAP TAKEN FROM TOPOGRAPHICAL SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 29, 2014.
2. ALL ELEVATIONS SHOWN ON THE PLAN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project	535 4TH AVENUE BLOCK No. 1041, LOT No. 1 BROOKLYN KINGS NEW YORK
Figure Title	SUBSURFACE PROFILE B-B'
Project No.	170264501
Date	1/25/2016
Scale	AS SHOWN
Drawn By / Checked By	AT / MNG
Submission Date	
Figure No.	3B
Sheet	4 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 3A-B - Subsurface Profiles_SMP.dwg Date: 1/25/2016 Time: 10:17 User: aschmiedicke Style Table: Langan.stb Layout: Profile B-B'



LEGEND:

- SITE BOUNDARY
- MW14 — PERFORMANCE MONITORING WELL LOCATIONS (GROUNDWATER ELEVATION IN PARENTHESIS)
- 24 — GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

NOTES:

1. BASE PLAN TAKEN FROM TOPOGRAPHIC SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 29, 2014.
2. ALL ELEVATIONS SHOWN ON THE SURVEY BASE PLAN ARE IN FEET WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. PERFORMANCE WELL MW05 WAS INSTALLED DURING THE PHASE II ESI BY LANGAN, FEBRUARY 2014.
4. PERFORMANCE WELL MW07 WAS INSTALLED DURING THE SUPPLEMENTAL INVESTIGATION BY LANGAN, OCTOBER 2014.
5. MONITORING WELLS MW12 THROUGH MW16 WERE INSTALLED ON SEPTEMBER 8 AND 9, 2015.
6. MONITORING WELL LOCATIONS WERE SURVEYED.
7. CONTOUR INTERVALS ARE SHOWN AT 1-FOOT INCRIMENTS.
8. GROUNDWATER ELEVATIONS WERE MEASURED ON MAY 23, 2016.

30 0 15 30
SCALE IN FEET

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

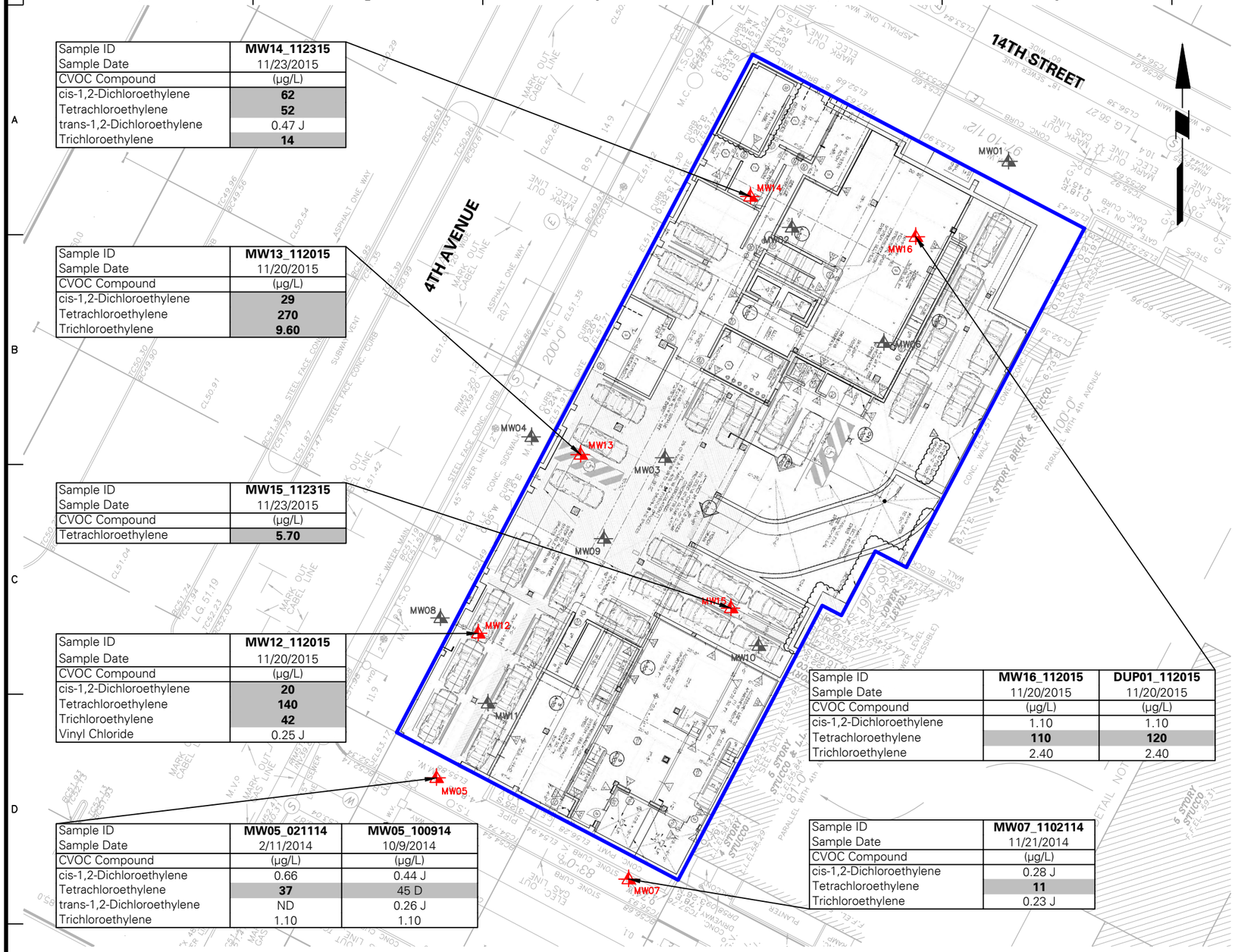
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC

Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
GROUNDWATER CONTOUR MAP

Project No. 170264501	Figure No. 4
Date 7/25/2016	
Scale 1"=30'	
Drawn By AT / Checked By BG	
Submission Date	Sheet 5 of 7



Sample ID	MW14_112315
Sample Date	11/23/2015
CVOC Compound	(µg/L)
cis-1,2-Dichloroethylene	**62**
Tetrachloroethylene	**52**
trans-1,2-Dichloroethylene	0.47 J
Trichloroethylene	**14**

Sample ID	MW13_112015
Sample Date	11/20/2015
CVOC Compound	(µg/L)
cis-1,2-Dichloroethylene	**29**
Tetrachloroethylene	**270**
Trichloroethylene	**9.60**

Sample ID	MW15_112315
Sample Date	11/23/2015
CVOC Compound	(µg/L)
Tetrachloroethylene	**5.70**

Sample ID	MW12_112015
Sample Date	11/20/2015
CVOC Compound	(µg/L)
cis-1,2-Dichloroethylene	**20**
Tetrachloroethylene	**140**
Trichloroethylene	**42**
Vinyl Chloride	0.25 J

Sample ID	MW05_021114	MW05_100914
Sample Date	2/11/2014	10/9/2014
CVOC Compound	(µg/L)	(µg/L)
cis-1,2-Dichloroethylene	0.66	0.44 J
Tetrachloroethylene	**37**	45 D
trans-1,2-Dichloroethylene	ND	0.26 J
Trichloroethylene	1.10	1.10

Sample ID	MW16_112015	DUP01_112015
Sample Date	11/20/2015	11/20/2015
CVOC Compound	(µg/L)	(µg/L)
cis-1,2-Dichloroethylene	1.10	1.10
Tetrachloroethylene	**110**	**120**
Trichloroethylene	2.40	2.40

Sample ID	MW07_1102114
Sample Date	11/21/2014
CVOC Compound	(µg/L)
cis-1,2-Dichloroethylene	0.28 J
Tetrachloroethylene	**11**
Trichloroethylene	0.23 J

LEGEND:

- SITE BOUNDARY
- MW01 REMEDIAL INVESTIGATION MONITORING WELL LOCATION (LANGAN, JANUARY AND FEBRUARY 2014)
- MW12 POST-INJECTION PERFORMANCE MONITORING WELL LOCATION (LANGAN, SEPTEMBER 2015)

NOTES:

1. BASE PLAN TAKEN FROM TOPOGRAPHICAL SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 29, 2014.
2. BASE MAP TAKEN FROM TOPOGRAPHICAL SURVEY, PREPARED BY ROGUSKI LAND SURVEYING, P.C., DATED SEPTEMBER 92, 2014.
3. MONITORING WELL LOCATIONS WERE SURVEYED BY LANGAN ON FEBRUARY 24 AND OCTOBER 29, 2014, JANUARY 30, 2015, AND NOVEMBER 25, 2015
4. REMEDIAL INVESTIGATION (RI) MONITORING WELLS WERE EITHER ABANDONED VIA THE APPLICATION OF GROUT, OR DESTROYED DURING SITE DEMOLITION.
5. MW-05 AND MW-07 WERE INSTALLED DURING THE RI, AND ARE TO BE USED AS POST-INJECTION PERFORMANCE MONITORING WELLS.
6. POST-INJECTION PERFORMANCE MONITORING WELLS WERE INSTALLED UNDER LANGAN OVERSIGHT IN SEPTEMBER OF 2015 .
7. MONITORING WELLS MW-05 AND MW-07 WERE NOT SAMPLED DURING THE NOVEMBER 2015 SAMPLING EVENT AS THEY WERE NOT ACCESSIBLE AT THAT TIME.
8. GROUNDWATER SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) 1.1.1 AMBIENT WATER QUALITY STANDARDS (AWQS) AND GUIDANCE VALUES FOR CLASS GA - DRINKING WATER.
9. ONLY DETECTED CHLORINATED VOLATILE ORGANIC COMPOUNDS (CVOC) ARE SHOWN.
10. CONCENTRATIONS EXCEEDING THE NYSDEC REGULATORY CRITERIA ARE HIGHLIGHTED AND IN BOLD.
11. µg/L = MICROGRAM PER LITER
12. J = ESTIMATED VALUE.
13. D = RESULT IS FROM AN ANALYSIS THAT REQUIRED A DILUTION.

NYSDEC TOGS 1.1.1 AWQS - Class GA (µg/L)	
cis-1,2-Dichloroethylene	5
Tetrachloroethylene	5
trans-1,2-Dichloroethylene	5
Trichloroethylene	5
Vinyl Chloride	2

30 0 15 30
SCALE IN FEET

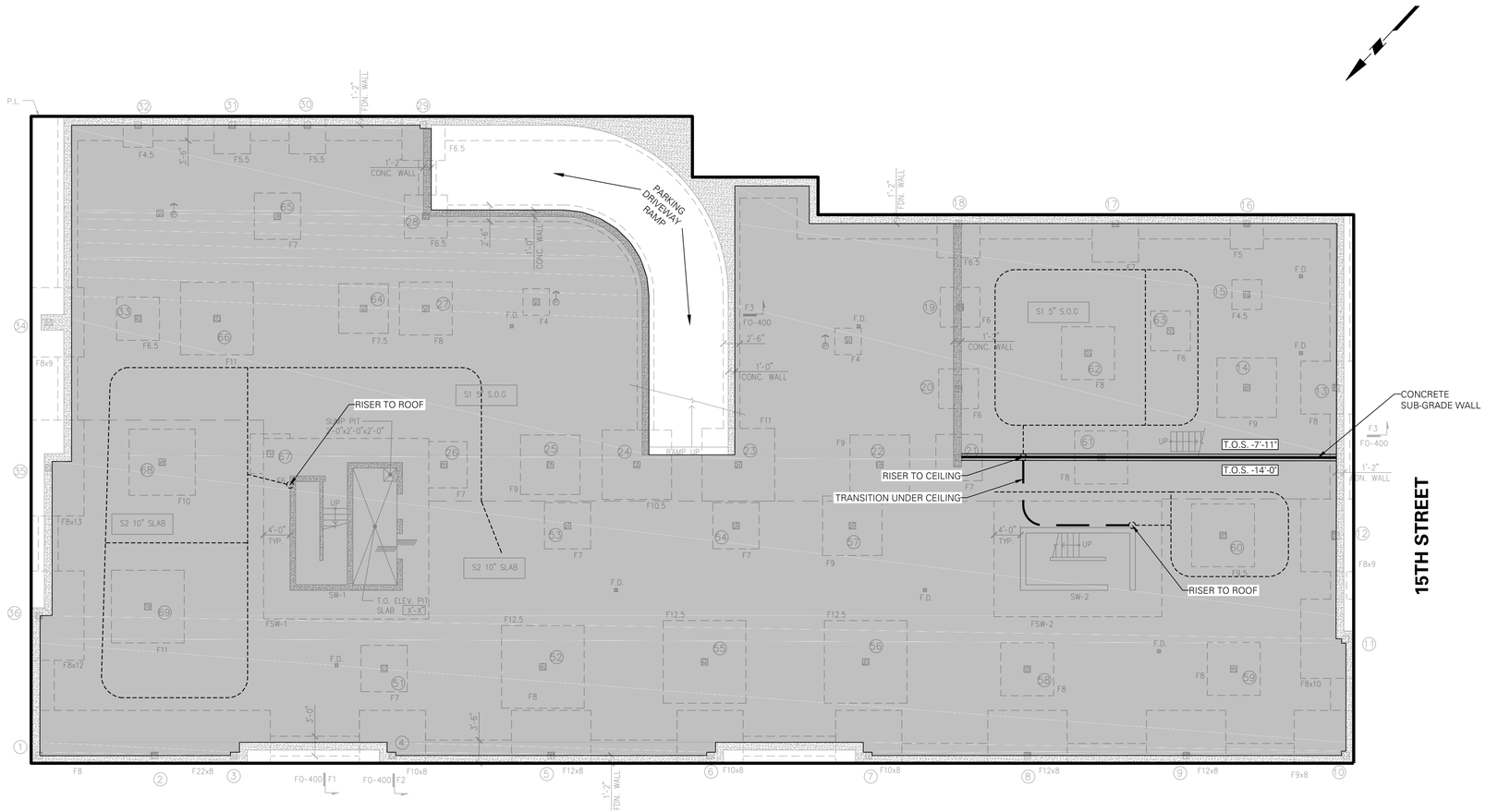
LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
PERFORMANCE MONITORING WELL LOCATIONS AND SAMPLING RESULTS

Project No. 170264501	Figure No. 5
Date 1/25/2016	
Scale 1" = 30'	
Drawn By AS / Checked By MNG	
Submission Date	Sheet 6 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 5 - Performance Monitoring Well Locations and Sampling Results.dwg Date: 1/25/2016 Time: 11:39 User: aschmiedicke Style Table: Langan.stb
Layout: ANSIB-BL



10 0 2 4 10
SCALE IN FEET

LEGEND:

- PROPERTY BOUNDARY
- SMD VAPOR COLLECTION PIPING
- APPROXIMATE RISER PIPE LOCATION
- TRANSITION UNDER CEILING
- VAPOR BARRIER EXTENTS

GENERAL NOTES:

1. BASE MAPS TAKEN FROM THE FOLLOWING DRAWINGS BY AUFGANG ARCHITECTS:
   - FOUNDATION/CELLAR FRAMING PLAN FO-100, DATED AUGUST 13, 2015
   - ARCHITECTURAL CELLAR PLAN, DATED AUGUST 5, 2015
2. RISER PIPE RUNS AND ROOF-TOP BLOWER AND EXHAUST POINT LOCATIONS TO BE DESIGNED BY OTHERS.
3. SUBMEMBRANE DEPRESSURIZATION SYSTEM (SMDS) DETAILS ARE PROVIDED IN APPENDIX O.

SIGNATURE DATE SIGNED
PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

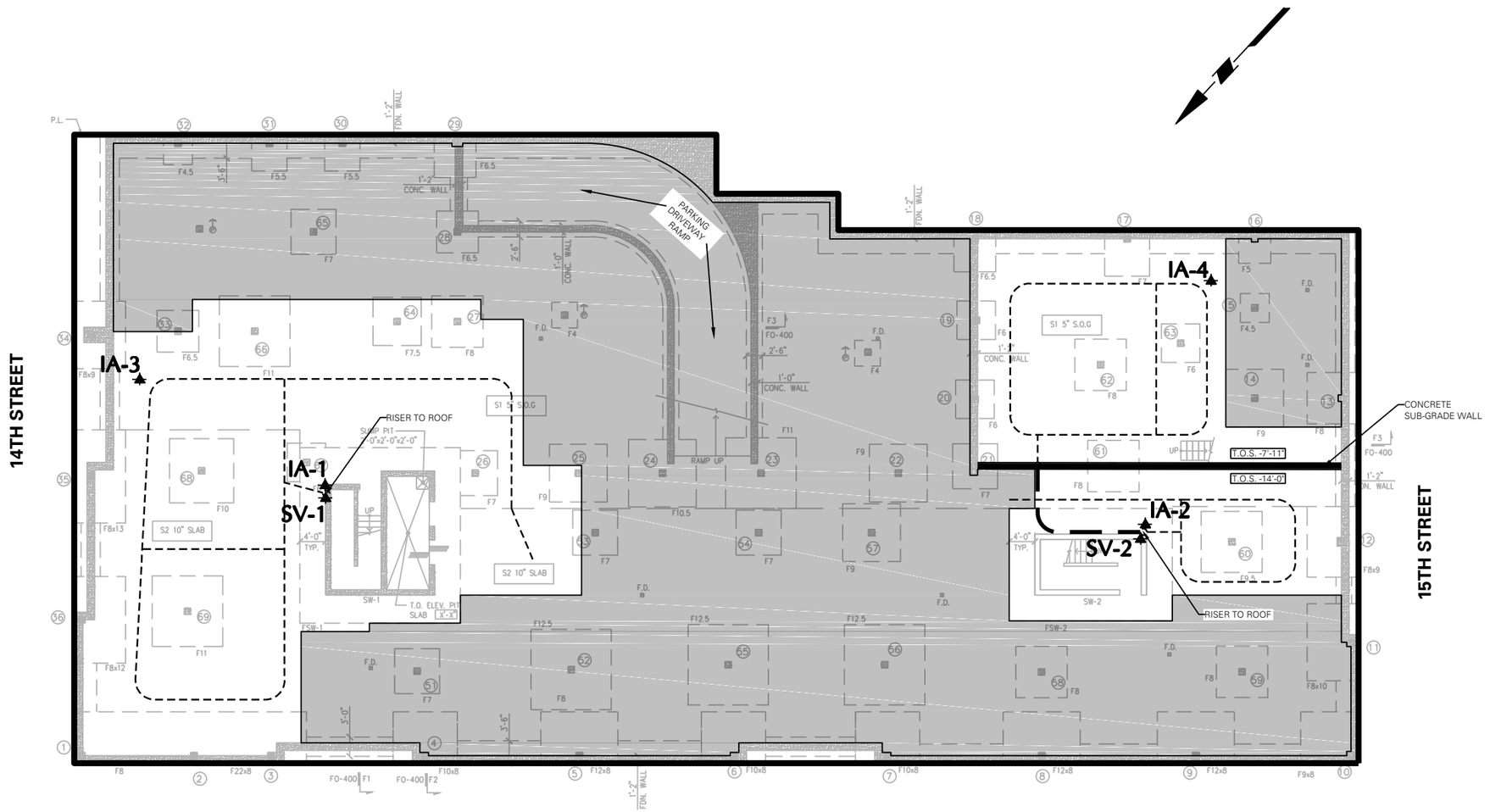
LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
NEW JERSEY NEW YORK CONNECTICUT PENNSYLVANIA OHIO
VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA
ABU DHABI ATHENS DOHA DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
SMDS LAYOUT PLAN

Project No. 170264501	Figure No. 6
Date 1/22/2016	
Scale 1"=10'	
Drawn By AS / Checked By MNG	
Submission Date	Sheet 7 of 7

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 6 - SMDS Layout Plan.dwg Date: 1/25/2016 Time: 11:44 User: aschmiedicke Style Table: Langan.stb Layout: ARCHD-SL



LEGEND:

- PROPERTY BOUNDARY
- SMD VAPOR COLLECTION PIPING
- APPROXIMATE RISER PIPE LOCATION
- TRANSITION UNDER CEILING
- VENTILATED PARKING GARAGE OR AREA NOT REQUIRING DEPRESSURIZATION
- IA-1 INDOOR AIR SAMPLE LOCATION
- SV-1 SOIL VAPOR SAMPLE LOCATION

GENERAL NOTES:

1. BASE MAPS TAKEN FROM THE FOLLOWING DRAWINGS BY AUFGANG ARCHITECTS:
   - FOUNDATION/CELLAR FRAMING PLAN FO-100, DATED AUGUST 13, 2015
   - ARCHITECTURAL CELLAR PLAN, DATED AUGUST 5, 2015
2. SAMPLE LOCATIONS ARE APPROXIMATE. VAPOR SAMPLES WILL BE COLLECTED FROM SAMPLE PORTS AT THE BASE OF EACH RISER PIPE. INDOOR AIR SAMPLES WILL BE COLLECTED DIRECTLY ADJACENT TO THE RISER PIPE AND AT THE OTHER SPECIFIED LOCATIONS.

20 0 5 10 20
SCALE IN FEET

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
VAPOR INTRUSION EVALUATION SAMPLING LOCATION PLAN

Project No. 170264501	Figure No. 7
Date 10/5/2016	
Scale 1" = 20'	
Drawn By AS / Checked By BG	
Submission Date	Sheet 8 of 8

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMP\Figure 7 - Vapor Intrusion Evaluation Sampling Locations.dwg Date: 10/5/2016 Time: 11:05 User: aschmiedicke Style Table: Langan.stb Layout: ANSIB-BL

ATTACHMENT A

ENVIRONMENTAL EASEMENT

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this _____day of _____, 20__, between Owner(s) XYZ Properties, Inc., (the "Grantor Fee Owner") having an office at 101 Girard Street, Brooklyn, New York 11235, County of New York, State of New York, and Partners VII/535 Fourth Owner, LLC, (the "Tenant"), having an office at c/o Slate Property Group, LLC, 850 Third Avenue, New York, New York 10022, County of New York, State of New York (collectively, the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor Fee Owner, is the owner of real property located at the address of 535 4th Avenue in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 1041 Lot 1, being the same as that property conveyed to Grantor Fee Owner by deed dated January 17, 1977 and recorded in the City Register of the City of New York in Reel 897, Page 1536. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.418 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 27, 2016 prepared by Szczepan H. Roguski, P.L.S., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, Tenant, has a 99 year leasehold interest in a portion of the Controlled Property by means of a Memorandum of First Modification of Lease dated March 18, 2016 and recorded in the City Register of the City of New York as CFRN # 2016000117765; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224189-06-14, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions. Except in cases of an emergency, Grantee will give prior notice to the current owner of its need to enter and inspect the Controlled Property.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C224189
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor Fee Owner has caused this instrument to be signed in its name.

XYZ Properties, Inc.:

By: _____

Print Name: _____

Title:_____ Date:_____

Grantor Fee Owner's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _____ day of _____, in the year 20 __, before me, the undersigned, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

IN WITNESS WHEREOF, Tenant has caused this instrument to be signed in its name.

Partners VII/535 Fourth Owner, LLC:

By: _____

Print Name: _____

Title:_____ Date:_____

Grantor Tenant's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _____ day of _____, in the year 20 __, before me, the undersigned, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the _____ day of _____, in the year 20__, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land situate, lying and being in the Borough of Brooklyn, County of Kings and State of New York bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of 14th Street and the easterly side of 4th Avenue;

THENCE southerly along the easterly side of 4th Avenue, 200 feet to the corner formed by the intersection of the northerly side of 15th Street and the easterly side of 4th Avenue;

THENCE easterly along the northerly side of 15th Street, 83 feet;

THENCE northerly parallel with the easterly side of 4th Avenue, 81 feet;

THENCE easterly at right angles to the easterly side of 4th Avenue, 5 feet 8 inches;

THENCE northerly at right angles to the northerly side of 15th Street, 19 feet;

THENCE easterly at right angles to the easterly side of 4th Avenue, 9 feet 2 ½ inches;

THENCE northerly parallel with the easterly side of 4th Avenue, 100 feet to the southerly side of 14th Street;

THENCE westerly along the southerly side of 14th Street, 97 feet 10 ½ inches to the corner, the point or place of BEGINNING.

(For Information Only: Block 1041 Lot 1)

ATTACHMENT B

PERFORMANCE MONITORING WELL CONSTRUCTION LOGS

WELL CONSTRUCTION SUMMARY

Well No. MW12

PROJECT: 535 4th Ave	PROJECT NO.: 170264501
LOCATION: 535 4th Ave. Brooklyn	ELEVATION AND DATUM:
DRILLING AGENCY: aarco	DATE STARTED: 9/4/15 DATE FINISHED:
DRILLING EQUIPMENT: geoprobe 7822DT	DRILLER: Tom
SIZE AND TYPE OF BIT: point	INSPECTOR: A. Rosenblatt

METHOD OF INSTALLATION: DPT. using 3 3/4 inch casing to 20 ft bgs.

METHOD OF WELL DEVELOPMENT: surge block up + down. 5-10 min. until easy. 12:46. Purged 3 gallons end. at 1:12. Using whale pump.

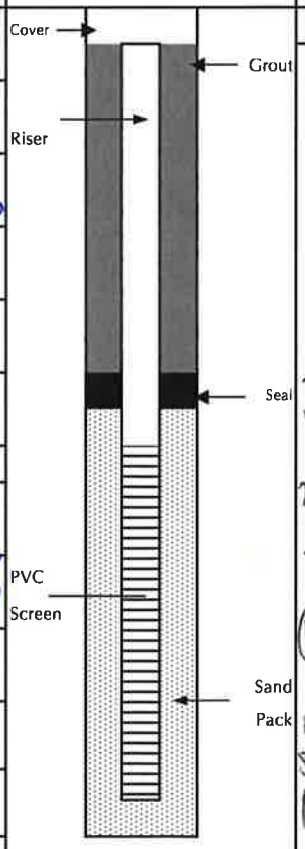
TYPE OF CASING: PVC	DIAMETER: ~~3 3/4 inch~~	TYPE OF BACKFILL MATERIAL:	
TYPE OF SCREEN: PVC	DIAMETER:	TYPE OF SEAL MATERIAL: betonite	
BOREHOLE DIAMETER: 4"		TYPE OF FILTER MATERIAL: sand #2	

	ELEVATION	DEPTH (ft)
TOP OF CASING		
TOP OF SEAL		23 ft bgs
TOP OF FILTER		25 ft bgs
TOP OF SCREEN		27 ft bgs
BOTTOM OF BORING		37 ft bgs
SCREEN LENGTH		10 ft
SLOT SIZE		0.02 inch

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
	9/9/15	31 ft bgs to casing
	9/10/15	31 ft bgs to casing

WELL DETAILS



SUMMARY SOIL CLASSIFICATION

12-25 Brown, grey fine SAND.

25-27 light Brown fine silty sand trace cobble

(wet) @ 31 ft

31-37 Brown fine silty sand [wet]

DEPTH (FT)

~~14.0~~ grout to surface at 17 ft bgs

31 ft bgs

~~37~~ ft bgs

LANGAN Engineering and Environmental Services, PC
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York

WELL CONSTRUCTION SUMMARY

Well No. MW13

PROJECT: 585 4th Ave	PROJECT NO.: 170264501
LOCATION: Brooklyn, NY	ELEVATION AND DATUM:
DRILLING AGENCY: Aarco	DATE STARTED: 9/8/15 DATE FINISHED: 9/8/15
DRILLING EQUIPMENT: Geoprobe 7822 DT	DRILLER:
SIZE AND TYPE OF BIT: point w/ 3 3/4" diameter casing	INSPECTOR: A. Rosenblatt

METHOD OF INSTALLATION: DPT.

METHOD OF WELL DEVELOPMENT:

TYPE OF CASING: PVC DIAMETER: 2"	TYPE OF BACKFILL MATERIAL: sand
TYPE OF SCREEN: PVC DIAMETER: 2"	TYPE OF SEAL MATERIAL: bentonite
BOREHOLE DIAMETER: 4"	TYPE OF FILTER MATERIAL: sand

	ELEVATION	DEPTH (ft)
TOP OF CASING		10 ft bgs
TOP OF SEAL		30 ft
TOP OF FILTER		32 ft
TOP OF SCREEN		31 ft bgs
BOTTOM OF BORING		~~41~~ ft bgs

ex. to 17 ft. bgs

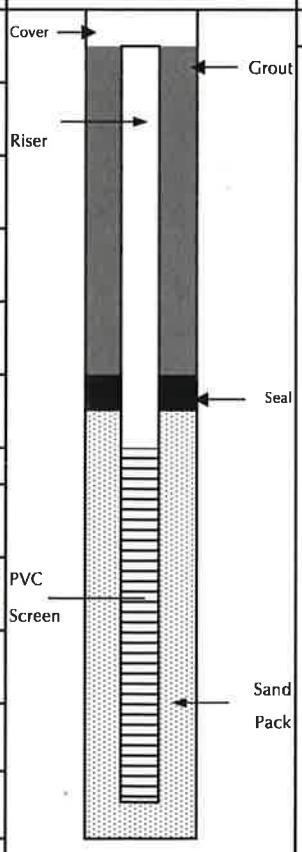
SCREEN LENGTH: 10 ft

SLOT SIZE: 0.02 inch

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
	9/9/15	36 ~~ft bgs~~ bgs
	9/10/15	36.6 ~~ft bgs~~ to casing

WELL DETAILS



SUMMARY SOIL CLASSIFICATION

Brown, fine silty

Brown, clay

DEPTH (FT)

~~14.0~~ grout to surface at 17 ft bgs

30 ft bgs.

36 ft

41 ft bgs

22 ft below ex

LANGAN Engineering and Environmental Services, PC
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York

WELL CONSTRUCTION SUMMARY

Well No. MW14

PROJECT: 535 4th Ave	PROJECT NO.: 170264501
LOCATION: Brooklyn, NY	ELEVATION AND DATUM:
DRILLING AGENCY: Aarco	DATE STARTED: 9/8/15 DATE FINISHED: 9/8/15
DRILLING EQUIPMENT: Geoprobe 7822 DT	DRILLER:
SIZE AND TYPE OF BIT: 3 3/4"	INSPECTOR: A. Rosenblatt

METHOD OF INSTALLATION: DPT.

METHOD OF WELL DEVELOPMENT: 4" Surge block + whale pump. Back + Forth until clean stream.

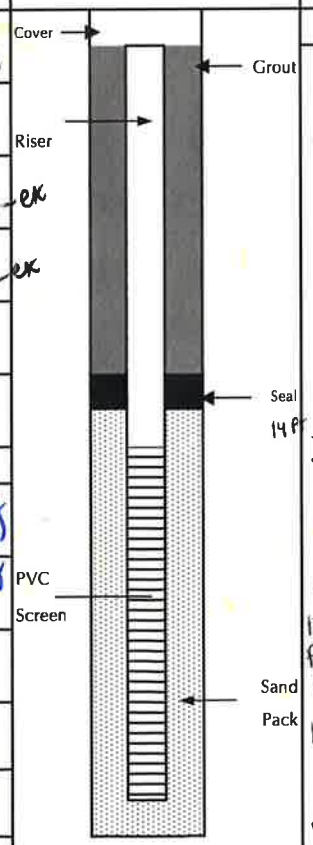
TYPE OF CASING: PVC	DIAMETER: 2"	TYPE OF BACKFILL MATERIAL: grout	
TYPE OF SCREEN: PVC pre-packed	DIAMETER: 2"	TYPE OF SEAL MATERIAL: bentonite	
BOREHOLE DIAMETER: 4"		TYPE OF FILTER MATERIAL: #2 (Morie) sand	

	ELEVATION	DEPTH (ft)
TOP OF CASING		~~10~~ ft bgs (approx)
TOP OF SEAL		27 ft bgs
TOP OF FILTER		29 ft
TOP OF SCREEN	30	13 ft bgs - ex
BOTTOM OF BORING	40	23 ft bgs - ex
SCREEN LENGTH		10 ft
SLOT SIZE		0.02 inch

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
	9/9/15	34 ft bgs to casing
	9/10/15	34.5 ft bgs to casing

9/10/15 Casing 1.5 ft above ground



SUMMARY SOIL CLASSIFICATION:
- 14 ft Brown fine silty sand.
- 17 ft Brown fine silty sand tightly packed.
- 18 ft - 22 ft Brown fine silty sand tightly packed.

DEPTH (FT):
- ~~14.0~~
- grout to surface at 17 ft bgs.
- 30 ft
- 34
- 40 ft bgs.

LANGAN Engineering and Environmental Services, PC
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York

14
18
22

WELL CONSTRUCTION SUMMARY

Well No. ~~MW17~~ MW15

PROJECT: 535 4th Ave	PROJECT NO.: 170264501
LOCATION: Brooklyn, NY	ELEVATION AND DATUM:
DRILLING AGENCY: Aarco	DATE STARTED: 9/9/15 DATE FINISHED:
DRILLING EQUIPMENT: geoprobe 2877DT	DRILLER: Tom
SIZE AND TYPE OF BIT: point	INSPECTOR: A. Rosenblatt

METHOD OF INSTALLATION: DPT. using 3 3/4 inch casing.

METHOD OF WELL DEVELOPMENT: whale pump + surge block. 5 mins. Then use whale pump

TYPE OF CASING: PVC	DIAMETER:	TYPE OF BACKFILL MATERIAL:	
TYPE OF SCREEN: PVC	DIAMETER:	TYPE OF SEAL MATERIAL:	
BOREHOLE DIAMETER: 4"		TYPE OF FILTER MATERIAL:	

	ELEVATION	DEPTH (ft)
TOP OF CASING		16'8" bgs
TOP OF SEAL		~~25~~ ft bgs
TOP OF FILTER		27 ft bgs
TOP OF SCREEN		28 ft bgs
BOTTOM OF BORING		38 ft bgs

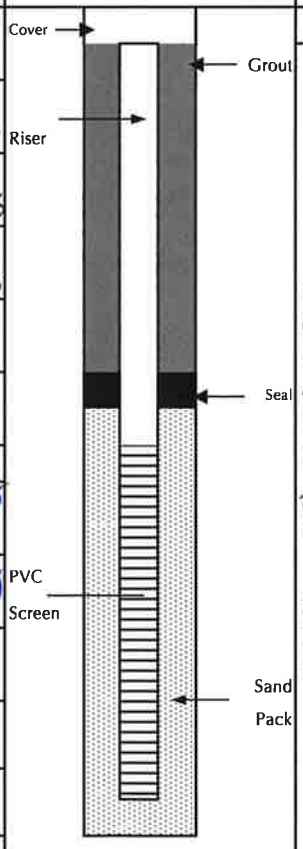
SCREEN LENGTH:

SLOT SIZE:

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
9/9/15		33 ft bgs to casing
9/10/15		30 ft bgs to casing

WELL DETAILS



SUMMARY SOIL CLASSIFICATION

17-25 Light brown m-f SAND some silt

25-30 Brown red m-f SAND some clay (moist)

30-33 Brown, black m-f SAND.

33 Brown, red fine silty sand (wet)

DEPTH (FT)

~~14.0~~ grout to surface at 17 ft bgs.

33 ft bgs

38 ft bgs

LANGAN Engineering and Environmental Services, PC
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York

WELL CONSTRUCTION SUMMARY

Well No. MW16

T 5354th Ave	PROJECT NO. 170264501
ATION Brooklyn, NY	ELEVATION AND DATUM
LING AGENCY Aarco	DATE STARTED 9/8/15 DATE FINISHED ~~9/9/15~~
LLING EQUIPMENT Geoprobe 7822DT	DRILLER
E AND TYPE OF BIT	INSPECTOR A. Rosenblatt

THOD OF INSTALLATION
DPT.

METHOD OF WELL DEVELOPMENT

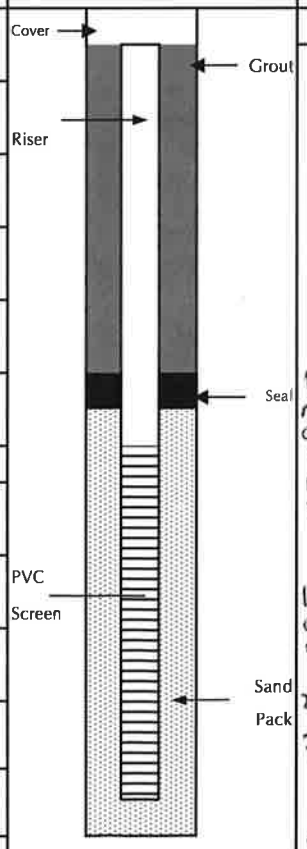
TYPE OF CASING PVC DIAMETER	TYPE OF BACKFILL MATERIAL
TYPE OF SCREEN PVC DIAMETER 2"	TYPE OF SEAL MATERIAL bentonite
BOREHOLE DIAMETER 4"	TYPE OF FILTER MATERIAL Sand #2 (Morie)

TOP OF CASING	ELEVATION	DEPTH (ft)
TOP OF SEAL	ELEVATION	DEPTH (ft)
TOP OF FILTER	ELEVATION	DEPTH (ft)
TOP OF SCREEN	ELEVATION	DEPTH (ft) 31 ft bgs
BOTTOM OF BORING	ELEVATION	DEPTH (ft) ~~41~~ 41 ft bgs
SCREEN LENGTH		10 ft
SLOT SIZE		0.02 inch

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
ELEVATION	DATE	DEPTH TO WATER
ELEVATION	DATE	DEPTH TO WATER
ELEVATION	DATE	DEPTH TO WATER
ELEVATION	DATE	DEPTH TO WATER
ELEVATION	DATE	DEPTH TO WATER

WELL DETAILS



SUMMARY SOIL CLASSIFICATION	DEPTH (FT)
	14.0
14 ft. light brown, red. medium SAND. with cobble and crushed stone. 18-19 crushed grey stone	14 ft
19 ft Dark Brown coarse Silty SAND. w/ pebbles (wet).	19 ft
20 to 22 ft Dark Brown m-f Silty SAND.	
Brown CLAY.	24 ft

LANGAN Engineering and Environmental Services, PC
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York

initial obstruction - move east + south of original location

ATTACHMENT C

VAPOR BARRIER MANUFACTURER DETAILS

BITUTHENE® SYSTEM 4000

Self-adhesive HDPE waterproofing membrane with super tacky compound for use with patented, water-based Bituthene® System 4000 Surface Conditioner

Description

Bituthene® System 4000 Waterproofing Membrane is a 1.5 mm (1⁄16 in.) flexible, pre-formed membrane which combines a high performance, cross laminated, HDPE carrier film with a unique, super tacky, self-adhesive rubberized asphalt compound.

Bituthene® System 4000 Surface Conditioner is a water-based, latex surface treatment which imparts an aggressive, high tack finish to the treated substrate. It is specifically formulated to bind site dust and concrete efflorescence, thereby providing a suitable surface for the Bituthene® System 4000 Waterproofing Membrane.

Conveniently packaged in each roll of membrane, Bituthene® System 4000 Surface Conditioner promotes good initial adhesion and, more importantly, excellent permanent adhesion of the Bituthene® System 4000 Waterproofing Membrane. The VOC (Volatile Organic Compound) content of this product is 100 g/L.

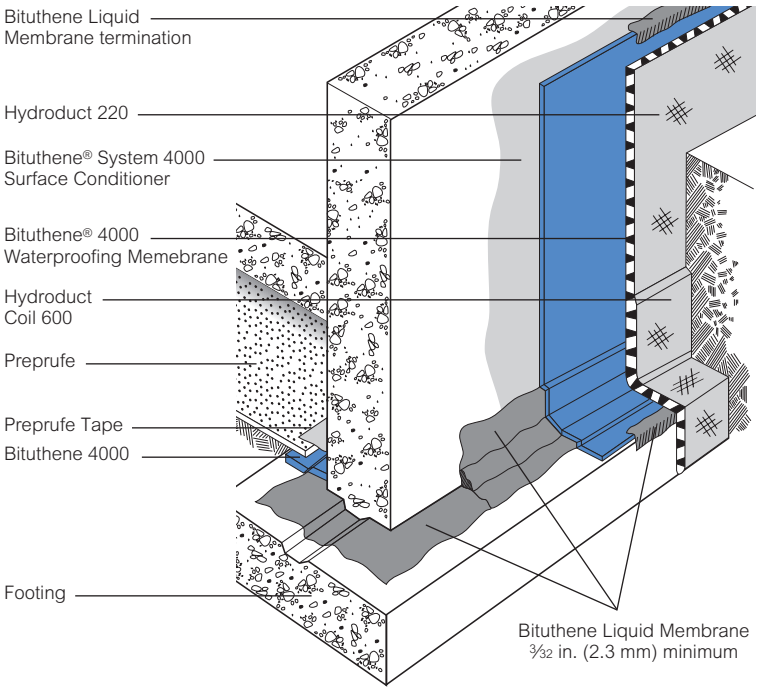
Architectural and Industrial Maintenance Regulations limit the VOC content in products classified as Architectural Coatings. Refer to Technical Letters at graceconstruction.com for most current list of allowable limits.

Advantages

- **Excellent adhesion**—special adhesive compound engineered to work with high tack System 4000 Surface Conditioner
- **Cold applied**—simple application to substrates, especially at low temperatures
- **Reduced inventory and handling costs**—System 4000 Surface Conditioner is included with each roll of membrane
- **Wide application temperature range**—excellent bond to self and substrate from 25°F (-4°C) and above

Product Advantages

- Excellent adhesion
- Cold applied
- Reduced inventory and handling costs
- Wide application temperature range
- Overlap security
- Cross laminated, high density polyethylene carrier film
- Flexible
- Ripcord®



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

- **Overlap security**—minimizes margin for error under site conditions
- **Cross laminated, high density polyethylene carrier film**—provides high tear strength, puncture and impact resistance
- **Flexible**—accommodates minor structural movements and will bridge shrinkage cracks
- **Ripcord®**—this split release on demand feature allows the splitting of the release paper into two (2) pieces for ease of installation in detailed areas

Use

Bituthene® membrane is ideal for waterproofing concrete, masonry and wood surfaces where in-service temperatures will not exceed 135°F (57°C). It can be applied to foundation walls, tunnels, earth sheltered structures and split slab construction, both above and below grade. (For above grade applications, see *Above Grade Waterproofing Bituthene® System 4000*.)

Bituthene® waterproofing membrane is 1/16 in. (1.5 mm) thick, 3 ft (0.9 m) wide and 66.7 ft (20 m) long and is supplied in rolls. It is unrolled sticky side down onto concrete slabs or applied onto vertical concrete faces primed with Bituthene® System 4000 Surface Conditioner. Continuity is achieved by overlapping a minimum 2 in. (50 mm) and firmly rolling the joint.

Bituthene® membrane is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene® products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable.

For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

If time is critical, Bituthene® Primer B2 or Bituthene® Primer B2 LVC may be used to allow priming and installation of membrane on damp surfaces or green concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity. Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Bituthene® Primer B2 or Bituthene® Primer B2 LVC, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene® System 4000 Membrane and Conditioner only in dry weather and when air and surface temperatures are 25°F (-4°C) or above.
- Apply Bituthene® Primer B2 or Bituthene® Primer B2 LVC in dry weather above 25°F (-4°C). (See separate product information sheet.)

Conditioning

Bituthene® System 4000 Surface Conditioner is ready to use and can be applied by spray or roller. For best results, use a pump-type air sprayer with fan tip nozzle, like the Bituthene® System 4000 Surface Conditioner Sprayer, to apply the surface conditioner.

Apply Bituthene® System 4000 Surface Conditioner to clean, dry, frost-free surfaces at a coverage rate of 300 ft^2/gal (7.4 m^2/L). Coverage should be uniform. Surface conditioner should not be applied so heavily that it puddles or runs. **Do not apply conditioner to Bituthene® membrane.**

Allow Bituthene® System 4000 Surface Conditioner to dry one hour or until substrate returns to its original color. At low temperatures or in high humidity conditions, dry time may be longer.

Bituthene® System 4000 Surface Conditioner is clear when dry and may be slightly tacky. In general, conditioning should be limited to what can be covered within 24 hours. In situations where long dry times may prevail, substrates may be conditioned in advance. Substrates should be reconditioned if significant dirt or dust accumulates.

Before surface conditioner dries, tools should be cleaned with water. After surface conditioner dries, tools should be cleaned with mineral spirits. Mineral spirits is a combustible liquid which should be used only in accordance with manufacturer's recommendations. **Do not use solvents to clean hands or skin.**

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene® Liquid Membrane, see separate product information sheet.

- At wall to footing inside corners—
  Option 1: Apply membrane to within 1 in. (25 mm) of base of wall. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Extend Bituthene® Liquid Membrane at least 2½ in. (65 mm) onto footing, and 2½ in. (65 mm) onto wall membrane.

  Option 2: Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Apply 12 in. (300 mm) wide strip of sheet membrane centered over fillet. Apply wall membrane over inside corner and extend 6 in. (150 mm) onto footing. Apply 1 in. (25 mm) wide troweling of Bituthene® Liquid Membrane over all terminations and seams within 12 in. (300 mm) of corner.
- At footings where the elevation of the floor slab is 6 in. (150 mm) or more above the footing, treat the inside corner either by the above two methods or terminate the membrane at the base of the wall. Seal the termination with Bituthene® Liquid Membrane.

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene® membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over 1/16 in. (1.5 mm) wide and all construction and control joints with 9 in. (230 mm) wide sheet membrane strip.

Application on Horizontal Surfaces

(Note: Preprufe® pre-applied membranes are strongly recommended for below slab or for any application where the membrane is applied before concreting. See Preprufe® waterproofing membrane product information sheets.)

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2 in. (50 mm). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30 in. (760 mm) wide, weighing a minimum of 75 lbs (34 kg) when filled. Cover the face of the roller with a resilient material such as a ½ in. (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene® Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 1 in. (25 mm) of the base of the protrusion. Apply Bituthene® Liquid Membrane 0.1 in. (2.5 mm) thick around protrusion. Bituthene® Liquid Membrane should extend over the membrane a minimum of 2½ in. (65 mm) and up the penetration to just below the finished height of the wearing course.

Vertical Surfaces

Apply membrane in lengths up to 8 ft (2.5 m). Overlap all seams at least 2 in. (50 mm). On higher walls apply membrane in two or more sections with the upper overlapping the lower by at least 2 in. (50 mm). Roll all membrane with a hand roller.

Terminate the membrane at grade level. Press the membrane firmly to the wall with the butt end of a hardwood tool such as a hammer handle or secure into a reglet. Failure to use heavy pressure at terminations can result in a poor seal. A termination bar may be used to ensure a tight seal. Terminate the membrane at the base of the wall if the bottom of the interior floor slab is at least 6 in. (150 mm) above the footing. Otherwise, use appropriate inside corner detail where the wall and footing meet.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 6 in. (150 mm) in all directions from the slit and seal edges of the patch with Bituthene® Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct® product information sheets.

Protection of Membrane

Protect Bituthene® membranes to avoid damage from other trades, construction materials or backfill. Place protection immediately in temperatures above 77°F (25°C) to avoid potential for blisters.

- On vertical applications, use Hydroduct® 220 Drainage Composite. Adhere Hydroduct® 220 Drainage Composite to membrane with Preprufe® Detail Tape. Alternative methods of protection are to use 1 in. (25 mm) expanded polystyrene or ¼ in. (6 mm) extruded

polystyrene that has a minimum compressive strength of 8 lbs/in.^{2} (55 kN/m^2). Such alternatives do not provide positive drainage to the system. If ¼ in. (6 mm) extruded polystyrene protection board is used, backfill should not contain sharp rock or aggregate over 2 in. (50 mm) in diameter. Adhere polystyrene protection board with Preprufe® Detail Tape.

- In mud slab waterproofing, or other applications where positive drainage is not desired and where reinforced concrete slabs are placed over the membrane, the use of ¼ in. (6 mm) hardboard or 2 layers of ⅛ in. (3 mm) hardboard is recommended.

Insulation

Always apply Bituthene® membrane directly to primed or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene® membranes over lightweight insulating concrete.

Backfill

Place backfill as soon as possible. Use care during backfill operation to avoid damage to the waterproofing system. Follow generally accepted practices for backfilling and compaction. Backfill should be added and compacted in 6 in. (150 mm) to 12 in. (300 mm) lifts.

For areas which cannot be fully compacted, a termination bar is recommended across the top termination of the membrane.

Placing Steel

When placing steel over properly protected membrane, use concrete bar supports (dobies) or chairs with plastic tips or rolled feet to prevent damage from sharp edges. Use special care when using wire mesh, especially if the mesh is curled.

Approvals

- City of Los Angeles Research Report RR 24386
- Miami-Dade County Code Report NOA 04-0114.03
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E

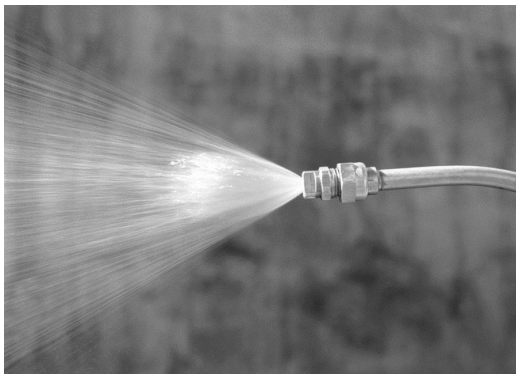
Bituthene System 4000 Surface Conditioner Sprayer

The Bituthene® System 4000 Surface Conditioner Sprayer is a professional grade, polyethylene, pump-type, compressed air sprayer with a brass fan tip nozzle. It has a 2 gal (7.6 L) capacity. The nozzle orifice and spray pattern have been specifically engineered for the optimum application of Bituthene® System 4000 Surface Conditioner.

Hold nozzle 18 in. (450 mm) from substrate and squeeze handle to spray. Spray in a sweeping motion until substrate is uniformly covered.

Sprayer should be repressurized by pumping as needed. For best results, sprayer should be maintained at high pressure during spraying.

To release pressure, invert the sprayer and spray until all compressed air is released.



Maintenance

The Bituthene® System 4000 Surface Conditioner Sprayer should perform without trouble for an extended period if maintained properly.

Sprayer should not be used to store Bituthene® System 4000 Surface Conditioner. The sprayer should be flushed with clean water immediately after spraying. For breaks in the spray operation of one hour or less, invert the sprayer and squeeze the spray handle until only air comes from the nozzle. This will avoid clogging.

Should the sprayer need repairs or parts, call the maintenance telephone number on the sprayer tank (800-323-0620).

- Bituthene® 4000 Membranes carry a Underwriters' Laboratory Class A Fire Rating (Building Materials Directory, File #R7910) when used in either of the following constructions:
  - —Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of ⅛ in. (3 mm) protection board, encased in 2 in. (50 mm) minimum concrete monolithic pour.
  - —Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of DOW Styrofoam PD Insulation Board [2 in. (50 mm) thick]. This is covered with one layer of 2 ft x 2 ft x 2 in. (0.6 m x 0.6 m x 50 mm) of concrete paver topping.

Warranty

Five year material warranties covering Bituthene® and Hydroduct® products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

Supply

Bituthene® System 4000	3 ft x 66.7 ft roll (200 ft²) [0.9 m x 20 m (18.6 m²)]
Roll weight	83 lbs (38 kg) gross
Palletization	25 rolls per pallet
Storage	Store upright in dry conditions below 95°F (+35°C).
System 4000 Surface Conditioner	1 x 0.625 gal (2.3 L) bottle in each roll of System 4000 Membrane
Ancillary Products	
Surface Conditioner Sprayer	2 gal (7.6 L) capacity professional grade sprayer with specially engineered nozzle
Bituthene® Liquid Membrane	1.5 gal (5.7 L) pail/125 pails per pallet or 4 gal (15.1 L) pail/48 pails per pallet
Preprufe® Detail Tape	2 in. x 50 ft (50 mm x 15 m) roll/16 rolls per carton
Bituthene® Mastic	Twelve 30 oz (0.9 L) tubes/carton or 5 gal (18.9 L) pail/36 pails per pallet
Complementary Material	
Hydroduct®	See separate data sheets

Equipment by others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene® System 4000 Waterproofing Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1/16 in. (1.5 mm) nominal	ASTM D3767—method A
Flexibility, 180° bend over 1 in. (25 mm) mandrel at -25°F (-32°C)	Unaffected	ASTM D1970
Tensile strength, membrane, die C	325 lbs/in.² (2240 kPa) minimum	ASTM D412 modified[1]
Tensile strength, film	5,000 lbs/in.² (34.5 MPa) minimum	ASTM D882 modified[1]
Elongation, ultimate failure of rubberized asphalt	300% minimum	ASTM D412 modified[1]
Crack cycling at -25°F (-32°C), 100 cycles	Unaffected	ASTM C836
Lap adhesion at minimum application temperature	5 lbs/in. (880 N/m)	ASTM D1876 modified[2]
Peel strength	9 lbs/in. (1576 N/m)	ASTM D903 modified[3]
Puncture resistance, membrane	50 lbs (222 N) minimum	ASTM E154
Resistance to hydrostatic head	231 ft (71 m) of water	ASTM D5385
Permeance	0.05 perms (2.9 ng/m²sPa) maximum	ASTM E96, section 12—water method
Water absorption	0.1% maximum	ASTM D570

Footnotes:
1. The test is run at a rate of 2 in. (50 mm) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 2 in. (50 mm) per minute at 40°F (5°C).
3. The 180° peel strength is run at a rate of 12 in. (300 mm) per minute.

Physical Properties for Bituthene® System 4000 Surface Conditioner

Property	Typical Value
Solvent type	Water
Flash point	>140°F (>60°C)
VOC* content	91 g/L
Application temperature	25°F (-4°C) and above
Freeze thaw stability	5 cycles (minimum)
Freezing point (as packaged)	14°F (-10°C)
Dry time (hours)	1 hour**

* Volatile Organic Compound
** Dry time will vary with weather conditions

www.graceconstruction.com

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

BIT-220I Printed in U.S.A. 04/14 GCS/PDF

FLORPRUFE® 120

Integrally bonded vapor protection for slabs on grade

Description

Florprufe® 120 is a high perfor-mance vapor barrier with Grace's Advanced Bond Technology™ that forms a unique seal to the underside of concrete floor slabs.

Comprising a highly durable polyolefin sheet and a specially developed, non-tacky adhesive coating, Florprufe 120 seals to liquid concrete to provide integrally bonded vapor protection.

Florprufe exceeds ASTM E1745 Class A rating.

Advantages

- Forms a powerful integral seal to the underside of concrete slabs
- Protects valuable floor finishes such as wood, tiles, carpet and resilient flooring from damage by vapor transmission
- Direct contact with the slab complies with the latest industry recommendations
- Remains sealed to the slab even in cases of ground settlement
- Ultra low vapor permeability
- Durable, chemical resistant polyolefin sheet
- Lightweight, easy to apply, kick out rolls
- Simple lap forming with mechanical fixings or tape

Use

Florprufe 120 is engineered for use below slabs on grade with moisture-impermeable or moisture-sensitive floor finishes that require the highest level of vapor protection.

[1] ACI 302.1R-96

Product Advantages

- Forms a powerful integral seal
- Protects valuable floor finishes
- Ultra low vapor permeability
- Durable, chemical resistant
- Lightweight and easy to apply

Florprufe complies with the latest recommendations of ACI Committees 302 and 360, i.e. for slabs with vapor sensitive coverings, the location of the vapor barrier should always be in direct contact with the slab1.

The membrane is loose laid onto the prepared sub-base, forming overlaps that can be either mechanically secured or taped. The unique bond of Florprufe to concrete provides continuity of vapor protection at laps. Alternatively, if a taped system is preferred, self-adhered Preprufe® Tape can be used to overband the laps.

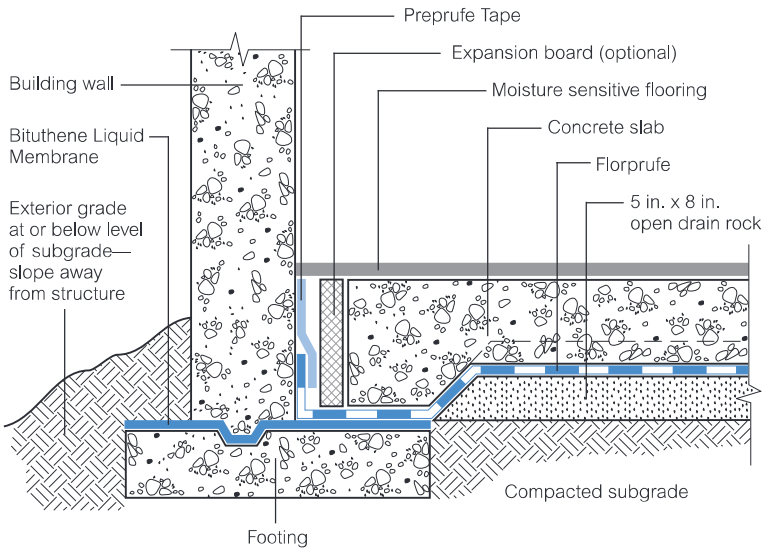
Slab reinforcement and concrete can be placed immediately. Once the concrete is poured, an integral bond develops between the concrete and membrane.

Installation

Health & Safety

Refer to relevant Material Safety Data Sheet. Complete rolls should be handled by 2 persons.

Florprufe 120 can be applied at temperatures of 25ºF (-4ºC) or above. Membrane installation is unaffected by wet weather. Installation and detailing of Florprufe 120 are generally in accordance with ASTM E1643-98.



Typical Assembly

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

Supply

Florprufe 120	
Supplied in rolls	4 ft x 115 ft (1.2 m x 35 m)
Roll area	460 ft² (42 m²)
Roll weight	70 lbs (32 kg) approx.
Ancillary Products	
Preprufe Tape is packaged in cartons containing 4 rolls that are 4 in. x 49 ft (100 mm x 15 m).	
Bituthene Liquid Membrane is supplied in 1.5 gal (5.7 L) pails.	

Physical Properties: Exceeds ASTM E1745 Class A rating

Property	Typical Value	Test Method
Color	White	
Thickness (nominal)	0.021 in. (0.5 mm)	ASTM D3767—method A
Water vapor permeance	0.03 perms	ASTM E96—method B1
Tensile strength	65 lbs/in.	ASTM E1541
Elongation	300%	ASTM D412
Puncture resistance	3300 gms	ASTM D17091
Peel adhesion to concrete	>4 lbs/in.	ASTM D903

1. Test methods that comprise ASTM E1745 standard for vapor retarders

Prepare substrate in accordance with ACI 302.1R Section 4.1. Install Florprufe 120 over the leveled and compacted base. Place the membrane with the smooth side down and the plastic release liner side up facing towards the concrete slab. Remove and discard plastic release liner. End laps should be staggered to avoid a build up of layers. Succeeding sheets should be accurately positioned to overlap the previous sheet 2 in. (50 mm) along the marked lap line.

Laps

1. Mechanical fastening method—
To prevent the membrane from moving and gaps opening, the laps should be fastened together at 39 in. (1.0 m) maximum centers. Fix through the center of the lap area using 0.5 in. (12 mm) long washer-head, self-tapping, galvanized screws (or similar) and allowing the head of the screw to bed into the adhesive compound to self-seal. It is not necessary to fix the membrane to the substrate, only to itself. Ensure the membrane lays flat and no openings occur. (See Figure 1.) Additional fastening may be required at corners, details, etc. Continuity is achieved once the slab is poured and the bond to concrete develops.

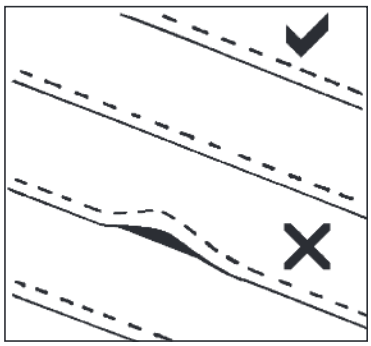


Figure 1

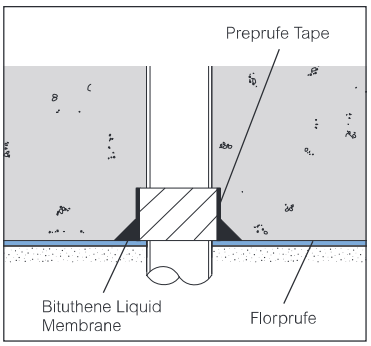


Figure 2

OR

2. Taped lap method—
For additional security use Grace Preprufe Tape to secure and seal the overlaps. Overband the lap with the 4 in. (100 mm) wide Preprufe Tape, using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.

Penetrations

Mix and apply Bituthene Liquid Membrane detailing compound to seal around penetrations such as drainage pipes, etc. (See Figure 2 and refer to the Bituthene Liquid Membrane data sheet, BIT-230.)

Concrete Placement

Place concrete within 30 days. Inspect membrane and repair any damage with patches of Preprufe Tape. Ensure all liner is removed from membrane and tape before concreting.

www.graceconstruction.com

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

PF-001G Printed in U.S.A. 3/07 FA/LI/1M

GRACE

PREPRUFE® 300R PLUS & 160R PLUS

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

Description

Preprufe® 300R Plus & 160R Plus membranes are unique composite sheets comprised of a thick HDPE film, pressure sensitive adhesive and weather resistant protective coating. Designed with Advanced Bond Technology™ and a dual adhesive ZipLap™, Preprufe Plus membranes form a unique, integral bond to poured concrete, preventing both the ingress and lateral migration of water while providing a robust barrier to water, moisture and gas.

Release liner free and designed for efficient, reliable installation, the Preprufe Plus ZipLap allows for an adhesive to adhesive bond at seam overlaps and delivers superior performance in harsh conditions without the need for specialized equipment, heat or power.

The Preprufe R Plus System includes:

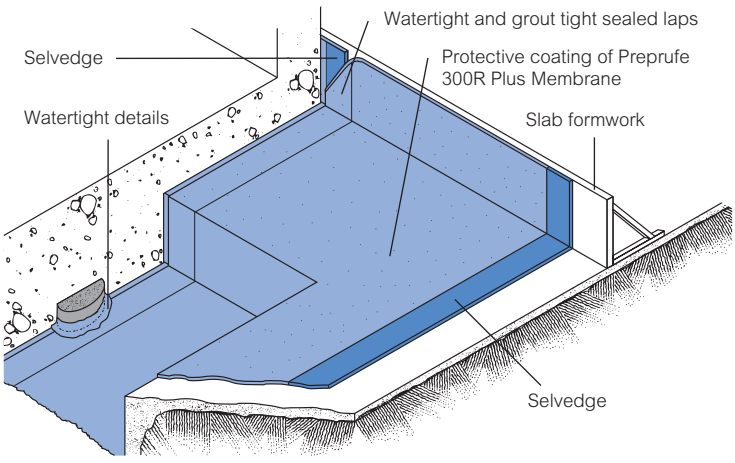
- **Preprufe® 300R Plus**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe® 160R Plus**—thinner grade for blindside, zero property line applications against soil retention systems.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

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

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

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered adhesive to adhesive watertight ZipLaps** and easy to execute detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **Easy roll/kick out installation**—reduces installation time and cost
- **Release liner free**—expedites installation and reduces construction site waste
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement



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

- **Unaffected by wet conditions**—cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
  - not reliant on confining pressures or hydration
  - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack

Installation

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

Preprufe® Plus membranes have colored zip strips at the top and bottom of the seam area on the edge of the roll. Both zip strips cover an aggressive adhesive. Once the yellow zip strip on the top of the membrane and the blue zip strip on the bottom of the membrane are removed, a strong adhesive to adhesive bond is achieved in the overlap area. This Preprufe® ZipLap™ provides an enhanced sealing of the overlaps in harsh conditions combined with a fast and easy way of execution without specialized equipment, heat or power.

Substrate Preparation

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

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

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

Membrane Installation

Preprufe® Plus membranes can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe Plus product in cold or marginal weather conditions <40°F (<4°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Plus Low Temperature (LT) membrane is available for low temperature applications. Refer to Preprufe Plus LT data sheet and Grace Tech Letter 16 for more information.

Horizontal substrates—Kick out or roll out the membrane HDPE film side to the substrate with the yellow zip strip facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave yellow and blue zip strips on the membrane until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.

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

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate for the substrate with the yellow zip strip facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 2). Immediately remove tinted plastic release liner from the tape.

Details

Detail drawings are available at graceconstruction.com.

Membrane Repair

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

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe® Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete. Provide temporary protection from concrete over splash for areas of the Preprufe membrane that are adjacent to a concrete pour.

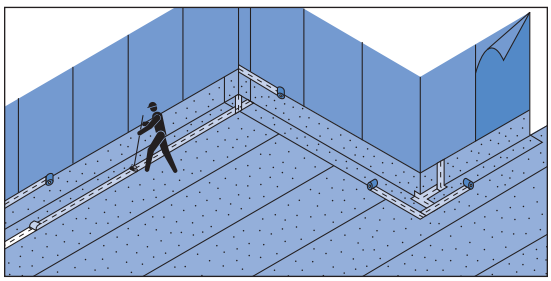


Figure 1

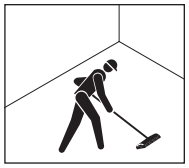
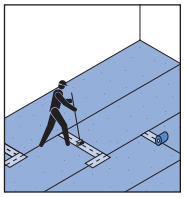


Figure 2

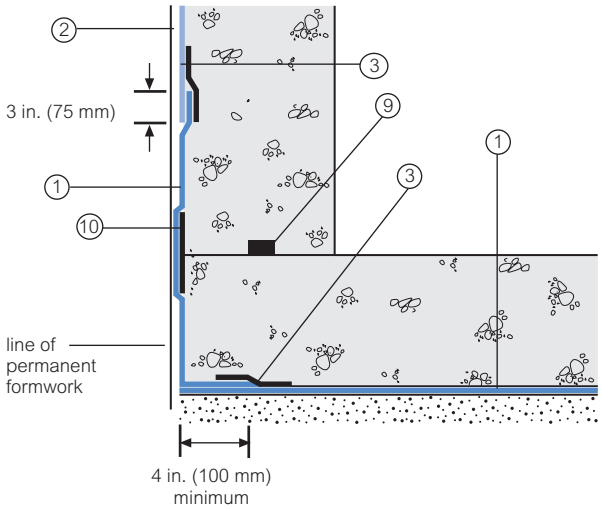


Detail Drawings

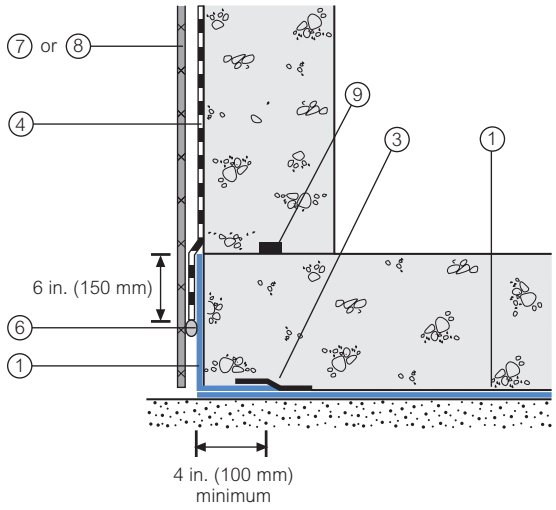
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at graceconstruction.com.

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

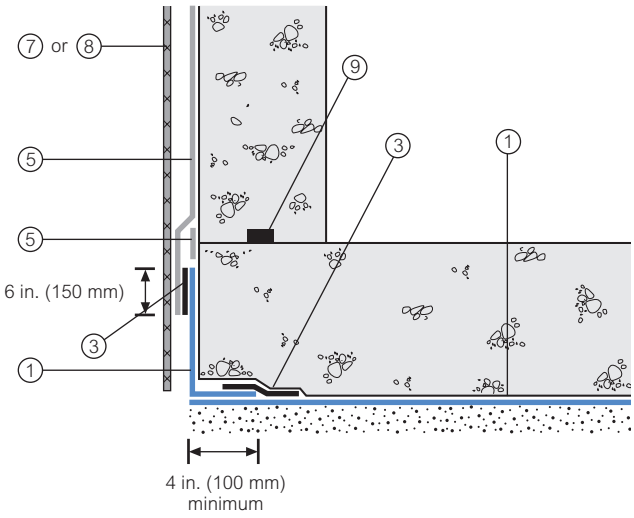
Wall base detail against permanent shutter



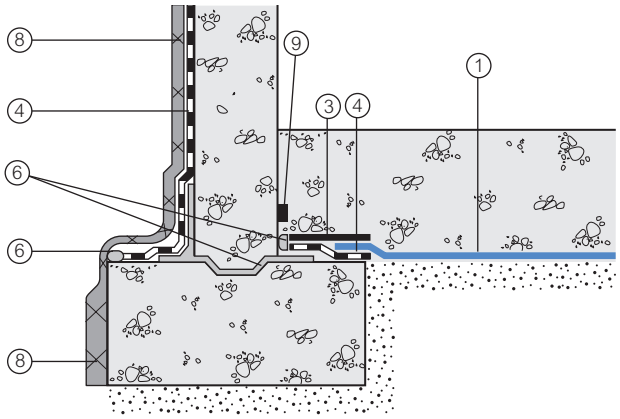
Bituthene® wall base detail (Option 1)



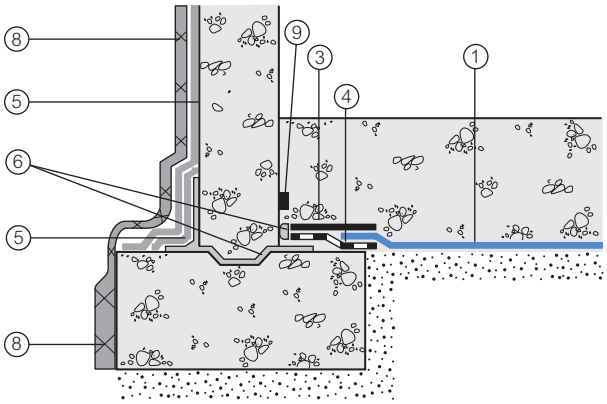
Procor® wall base detail (Option 1)



Bituthene® wall base detail (Option 2)



Procor® wall base detail (Option 2)



1 Preprufe® 300R Plus
2 Preprufe® 160R Plus
3 Preprufe® Tape
4 Bituthene®
5 Procor®
6 Bituthene® Liquid Membrane
7 Approved Protection Course
8 Hydroduct®
9 Adcor™ ES
10 Preprufe® CJ Tape

Supply

Dimensions (Nominal)	Preprufe 300R Plus Membrane	Preprufe 160R Plus Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	3 ft. 10 in. x 102 ft. (1.17m x 31.15m)	3 ft. 10 in. x 120 ft. (1.17m x 36.6m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft² (36 m²)	460 ft² (42 m²)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)

Physical Properties

Property	Typical Value 300R Plus	Typical Value 160R Plus	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified[1]
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified[2]
Elongation	500%	500%	ASTM D412, modified[3]
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836[4]
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified[5]
Lap peel adhesion at 72°F (22°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified[6]
Lap peel adhesion at 40°F (4°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified[6]
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa x s x m²))	0.01 perms (0.6 ng/(Pa x s x m²))	ASTM E96, method B

Footnotes:

1. Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
2. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
3. Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
4. Concrete is cast against the Preprufe membrane and allowed to cure (7 days minimum)
5. Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
6. The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute at 72°F (22°C).

Removal of Formwork

Preprufe® membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems, see Grace Tech Letter 13 for information on forming systems used with Preprufe products.

A minimum concrete compressive strength of 3000 psi (20 N/mm²) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

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

Specification Clauses

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

NOTE: Use Preprufe Tape to tie-in Procor® fluid-applied membrane with Preprufe product.

Health and Safety

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

www.graceconstruction.com

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

PF-189A Printed in U.S.A. 12/14 GCS/PDF

GRACE

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

RAVEN INDUSTRIES

Product Description

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

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

Product Use

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

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

Size & Packaging

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

Under-Slab Vapor/Gas Retarder

Product	Part #
VaporBlock Plus 20	VBP20

APPLICATIONS

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

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

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

VaporBlock® Plus™ Placement

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

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

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

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

RAVEN INDUSTRIES

Engineered Films Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Toll Free: **800-635-3456**
Email: **efdsales@ravenind.com**
www.ravenefd.com
1/11 EFD 1125

Scan QR Code to download current technical data sheets via the Raven website.

ATTACHMENT D

EXCAVATION WORK PLAN

EXCAVATION WORK PLAN

D-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Currently, this notification will be made to:

Larry Alden
NYSDEC Regional Project Manager
(518) 402-9767
Larry.alden@dec.ny.gov

This notification will include:

- A detailed description of the proposed work. The description should include the location and aerial extent of the proposed work, plans for site re-grading, intrusive elements or utilities to be installed below the cover system, estimated volumes of contaminated soil to be excavated, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated in the work areas, including the nature and anticipated concentration of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this Excavation Work Plan (EWP);
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- The contractor's Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) will be updated and re-submitted, in electronic format, if it differs from the HASP provided in Appendix F of the SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

D-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based soil screening will be performed by a field engineer, scientist or geologist under the direct supervision of a New York State Professional Engineer (PE) or Qualified Environmental Professional (QEP) during all

remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

D-3 STOCKPILE METHODS

Soil stockpile areas, if needed for the different soil materials, will be constructed for staging of site soil, pending loading or characterization testing. Separate stockpile areas will be constructed to avoid co-mingling materials of differing types. The excavated soil will be appropriately lined and securely covered. Stockpiles will be routinely inspected and broken sheeting covers will be promptly replaced.

Stockpiles will be covered upon reaching their capacity of approximately 1,000 cubic yards until ready for loading. Stockpiles that have not reached their capacity will be covered at the end of each workday. Active stockpiles will be covered at the end of each workday. Individual stockpiles will not exceed 1,000 cubic yards.

Each stockpile area will be encircled with silt fences and hay bales, as needed to contain and filter particulates from any rainwater that has drained off the soils, and to mitigate the potential for surface water run-off. Hay bales will be used as needed near catch basins and other discharge points. The stockpile areas will be inspected daily and after every storm event, and noted deficiencies will be promptly addressed.

D-4 MATERIALS EXCAVATION AND LOAD OUT

A field engineer, scientist or geologist under the direct supervision of a NYS PE or QEP will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements.

Loaded vehicles leaving the site will be appropriately lined, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). A truck wash will be operated on-site. The engineer, scientist or geologist will be responsible for documenting that all outbound truck tires and exterior carriage will be free from dirt and debris. Trucks will be cleaned or washed as required before leaving the site until the activities performed under this section are complete. Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The engineer, scientist or geologist will be responsible for documenting that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

D-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be appropriately lined and secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the site. Truck wash waters will be collected and disposed of off-site in accordance with appropriate local, State, and Federal regulations.

Truck traffic would be routed on the most direct course using major thoroughfares where possible and flaggers would be used to protect pedestrians at site entrances and exits. Truck routes will take into account:

(a) limiting transport through residential areas and past sensitive sites;
(b) use of city mapped truck routes;
(c) prohibiting off-site queuing of trucks entering the facility, to the extent possible;
(d) limiting total distance to major highways;
(e) promoting safety in access to highways;
(f) overall safety in transport; and
(g) community input [where necessary]

Trucks will be prohibited from stopping and idling in the neighborhood outside the site. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited to the extent possible.

D-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC for approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, concrete recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

D-7 MATERIALS REUSE ON-SITE

Materials reuse on-site will not be permitted, without NYSDEC approval. Pending NYSDEC approval, reused soil must be nonhazardous and meet the lower of 6 NYCRR 375-6.8(a) Unrestricted or 6 NYCRR 375-6.8(b) Protection of Groundwater SCOs in accordance with the predetermined beneficial use determination listed in 6 NYCRR § 360-1.15(b). The Protection of Groundwater SCOs apply only to compounds or analytes detected in groundwater at concentrations that exceeded the Class GA AWQS. If any of the waste materials specified are used by the Owner for an end use specified in Section 360-1.15(b), it will not be considered a solid waste. Material will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. Reuse of soil will be coordinated in advance with the NYSDEC case manager. Material deemed unfit for reuse will be transported for off-site disposal.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface, but will be managed off-site, unless prior approval is obtained from the NYSDEC.

D-9 COVER SYSTEM RESTORATION

After the completion of any invasive activities, the cover system, including the vapor barrier membrane underlying the concrete slab, will be restored in a manner that complies with the RAWP, RAWP Addendum and Decision Document. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the Site Management Plan.

D-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the PE or QEP and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at, http://www.dec.ny.gov/regulations/67386.html will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. For soil sources, an environmental professional under the oversight of a QEP will collect representative samples at a frequency consistent with CP-51 / Soil Cleanup Guidance (Table 4). The samples would be analyzed for Part 375 VOCs (EPA Method 8260), SVOCs (EPA Method 8270), pesticides/PCBs (EPA Method 8082/8081) and metals by an NYSDOH ELAP-certified laboratory.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, all imported soils will meet the soil quality standards listed in Table 1. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not

be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

D-11 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product and surrounding soils, as necessary, to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (TAL metals; Part 375 VOCs and SVOCs, pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 6.3 of the SMP.

D-12 DUST, ODOR, AND VAPOR CONTROL/MONITORING PLAN

This dust, odor, and organic vapor control and monitoring plan was developed in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) and OSHA standards for construction (29 CFR 1926). Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust will be required for all ground intrusive activities such as site remediation operations and handling activities. Two stationary air-monitoring stations will be set up at site perimeters (one upwind and one downwind) during intrusive site work for continuous monitoring. Each station will include a PID and a DustTrak aerosol monitor or equivalent. A PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil sampling. Action levels for the protection of the community and visitors are set forth in the CAMP, which is included in the HASP (Appendix F to the SMP).

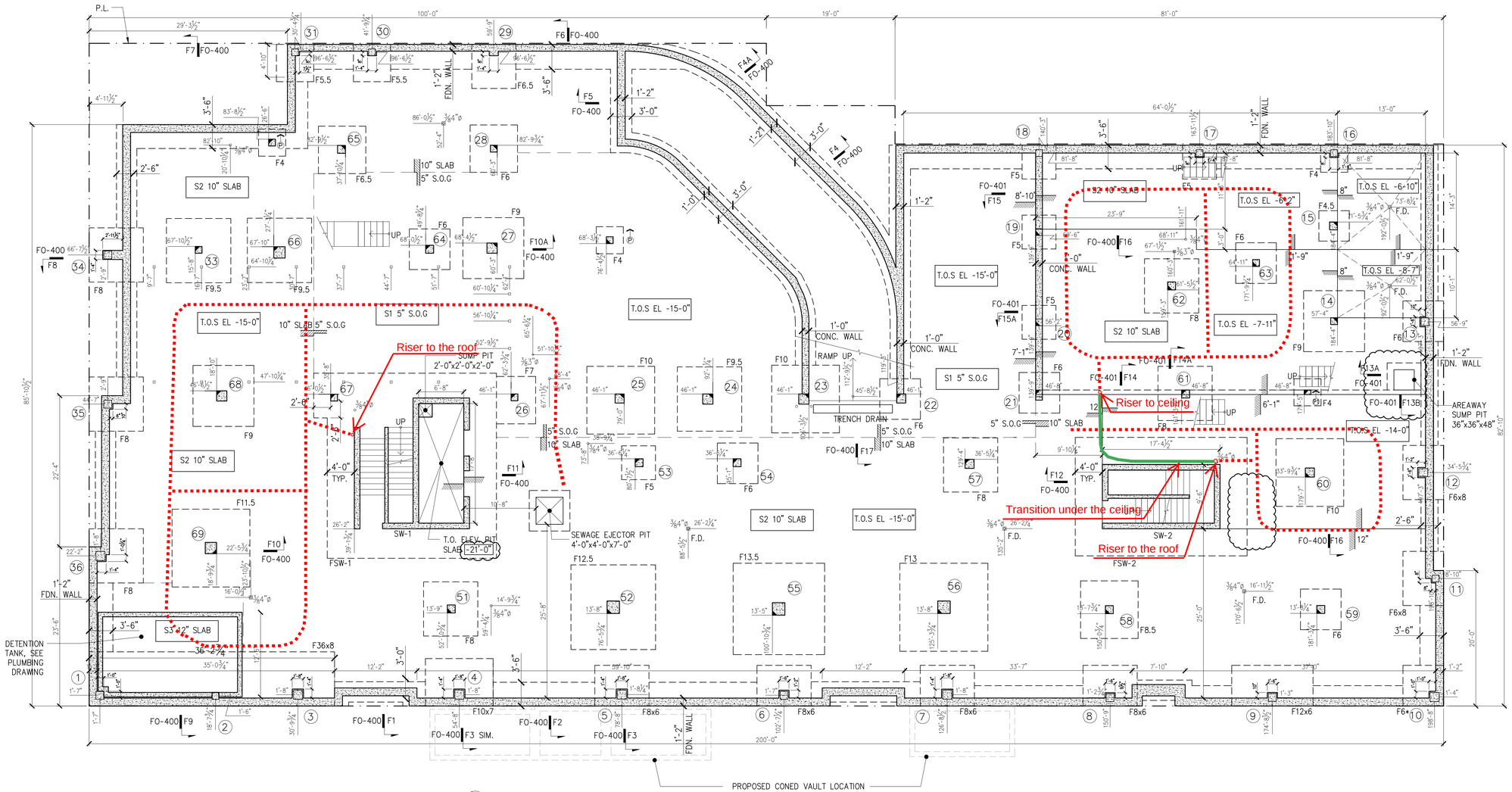
Work practices to minimize odors and vapors will be used during all intrusive activities. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include the use of chemical odorants in spray or misting systems and the use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

ATTACHMENT E

SMDS AS-BUILT DRAWING AND MANUFACTURER DETAILS



FOUNDATION/CELLAR FRAMING PLAN

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

NOTES:

1. TOP OF SLAB SHALL BE AT PROJECT ELEVATION -15'-0" U.O.N. [± ....] INDICATING TOP OF SLAB ELEVATION.
2. FOUNDATION DESIGN IS BASED ON THE RECOMMENDATIONS CONTAINED IN THE GEOTECHNICAL REPORT PREPARED BY LANGAN ENGINEERING DATED 25 JULY 2014.
3. FOOTING MUST BE BEAR ON SOIL WITH MINIMUM ALLOWABLE BEARING CAPACITY OF 3 TONS PER SQUARE FOOT. IN THE EVENT THAT 3 TSF SOIL IS NOT REACHED AT ANTICIPATED ELEVATION SHOWN ON PLANS, FOOTINGS SHALL BE LOWERED TO A DEPTH AT WHICH REQUIRED BEARING CAPACITY IS FOUND. ALL BOTTOM OF FOOTING SOIL CONDITIONS SHALL BE VERIFIED BY GEOTECHNICAL ENGINEER.
4. S1 SHALL BE 5" THICK NORMAL WEIGHT CONCRETE SLAB ON GRADE WITH f'c=5,000 PSI REINFORCED WITH WWF 6x6 W2.0x2.0 AT 1" FROM TOP OF SLAB.
   S2 SHALL BE 10" THICK NORMAL WEIGHT REINFORCED CONCRETE SLAB WITH f'c=5,000 PSI REINFORCED WITH #4@10" CONT. TOP & BOT. EA. WAY.
   S3 SHALL BE 12" THICK NORMAL WEIGHT REINFORCED CONCRETE SLAB WITH f'c=5,000 PSI REINFORCED WITH #6@12" CONT. TOP & BOT. EA. WAY.
5. TOP OF FOOTING SHALL BE 1'-0" BELOW TOP OF SLAB U.O.N. THUS (± ...) INDICATES BOTTOM OF FOOTING ELEVATION. TOP OF FSW-1 AND FSW-2 ARE TOP OF SLAB ELEVATION.
6. F.... INDICATES FOOTING MARK, FOR SIZE AND REINF. SEE FOOTING SCHEDULE.
7. FOR WATER PROOFING, SEE ARCH. DWGS.
8. FOUNDATION WALLS, BUTTRESS CONCRETE STRENGTH SHALL BE f'c=5,000 PSI. U.O.N
9. SEE THE FOLLOWING DRAWINGS FOR THE ITEMS NOTED:

GENERAL NOTES	S-001.00
COLUMN SCHEDULE	S-200.00
SHEAR WALL PLANS	S-202.00
TYPICAL DETAILS	S-300.00 SERIES
SECTIONS & DETAILS	S-400.00 SERIES

INDICATES 12"x12" CONCRETE POST REINF. WITH. 4-#6 VERT.
INDICATES 12"x8" CONCRETE POST REINF. WITH 4-#6 VERT.

FOOTING SCHEDULE

ALLOWABLE MIN. BEARING CAPACITY = 3 TSF

MARK	DIMENSION			REINFORCEMENT				REMARKS
				BOTTOM		TOP		
	LENGTH	WIDTH	THICKNESS	LONG WAY	SHORT WAY	LONG WAY	SHORT WAY	
F4	4'-0"	4'-0	1'-0"	4 #7	4 #7	4 #5	4 #5	
F4*	4'-0"	4'-0"	1'-0"	4 #7	4 #7	4 #7	4 #7	
F5	5'-0"	5'-0"	1'-3"	5 #7	5 #7	5 #5	5 #5	
F5.5	5'-6"	5'-6"	1'-3"	6 #7	6 #7	6 #5	6 #5	
F6	6'-0"	6'-0"	1'-6"	7 #7	7 #7	7 #5	7 #5	
F6*	6'-0"	6'-0"	1'-6"	7 #7	7 #7	7 #7	7 #7	
F6.5	6'-6"	6'-6"	1'-6"	7 #7	7 #7	7 #5	7 #5	
F7	7'-0"	7'-0"	1'-9"	8 #7	8 #7	8 #5	8 #5	
F8	8'-0"	8'-0"	2'-0"	9 #7	9 #7	9 #5	9 #5	
F8.5	8'-6"	8'-6"	2'-0"	9 #8	9 #8	9 #5	9 #5	
F9	9'-0"	9'-0"	2'-3"	10 #8	10 #8	10 #5	10 #5	
F9.5	9'-6"	9'-6"	2'-3"	10 #9	10 #9	10 #5	10 #5	
F10	10'-0"	10'-0"	2'-6"	11 #9	11 #9	11 #5	11 #5	
F11.5	11'-6"	11'-6"	2'-6"	12 #9	12 #9	12 #5	12 #5	

FOOTING SCHEDULE

ALLOWABLE MIN. BEARING CAPACITY = 3 TSF

F12.5	12'-6"	12'-6"	2'-9"	14 #9	14 #9	13 #5	13 #5	
F13	13'-0"	13'-0"	2'-9"	16 #9	16 #9	14 #5	14 #5	
F13.5	13'-6"	13'-6"	2'-9"	17 #9	17 #9	14 #5	14 #5	
F6x8	6'-0"	8'-0"	2'-3"	7 #7	9 #7	7 #7	9 #7	
F6x12	6'-0"	12'-0"	2'-3"	7 #7	13 #7	7 #7	13 #7	
F7x10	7'-0"	10'-0"	2'-3"	8 #8	11 #8	9 #7	11 #7	
FSW1	SEE PLAN	SEE PLAN	2'-9"	#7@12"	#7@12"	#5@12"	#5@12"	
FSW2	SEE PLAN	SEE PLAN	2'-9"	#7@12"	#7@12"	#5@12"	#5@12"	
F36x8	8'-0"	SEE PLAN	2'-0"	9 #8	37 #8	9 #6	37 #6	

PROPOSED MIXED USES BUILDING:

FOURTH AVENUE

535 4TH AVENUE
BROOKLYN, NY

BLOCK: 1041 LOT: 1

ARCHITECT:
AUFGANG ARCHITECTS LLC
49 NORTH AIRMONT RD.
SUFFERN, NY
INFO@AUFGANG.COM 845.368.0004

DEVELOPER:
PARTNERS VII / 535 FOURTH OWNER LLC

STRUCTURAL ENGINEER:
ADG ENGINEERING PC
744 BROAD STREET, 19TH FLOOR
NEWARK, NJ 07102
Tel. 973.242.2626
Fax. 973.242.2676

MEP ENGINEER:
ETTINGER ENGINEERING
505 8th AVENUE
NY, NY 10001
Tel. 212.244.2410
Fax. 212.643.1606

AUFGANG ARCHITECTS

DATE	SUBMISSIONS / REVISIONS
08.05.15	REVISION 1
07.10.15	PAA
05.15.15	ISSUED FOR CONSTRUCTION
01.16.15	REVISED AS PER DOB COMMENTS
11.14.14	ISSUED FOR BID
09.08.14	ISSUED TO DOB FOR REVIEW AND COMMENT
08.20.14	TA SUBMISSION
08.01.14	DOB SUBMISSION

SHEET TITLE:

FOUNDATION/CELLAR FRAMING PLAN

SEAL & SIGNATURE

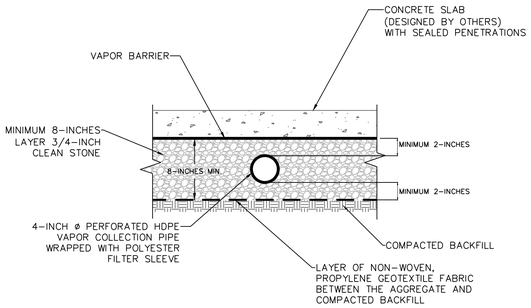
ISSUE DATE: PROJECT NO: 08-01-14 14579

DRAWN BY: LM CHECKED BY: AM

SCALE: AS NOTED SHEET NO: 3 of 27

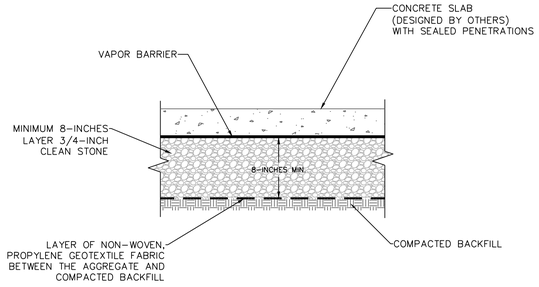
DRAWING NO: FO-100.01

NYC DOB NUMBER:



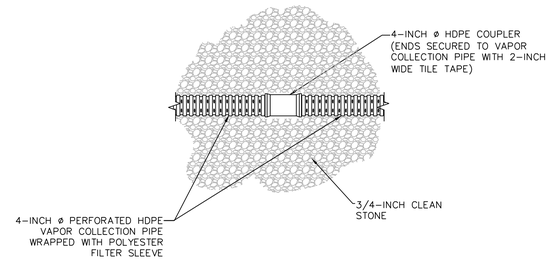
DETAIL 1: TYPICAL SECTION FOR VAPOR COLLECTION PIPE AND VAPOR BARRIER

NOT TO SCALE



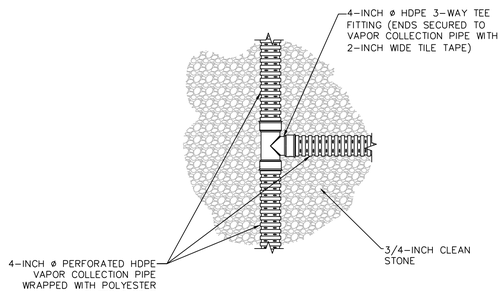
DETAIL 2: TYPICAL SECTION THROUGH SUB-SLAB

NOT TO SCALE



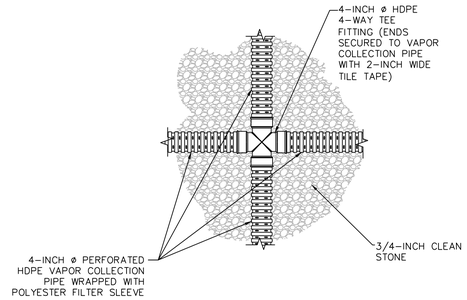
DETAIL 3: TYPICAL COUPLER CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



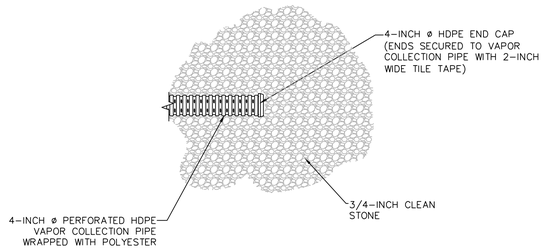
DETAIL 4: TYPICAL 3-WAY TEE FITTING CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



DETAIL 5: TYPICAL 4-WAY TEE FITTING CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE



DETAIL 6: TYPICAL END CAP CONNECTION FOR VAPOR COLLECTION PIPE (PLAN VIEW)

NOT TO SCALE

GENERAL NOTES:

1. DESIGN DETAILS AND DRAWINGS ARE ADAPTED FROM EPA DOCUMENT EPA/625/R-92/016.
2. INSTALLATION OF THE SUBMEMBRANE COMPONENTS AND RISER PIPE MUST BE COORDINATED WITH THE INSTALLATION OF OTHER UTILITIES AND STRUCTURAL COMPONENTS.
3. SOLID-SUBMEMBRANE PIPE SHALL BE 4-INCH ø FLEXIBLE, CORRUGATED, SMOOTH INTERIOR, HIGH DENSITY POLYETHYLENE (HDPE) PIPE WITH A MINIMUM PIPE STIFFNESS OF 35 POUNDS PER SQUARE INCH (PSI) AT 5% DEFLECTION.
4. SOLID-SUBMEMBRANE PIPE SHALL MAINTAIN A MINIMUM SLOPE OF 1/8" PER LINEAR FOOT SLOPING DOWN FROM THE RISER PIPE LOCATION.
5. PERFORATED VAPOR COLLECTION PIPE SHALL BE 4-INCH ø FLEXIBLE, CORRUGATED, SMOOTH INTERIOR, PERFORATED, HIGH DENSITY POLYETHYLENE (HDPE) PIPE WITH A MINIMUM PIPE STIFFNESS OF 35 POUNDS PER SQUARE INCH (PSI) AT 5% DEFLECTION. PERFORATIONS SHALL BE SLOT-TYPE. THERE SHALL BE, AT A MINIMUM, THREE EQUALLY SPACED PERFORATIONS PER GROOVE (I.E. DEPRESSED SECTION OF THE PIPE) OF THE CORRUGATED PIPE. PERFORATIONS ON ALTERNATING GROOVES SHALL BE OFF-SET.
6. TOP OF PERFORATED VAPOR COLLECTION PIPE SHALL BE 2 INCHES FROM THE BOTTOM OF SLAB. WHEN NECESSARY, PERFORATED VAPOR COLLECTION PIPE MAY BE ROUTED UNDERNEATH OTHER UTILITIES AND PIPING IN THE SUBSURFACE; TOP OF PERFORATED VAPOR COLLECTION PIPE SHOULD NOT EXCEED 12 INCHES FROM THE BOTTOM OF THE SLAB.
7. ALL FITTINGS AND CONNECTIONS FOR THE VAPOR COLLECTION PIPE SHALL BE 4-INCH ø HDPE FITTINGS, MADE BY THE SAME MANUFACTURER AS THE 4-INCH ø PIPE, AND OF THE TYPE RECOMMENDED BY THE MANUFACTURER FOR USE WITH THE 4-INCH ø PIPE. SECURE ALL FITTINGS AND CONNECTIONS WITH 2-INCH WIDE TILE TAPE.
8. POLYESTER FILTER SLEEVES SHALL HAVE A MINIMUM AIR PERMEABILITY OF 70 CUBIC FEET/SQUARE FEET/MINUTE.
9. RISER PIPE (DESIGNED BY OTHERS) SHALL BE 4-INCH ø METAL PIPE OR OTHER MATERIAL THAT COMPLIES WITH APPLICABLE BUILDING CODE.
10. RISER PIPE (DESIGNED BY OTHERS) SHALL BE EXTENDED TO THE ROOF WITH MINIMAL CHANGES IN DIRECTION AS SHOWN ON THE MECHANICAL AND PLUMBING DRAWINGS.
11. ALL PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER) SHALL BE SEALED WITH A HIGH ADHESIVE SEALANT, UNLESS OTHERWISE SPECIFIED. PENETRATIONS SHALL BE AIR-TIGHT.
12. RISER PIPE MUST BE CLEARLY LABELED "CAUTION: DO NOT ALTER SUBSLAB VAPOR VENT PIPE" IN EACH ACCESSIBLE AREA (A MINIMUM OF EVERY 10 LINEAR FEET OF RISER PIPE RUN).
13. SYSTEM INSTALLATION SHALL ADHERE TO: FINAL GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSION IN THE STATE OF NEW YORK PREPARED BY NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH), DATED OCTOBER 2006 AND 2008 NEW YORK CITY MECHANICAL CODE, CHAPTER 5, SECTION MC 512-SUBSLAB EXHAUST SYSTEMS. POINT OF EXHAUST (DESIGNED BY OTHERS) SHALL BE:
    - ABOVE THE EAVE OF THE ROOF (PREFERABLY, ABOVE THE HIGHEST EAVE OF THE BUILDING AND AT LEAST 12-INCHES ABOVE THE
    - SURFACE OF THE ROOF):
    - AT LEAST 10 FEET ABOVE GROUND LEVEL,
    - AT LEAST 10 FEET AWAY FROM ANY OPENING THAT IS LESS THAN 2 FEET BELOW THE EXHAUST POINT, AND
    - 10 FEET FROM ANY ADJOINING OR ADJACENT BUILDINGS, OR HVAC INTAKES OR SUPPLY REGISTERS.
14. ALL EXTERNAL PIPES SHALL BE PAINTED WITH A CORROSION RESISTANT COATING, DEPENDING ON PIPE MATERIAL.
15. 3/4-INCH CLEAN STONE = IN-PLACE STONE SHALL BE CLEAN, COARSE, NATURAL, ANGULAR, WASHED 3/4-INCH AGGREGATE WITH THE FOLLOWING GRADATION:

SIEVE SIZE	% PASSING BY WEIGHT
1 1/2-INCH	100
1-INCH	90-100
1/2-INCH	0-5
#200	<1

16. CLEAN STONE LAYER ON TOP OF PIPE SHALL NOT BE COMPACTED AND SHALL EXTEND CONTINUOUSLY ACROSS THE DEPRESSURIZED AREA.
17. CONTRACTOR SHALL PROVIDE CERTIFIED AS-BUILT DRAWINGS OF COMPLETE SMD SYSTEM TO REMEDIATION ENGINEERING FOLLOWING INSTALLATION.

VAPOR BARRIER NOTES:

1. VAPOR BARRIER SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE MANUFACTURER GUIDELINES AND DETAILS.
2. VAPOR BARRIER SHALL BE INSTALLED BY A MANUFACTURER-CERTIFIED INSTALLER.
3. VAPOR BARRIER SHALL BE INSPECTED IMMEDIATELY BEFORE CONCRETE IS PLACED. ALL PENETRATIONS, HOLES, OR TEARS SHALL BE SEALED BEFORE CONCRETE IS PLACED.
4. CONTRACTOR SHALL PROVIDE CERTIFIED AS-BUILT DRAWINGS OF COMPLETED VAPOR BARRIER EXTENTS TO REMEDIATION ENGINEER FOLLOWING INSTALLATION.

Date	Description	No.
REVISIONS		

SIGNATURE DATE SIGNED
PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
NEW JERSEY NEW YORK CONNECTICUT PENNSYLVANIA OHIO
VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA
ABU DHABI ATHENS DOHA DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

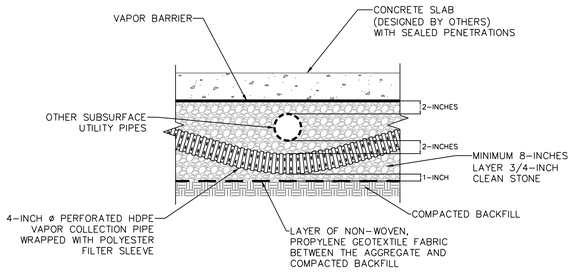
Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
SMD DETAILS

Project No.	Figure No.
170264501	APPENDIX L-1
Date: 12/9/2014	
Scale: N.T.S.	
Drawn By: AT / Checked By: -	
Submission Date: -	Sheet 1 of 3

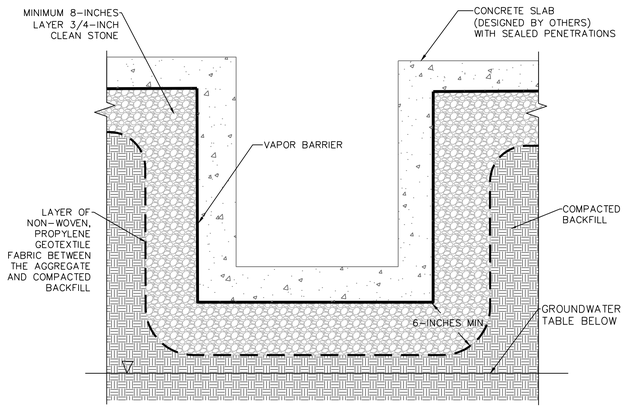
Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMD Design\Appendix ## - SMD Details.dwg Date: 12/9/2014 Time: 16:30 User: atashji Style Table: Langan.stb Layout: Appendix L-1

NOTE: DETAIL 7 ONLY APPLIES WHERE 4-INCH HDPE VAPOR COLLECTION PIPE DOES NOT FIT ABOVE UTILITY PIPE.



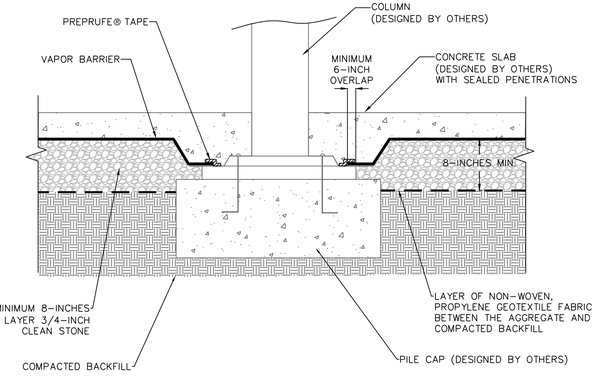
DETAIL 7: TYPICAL DETAIL AT LOCATIONS OTHER SUBMEMBRANE UTILITY PIPE OVERLIES PERFORATED SUBSLAB PIPE

NOT TO SCALE



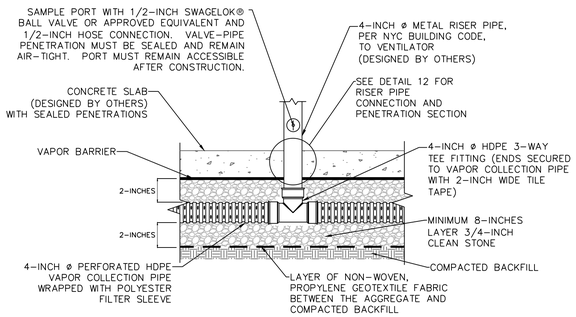
DETAIL 8: TYPICAL ELEVATOR/EJECTOR PIT SECTION (ABOVE GROUNDWATER)

NOT TO SCALE



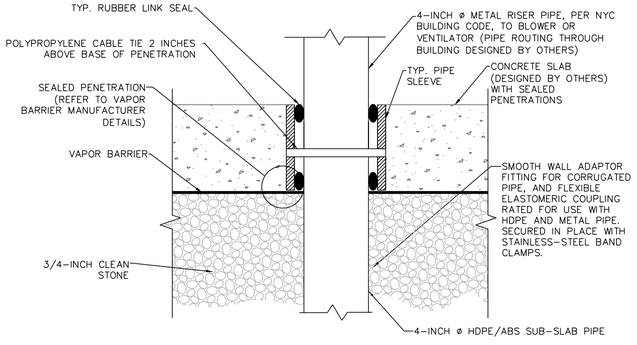
DETAIL 9: TYPICAL DETAIL FOR INTERIOR FOOTING

NOT TO SCALE



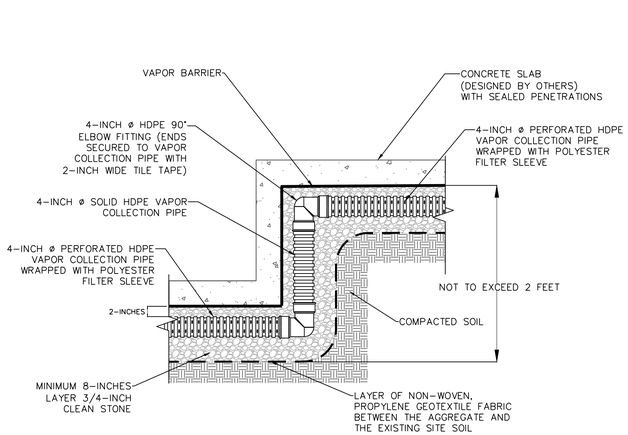
DETAIL 10: TYPICAL SECTION AT SOLID RISER PIPE

NOT TO SCALE



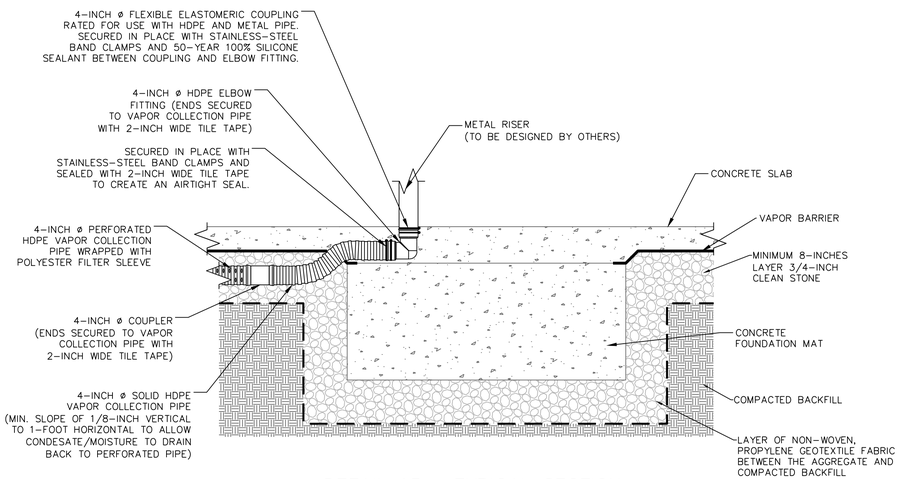
DETAIL 11: RISER PIPE CONNECTION

NOT TO SCALE



DETAIL 12: TYPICAL SECTION FOR PERFORATED SUBSLAB PIPE AT ELEVATION CHANGE BETWEEN TWO SLABS

NOT TO SCALE



DETAIL 13: TYPICAL SECTION RISER PENETRATION ABOVE FOUNDATION MAT

NOT TO SCALE

SEE DETAIL 1 FOR GENERAL NOTES.

No.	Description	Date
1	REVISED FDN/ARCH	10/13/15

REVISIONS

SIGNATURE DATE SIGNED

PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
NEW JERSEY NEW YORK CONNECTICUT PENNSYLVANIA OHIO VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA ABU DHABI ATHENS DOHA DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project

535 4TH AVENUE

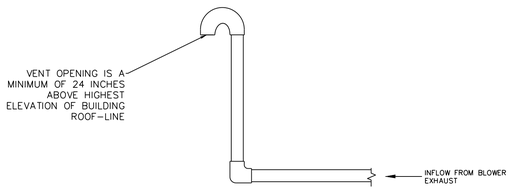
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS **NEW YORK**

Figure Title

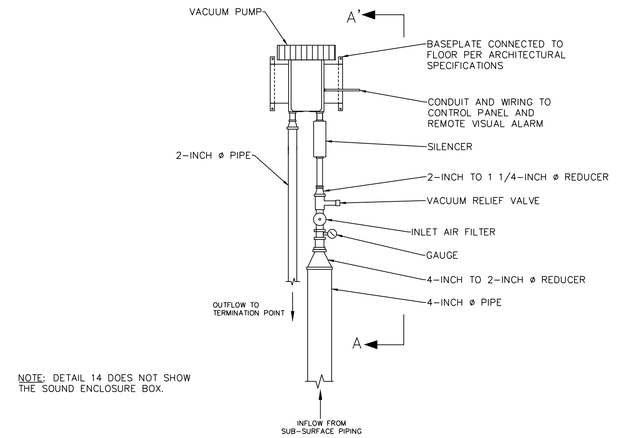
SMD DETAILS

Project No. **170264501**	Figure No. **DETAIL 2**
Date **12/9/2014**	
Scale **N.T.S.**	
Drawn By **AT** / Checked By **-**	
Submission Date **-**	Sheet 2 of 4

Filename: \\langan.com\data\NY\data5\170264501\Cadd Data - 170264501\2D-DesignFiles\Environmental\SMD Design\SMD Details.dwg Date: 10/14/2015 Time: 08:19 User: atashji Style Table: Langan.stb Layout: Details 2

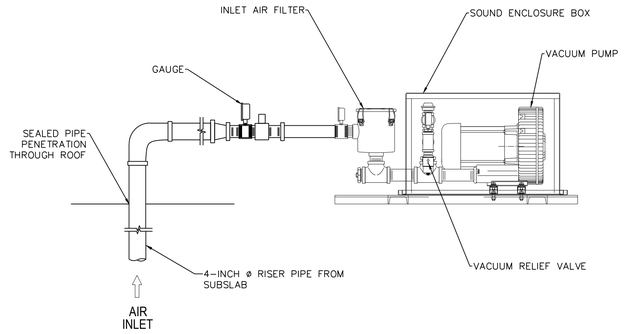


DETAIL 13: VENT TERMINATION POINT SECTION VIEW
NOT TO SCALE



NOTE: DETAIL 14 DOES NOT SHOW THE SOUND ENCLOSURE BOX.

DETAIL 14: VACUUM BLOWER PLAN VIEW
NOT TO SCALE



DETAIL 15: VACUUM BLOWER SECTION VIEW (A-A')
NOT TO SCALE

BLOWER NOTES:

1. THE COMPLETE BLOWER ASSEMBLY INCLUDING BLOWER, MOTOR, BASEPLATE, CONTROL PANEL, REMOTE VISUAL ALARM, VALVES, GAUGES, FILTER, AND FLEXIBLE HOSE SHALL BE PROVIDED BY THE MANUFACTURER.

2. BLOWER ASSEMBLY TO BE INSTALLED SHALL PROVIDE AT CONTINUOUS OPERATION:

   - NORTH BLOWER: MINIMUM OF 45 CUBIC FEET PER MINUTE (CFM) FLOW RATE AT 30 INCHES OF WATER COLUMN (INCHES WC) VACUUM AT BLOWER; AND
   - SOUTH BLOWER: MINIMUM OF 32 CFM FLOW RATE AT 30 INCHES OF WATER COLUMN (INCHES WC) VACUUM AT BLOWER.

3. BLOWERS TO BE INSTALLED SHALL BE:

   - NORTH BLOWER: AIRTECH 3BA1310-7AT26 OR APPROVED ALTERNATIVE; AND
   - SOUTH BLOWER: AIRTECH 3BA1300-7AT06 OR APPROVED ALTERNATIVE.

   - THE BLOWER SCHEMATICS ARE SHOWN TO ILLUSTRATE THE REQUIRED COMPONENTS AND THE GENERAL LOCATIONS IN THE PIPE RUN AND SHALL NOT BE CONSIDERED TO BE ACCURATE. THE ACTUAL CONFIGURATION AND DIMENSIONS OF THE BLOWER ASSEMBLY WILL VARY BASED ON MANUFACTURING METHODS AND FIELD CONDITIONS. FINAL DESIGN AND BLOWER SYSTEM SELECTED ARE SUBJECT TO APPROVAL BY THE ENGINEER. PROVIDE ALL BLOWER SPECIFICATIONS AND CUT SHEETS FOR COMMISSION AND/OR CONSTRUCTION MANAGER'S APPROVAL PRIOR TO INSTALLATION.

   - THE BLOWERS SHALL BE HOUSED IN A SD-4 METAL SOUND ENCLOSURE RATED AS EXPLOSION PROOF. THE BLOWERS SHALL BE INSTALLED WITHIN THE ENCLOSURE BY THE BLOWER MANUFACTURER.

   - THE ELECTRICAL PANEL FOR EACH BLOWER SHALL INCLUDE AN AUXILIARY CONTACT FOR THE REMOTE ALARM AND WILL BE MOUNTED ON THE EXTERIOR OF THE ENCLOSURE. THE ELECTRICAL PANEL SHALL BE HOUSED IN NEMA 7 ENCLOSURE. THE REMOTE ALARM SHALL BE LOCATED WITHIN A BUILDING MANAGERS OFFICE. THE ALARM SHALL CONSIST OF A WARNING LIGHT, NEMA 12 ENCLOSURE, AND ASSOCIATED RELAYS. THE REMOTE ALARM AND BLOWER CONTROL PANEL SHALL BE CONFIGURED SUCH THAT IF THE BLOWER STOPS OPERATING, THE REMOTE ALARM WILL BE ACTIVATED. A 120 VOLT ELECTRICAL SUPPLY SHALL BE PROVIDED TO THE REMOTE PANEL.

   - THE REMOTE VISUAL ALARM SHALL BE LABELED AS FOLLOWS:
   - SUBSLAB VAPOR VENTING SYSTEM ALARM
   - BLOWER MALFUNCTION IF LIT
   - SERVICE BLOWER IMMEDIATELY

8. SUPPLY POWER TO BLOWER ASSEMBLY, INCLUDING BLOWER, CONTROL PANEL, AND REMOTE ALARM, IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS.

9. BLOWER ASSEMBLY SHALL BE LOCATED ON ROOF, AS SHOWN ON MEP DRAWINGS.

10. RISER PIPE RUN WITHIN THE BUILDING IS LOCATED AS SHOWN ON MEP DRAWINGS.

11. BLOWER WILL REQUIRE A THREE-PHASE, 60 HZ, 220 TO 250 VOLT POWER SUPPLY.

DRAFT
NOT FOR CONSTRUCTION

Date	Description	No.
REVISIONS		

SIGNATURE DATE SIGNED
PROFESSIONAL XXXXXXXXXX
STATE LIC. No. XXXXX

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com
NEW JERSEY NEW YORK CONNECTICUT PENNSYLVANIA OHIO VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA
ABU DHABI ATHENS DOHA DUBAI ISTANBUL
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
535 4TH AVENUE
BLOCK No. 1041, LOT No. 1
BROOKLYN
KINGS NEW YORK

Figure Title
SMD DETAILS

Project No. 170264501	Figure No. APPENDIX L-3
Date 12/9/2014	
Scale N.T.S.	
Drawn By AT / Checked By -	
Submission Date -	Sheet 3 of 3

ATTACHMENT F

QUALITY ASSURANCE PROTECTION PLAN

SOP #01 – Sample Nomenclature

INTRODUCTION

The Langan Environmental Group conducts an assortment of site investigations where samples (Vapor, Solids, and Aqueous) are collected and submitted to analytical laboratories for analysis. The results of which are then evaluated and entered into a data base allowing quick submittal to the state regulatory authority (New York State Division of Environmental Conservation [NYSDEC]). In addition, Langan is linking their data management system to graphic and analytical software to enable efficient evaluation of the data as well as creating client-ready presentational material.

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the general framework for labeling vapor, solid (soil) and aqueous (groundwater) samples that will be submitted for laboratory analysis. The nomenclature being introduced is designed to meet the NYSDEC EQuIS standard and has been incorporated into Langan software scripts to assist project personnel in processing the data. While this SOP is applicable to all site investigation; unanticipated conditions may arise which may require considerable flexibility in complying with this SOP. Therefore, guidance provided in this SOP is presented in terms of general steps and strategies that should be applied; but deviation from this SOP must be reported to the Project Manager (PM) immediately.

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels

All sample ware must have a label. Recall that when you are using the Encore™ samples (see below); they are delivered in plastic lined foil bags. You are to label the bags[1]:

All other samples containers including Terra Cores™ must be labeled with laboratory provided self-adhesive labels.

Quick Breakdown of Sample Format

The general format for sample nomenclature is:

[1]Both Alpha and York laboratories permit the combining of the three Encore™ into a single bag. This may not be appropriate for all laboratories so please confirm with the labs themselves

LLNN_ID

Where

LL is a grouping of two (2) to four (4) letters signifying the sample media source. In older nomenclature SOPs this portion of the sample identification is commonly referred to as the *Sample Investigation Code*

NN represents a two digit number identifying the specific sample location or sample sequence number

_ ***(underscore)*** is required between the sample lettering and numeric identification and additional modifying data that determines the date of sampling or the depth of the sample interval

ID is a modifier specific to the sample type media (depth of soil sample or date of groundwater sample)

LL – Sample Investigation Code

Langan has devised a list of two to four letters to insure a quick ability to identify the sample investigation.

Code	Investigation
AA	Ambient Air
DS	Drum
EPB	Endpoint Location - Bottom (Excavation)
EPSW	Endpoint Location - Sidewall (Excavation)
FP	Free Product
IA	Indoor Air
IDW	Investigation Derived Waste (Soil Pile)
MW	Monitoring Well (Permanent)
SB	Soil Boring
SG	Staff Gauge (Stream Gauging)
SL	Sludge
SV	Soil Vapor Point
SVE	Soil Vapor Extraction Well
SW	Surface Water
TMW	Temporary Monitoring Well
TP	Test Pit (Excavated Material from Test Pit Not Associated With Sidewall or Bottom Samples)
WC	Waste Characterization Boring
COMP	Composite Sample
TB	Trip Blank (QA/QC Sampling – All Investigations)
FB	Field Blank (QA/QC Sampling – All Investigations)
DUP	Duplicate (QA/QC Sampling – All Investigations)

NN – Numeric Identifier

The two digit number that follows the sample investigation code (LL) identifies the specific sample based on the soil boring, monitoring well, endpoint or other location identification. For a subset of samples

where there is no specific location identifier, the two digit number is the sequence number for the sample submitted. For example, an aqueous sample from a monitoring well identified as MW-1 would have the sample investigation code of MW and the numeric identifier as 01. Note there is no hyphen. The same can be done for soil borings, a soil sample collected from soil boring 9 (SB-9) would be have the LLNN identification of SB09 (again, no hyphen).

Note however that there is a subset of samples related to laboratory analytical quality assurance, among these includes TB, FB, and DUP. On many investigations, the Scope will require multiple collections of these types of samples, therefore the numerical number represents the sequence sample count where the first sample is 01, the second sample is 02, and the third sample is 03 and so on.

_ Underscore
The underscore is required. It separates the investigation code and numeric identifier from the modifier specific to the sample itself. Note that every effort should be made to insure that the underscore is clear on the sample label and chain of custody (COC).

ID – Modifier Specific to Type Media
Each sample investigation code and numeric identifier is further modified by an ID specific to the sample type media. In general, soil samples (soil borings or endpoint samples) use an ID that indicates the depth at which the sample was taken. Aqueous samples (groundwater or surface water samples) are identified by the date the sample was collected. Other types of samples including quality control (TB, FB, and DUP), Vapor samples (AA, IA, SV or SVE), other soil type samples (IDW, sludge, free product, drum, and others) are also identified by a date. The following rules apply to the ID when using sample depth or sample date.

Sample Depth
The sample depth must be whole numbers (no fractions) separated by a hyphen. Thus for a soil sample collected from the soil boring SB-1 from a depth of 6 feet to 8 feet, the sample would be identified as:

SB01_6-8

Unfortunately, the NYSDEC EQuIS system does not accept fractions. Therefore, if your sample interval is a fraction of a foot (6.5-7.5), round up to the larger interval (6-8).

Sample Date
The sample date is always in the format of MMDDYY. Note that the year is two digits. Thus for a groundwater sample collected on July 1, 2015 from the monitoring well MW-1, the sample would be identified as:

MW01_070115

Special Cases
There are a couple of specific sample types that require further explanation.

Endpoint Sampling
End point sidewall samples are sometimes modified by magnetic direction (N, S, E, and W). For example, the first sidewall endpoint sample from the north wall of an excavation at a depth of 5 feet would be written as:

EPSW01_N_5

Again, note that the N in the identification refers to north and is separated from the prefix investigation code/numeric identifier and ID modifier suffix by underscores.

Vapor Extraction Well Sample
As with the sidewall endpoint samples, the sample name is altered by inserting a middle modifier between the prefix and suffix of the sample name. The middle modifier is used to identify the source of the sample (inlet sample port, midpoint sample port or outlet sample port). For example the midpoint port of the vapor extraction well number 1 sampled on July 1, 2015 would be written as;

SVE01_MID_070115

Matrix Spike and Matrix Spike Duplicate
On occasion, a Langan investigation will collect a sample to be used to provide the lab with a site specific medium to spike to determine the quality of the analytical method. This special case of sampling requires additional information to be used in the sample name, specifically, a suffix specifying whether the sample is the matrix spike (MS) or the matrix spike duplicate (MSD). In the following example, the sample is collected from soil boring number 1 at a depth of 2-4 feet. For the matrix spike sample:

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

Multiple Interval Groundwater Sampling
Although not currently a common practice, low flow sampling facilitates stratigraphic sampling of a monitoring well. If the scope requires stratigraphic sampling then groundwater samples will be labeled with a lower case letter following the well number. For example, placing the pump or sampling tube at 10 feet below surface in MW01 on July 1, 2015 would require the sample to be labeled as:

MW01a_070115

While a second sample where the pump or tubing intake is placed at 20 feet would be labeled as:

MW01b_070115

Note that it is important that you record what depth the intake for each sample represents in your field notes; as this information is going to be critical to interpreting the results.

ATTACHMENT G

INSPECTION FORMS AND CHECKLISTS

Import Sys Data

Mitigation System Installation Record

☐ Structure was sampled previously

System Information

Site No: _____

System ID: _____ Site Name: _____

Owner Name: _____ ☐ Owner Occupied

System Address: _____ Telephone: _____

City: _____ Zip: _____ Alt. Telephone: _____

Contractor Information

Installer Name: _____ Company: _____

Telephone: _____

Building Conditions Building Type: _____

Slab Integrity: ○ Poor ○ Average ○ Good ○ Excellent

Slab Penetrations: ☐ Sump ☐ Floor drain ☐ Perimeter drain ☐ Other

Describe:

Observed Water: ○ Dry ○ Damp ○ Sump only ○ Standing

Describe:

System Installation

Installation Type: _____ Date Installed: _____

Slab Thickess (inches): _____

Subslab Material: _____ Subslab Moisture: _____

Number of Suction Points: _____ Number of Fans Installed: _____

	☐ Fan #1 Operating	☐ Fan #2 Operating	☐ Fan #3 Operating
Fan Model No(s):			
Fan Serial No(s):			
Final U-Tube Levels:			

Additional Mitigation Elements (check all that apply):

☐ Drainjer ☐ Membrane ☐ Sealed cracks ☐ New floor ☐ Rain cap ☐ Other

Comments:

Export Data

Print Form

Communication Testing

Test Method: Meter Type/Manufacturer: _____

Location	Reading/Result	Dist. From Suction Point (ft)	Passed?
			☐
			☐
			☐
			☐
			☐

NORTH

System Sketch
(indicate notable features, location of extraction points, and communication test holes)

Export Data

Submit by Email

SITE INSPECTION CHECKLIST

Site Name: _____ Location: _____ Project Number: _____

Inspector Name: _____ Date: _____ Weather Conditions: _____

Reason for Inspection (i.e., routine, severe condition, etc.): _____

Check one of the following: **Y:** Yes **N:** No **NA**: Not Applicable

		Y	N	NA	Normal Situation	Remarks
	General					
1	What are the current site conditions?	--	--	--	--	
2	Are all applicable site records (e.g., documentation of construction activity, SMD system maintenance and repair, most current easement, etc.) complete and up to date?				Y	
	Easement					
3	Has site use (restricted residential) remained the same?				Y	
4	Does it appear that all environmental easement restrictions have been followed?				Y	
	Impermeable Cap					
5	Are there any indications of a breach in the capping system at the time of this inspection?				N	
6	Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the capping system, on-site at the time of this inspection?				N	
7	If YES to number 7, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed?				NA if N to 6/ Y if Y to 6	
	SMD Systems					
8	Are all visible SMD system components intact and operational at the time of this inspection?				Y	

***

If the answer to any of the above questions indicate non-compliance with any IC/ECs for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.

SITE INSPECTION CHECKLIST

Additional remarks _____
_____
_____
_____
_____
_____
_____
_____

Minimum Inspection Schedule: Site-wide inspections will be conducted annually, per certification year, at a minimum.

ATTACHMENT H

SAMPLE GROUNDWATER SAMPLING LOG

GROUND WATER SAMPLE FIELD INFORMATION FORM

Site:	**Well#/Location:**	**Job No.**
Date:	**Weather:**	**Sampling Personnel:**

Well Information

Sample ID	
Well Depth (ft)	
Screened Interval (ft)	
Casing Elevation (msl)	
Casing Diameter (in)	
Depth to Water (ft)	
Water Elevation (msl)	
Casing Volume (gal)	
PID/FID Reading (ppm)	

Purging Information

Purging Method	
Purging Rate (l/m; gpm)	
Start Purge Time	
End Purge Time	
Volume Purged (gal)	

Sampling Information

Sampling Method	
Start Sampling Time	
End Sampling Time	
Depth Before Sampling (ft)	
Number Bottles Collected	

	Parameters							
Sample Time	**Temp (◦C)**	**pH**	**ORP (mV)**	**Conductivity (mS/cm)**	**Turbidity (NTU)**	**Dissolved Oxygen (mg/L)**	**Depth to Water (ft)**	**Purged Volume (gallons)**

Notes/Remarks

Stablility

PH - ± 0.1 unit

Specific Conductance - ± 3%

Temperature - ± 3%

Dissolved Oxygen - ±10% above 0.5 mg/L

Turbidity - ± 10% above 5 NTU

ORP/Eh - ±10 millivolts

Maximum flow rate - <0.5 L/m or 0.13 gpm

Maximum drawdown - <0.33 feet

Remember: Battery Connections - **RED** is **POSITIVE** and **BLACK** is **NEGATIVE**

ATTACHMENT I

SAMPLE HEALTH AND SAFETY PLAN

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This Health and Safety Plan (HASP) was designed to protect against occupational injuries and illnesses from workplace hazards, tasks and chemical exposures during groundwater activities associated with the remedial investigation for 535 4th Avenue, Brooklyn, New York ("the Site"). This HASP has been developed to comply with Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response (HAZWOPER) and addresses foreseeable activities associated with the Site remedial investigation. This HASP will be implemented by Langan personnel while on site. Compliance with this HASP is required of all Langan personnel.

The management of groundwater-related activities and implementation of this HASP in the field is the responsibility of the site Langan Field Team Leader (LFTL). Assistance in the implementation of this HASP can also be obtained from the site Langan Health and Safety Officer (LHSO) and the Langan Health and Safety Manager (LHSM). The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the work plan.

1.1 Site Description

The subject property is located in the Park Slope neighborhood of the New York City borough of Brooklyn and is situated on the city block bordered by 14th Street to the north, 15th Street to the south, 5th Avenue to the east, and 4th Avenue west. The subject property is comprised of Block 1041, Lot 1 and occupies an area of approximately 18,200 square feet. A vacant automotive repair facility, which includes a vehicle maintenance garage, a parking area, retail and stock areas, and administrative offices, occupies the subject property. According to the United States Geological Survey (USGS) Brooklyn Quadrangle 7.5-minute Series Topographic Map, the Subject Property sits at an elevation of approximately 55 feet above mean sea level (msl). The Subject Property and surrounding area slope to the west toward the Gowanus Canal.

1.2 Summary of Work Tasks

The general categories of groundwater tasks being performed during implementation of the work plan include:

1.2.1 Groundwater Monitoring Well Completion, Development and Sampling

A properly licensed drilling contractor will complete a select number of soil borings into groundwater monitoring wells in accordance with the specifications outlined in the scope of work. The Langan employee will coordinate and supervise well completion; however, he/she is not permitted to handle any equipment or assemble monitoring well parts nor participate in the actual completion of a monitoring well.

After the well has been completed, the Langan employee will develop the well in accordance with the Langan Well Development Standard Operating Procedure (SOP #07) following the

specifications outlined in the scope of work. Subsequent to well development, a Langan employee will return to the site to collect groundwater samples.

Groundwater samples will be collected for laboratory analysis in accordance with the Langan Low Flow Groundwater Sampling Standard Operating Procedure (SOP #12) following specifications outlined in the scope of work. All samples will be will be submitted under chain-of-custody protocol to a certified laboratory for analysis.

1.2.2 Monitoring Well Decommissioning

A properly licensed drilling contractor will remove and decommission a select number of groundwater monitoring wells as needed after sampling has been completed, in accordance with the specifications outlined in the scope of work. The Langan employee will coordinate and supervise monitoring well decommissioning; however, he/she is not permitted to handle any equipment or assemble monitoring well parts nor participate in the actual completion of a monitoring well.

1.3 Safety Organization

The Safety Organization at the Site will involve the joint cooperation of all parties, including Langan (Prime Contractor) and its affiliates and all subcontractors. Subcontractors are responsible for working safely and complying with their own HASP, which at a minimum meets the requirements of this HASP.

1.3.1 Safety and Planning Meetings

For routine investigation tasks; a task-specific kick-off meeting to discuss safety issues will take place to review appropriate safety issues prior to starting fieldwork. This meeting will be held in the field on the first day of work. Additional safety meetings will be conducted as the job progresses to discuss health and safety issues related to upcoming tasks. Langan will prepare and maintain documentation of these meetings.

1.3.2 Report of Accidents and Emergencies

All incidents involving injuries or property damage shall be reported to Langan by the appropriate subcontractor Safety Coordinator, and accident/incident reports will be completed for all accidents and incidents by those Safety Coordinators. At a minimum, the information presented in the accident/incident report form (Appendix A) must be provided.

2.0 ASSIGNMENT OF RESPONSIBILITIES

2.1 General

All activities on or around the Site are subject to this health and safety plan. These activities include, but are not limited to soil borings, well and vapor point installation, test pit excavation, and other support activities.

All personnel, including subcontractor personnel, will be responsible for continuous adherence to the safety procedures during the performance of this work. Deviations from the procedures or intent of the HASP will not be allowed without express consent of the Langan Site Safety Health Officer (SSHO), who shall coordinate all significant changes with the Langan Project Management staff and subcontractor personnel, as appropriate. The Project Management and field supervisor for each contractor and subcontractor is responsible for ensuring that their personnel follow the established procedures in this HASP and the subcontractor's respective HASPs. After appropriate warning and notification, personnel who violate health and safety procedures will be dismissed from site operations. It must be remembered that the person most responsible for the health and safety of an individual is the individual him/herself.

Langan and subcontractor Project Management staff will participate in periodic health and safety inspections and accident investigations; attend periodic safety meetings; and coordinate on field-approach or project scope changes that could impact the project safety program. The Langan SSHO will be informed of any changes in approach that could impact existing safety protocols.

Langan employees will be expected to sign the Employee Acknowledgement of Site Specific Health and Safety Plan Form (Appendix B). Project field personnel for all subcontractors will be required to sign an acknowledgement form indicating that they have reviewed and are familiar with the HASP.

2.2 Langan Responsibilities

Langan is the Prime Contractor for the Site and is responsible for setting safety policies as prescribed by local, state and federal jurisdictions for all work done by contractors (if any) and subcontractors. Langan will directly manage all environmental investigation and remediation activities and will be directly responsible for the implementation of this HASP.

2.2.1 Langan Site Safety Health Officer

The Langan Site Safety Health Officer (SSHO) shall be responsible for providing overall technical and administrative oversight of the health and safety program, both on-site and off-site. Additionally, the SSHO will have the following responsibilities:

- The SSHO will review and approve the HASP and any changes to the plan.

- The SSHO will receive and maintain documentation from subcontractor field supervisors or Site Safety Coordinators for all safety related matters, including accident record keeping, accident investigations, safety training and certifications.
- The SSHO will coordinate with field staff on matters regarding safety program compliance.

2.2.2 Langan Site Safety Coordinator

Langan's Site Safety Coordinator (SSC) will be responsible for the day-to-day safety compliance of Langan employees and Langan subcontractors, during all field activities. Langan will provide a SSC for all field investigation and remediation work that Langan directly manages. The SSC is a full-time member of Langan's field staff during all work. Depending on the complexity of the work; Langan's Field Supervisor may also serve as the SSC, or a separate member of the field staff will serve as SSC. The primary duties of the SSC will include:

- Directing and implementing requirements of the HASP.
- Attendance at safety and planning meetings.
- Formal weekly and daily site inspections.
- Ensuring that all Langan project personnel and subcontractors working under this HASP have been adequately trained in the recognition and avoidance of unsafe site conditions, the content of this HASP, and regulations applicable to the work in order to control or eliminate hazards or other exposure to illness or injury.
- Authorizing "Stop Work Orders" to subcontractors that shall be executed upon the determination of an imminent health and safety concern.
- Contacting the Langan Project Manager and SSHO on the issuance of the Stop Work Orders when the SSC has made the determination of an imminent health and safety concern.
- Authorizing work to resume upon approval from the Langan Project Manager and the SSHO.
- Directing activities as defined in this HASP during emergency situations, subject to restrictions identified in Section 6.

The SSC will initiate evacuation procedures when necessary, subject to restrictions identified in Section 6.

The SSC will be responsible for assessing daily site activities for compliance with all provisions of the HASP. Deviations will be noted, corrected, and reported to the Langan Project Manager and SSHO. The SSC or designee will ensure that required monitoring and hazard evaluations are performed. The SSC will also ensure that subcontractor site safety inspection logs and documents are maintained for inspection at the jobsite as part of the Contractor's Safety Program Evaluation (Section 2.2.4).

2.2.3 Maintenance of Records

Langan will maintain records pertinent to the overall safety program as described in this HASP, including meeting minutes, accident records, safety inspection records, contractor evaluations, records of applicable training, and records of accident investigations. Copies of these records will be available for review by OER.

2.2.4 Contractor's Safety Program Evaluation

Langan will periodically evaluate contractor and subcontractor safety performance. Results of this evaluation may be discussed and corrected immediately or, if immediate correction is not possible, forwarded directly to the contractor's office for resolution. Langan's Project Management and the contractor's Project Management will receive copies of this evaluation. The Contractor's Safety Program Evaluation form can be found in Appendix C.

2.3 Key Personnel and Emergency Telephone Numbers

The key personnel in this project and emergency phone numbers are included in Appendix D.

2.4 Site Access and Site Security

Site access will be controlled through the gated entrance on site. Barrier protection will be installed around work areas as needed. Equipment may be stored on-site.

Equipment and operations carried on outside of property boundaries need to be secured to prevent injury and property damage. All moving, hot, or hazardous equipment should be secured. Access to such hazardous operations and equipment should be restricted via use of standard guard railing or barrier tape. If this is not possible, a watchman shall be posted for as long as the danger exists.

3.0 STANDARD OPERATING PROCEDURES

3.1 Standard Work Practices

The following work practices and engineering controls may be used during each phase of the project. The work practices are Standard Operating Procedures, and will not be deviated from without the consent of the SSHO.

Hazards associated with site work, working with utilities, drilling, test-pit excavation, soil and groundwater sampling, and cold/heat stress are covered under this HASP.

3.2 Safety Inspection Program

Safety inspections are a key to compliance with safety rules, and the maintenance of safe conditions. Accidents can be a direct result of whether or not these inspections have taken place. Safety inspections will take four forms:

Everyday inspections – results of which are to be recorded by SSCs or the SSM

Weekly inspections – formal inspections that should be recorded on a form similar to the Safety Inspection Form located in Appendix E

Contractor Evaluations – as described in section 2.2.4

3.3 Accident Investigations

The purpose of these investigations is to determine cause of an accident so that a similar accident will not occur in the future. Depending on who is directly managing the work; Langan shall determine the nature of such accident, record the findings, and correct the cause. Langan will investigate accidents related to site characterization.

In the event that an injury occurs, an Injury Report form (Appendix F) will be completed within 24-hours of the incident. Langan will provide an investigation report that includes a description of the incident, root cause determination, and preventative actions to be taken to prevent recurrence. Work will not resume on the task until the Owner is satisfied with Langan's preventative action plan.

3.4 Site Hazard Assessments

Hazard assessments shall be performed for each task on this project. Such assessments may involve the use of air sampling, or a site survey for exposure to chemicals and gases or other physical agents such as noise or electricity. During such a survey, engineering or administrative controls will be considered before resorting to Personal Protective Equipment (PPE). If these

controls do not adequately address work-related hazards, PPE needs must be evaluated. The specific hazards which will be encountered are described below:

Hazard 1. Vehicular Traffic

Drilling will be performed in an active parking lot. All site workers shall be provided with and shall wear warning vests of other suitable garments marked with or made of reflective or other high-visibility material.

Hazard 2. Nuisance Odors, Vapor Emissions, or Dust.

Measures used to monitor/control such exposures will include use of air monitoring or water for dust suppression.

Hazard 3. Falling Loads

No workers shall be permitted underneath loads handled by drilling equipment.

Hazard 4. Underground Utilities.

Fire, electrocution, burn and explosion hazards are present during any excavation.

3.5 Health Risks

Potential health risks will involve exposure to chemical and physical hazards. Chemical hazards may result from subsurface contaminants and gases, silica in concrete, and other hazards. Physical hazards result from exposure to noise, construction or drilling equipment, electricity, utilities and traffic. Work methods when near such exposures will need pre-planning and use of exposure limiting controls such as use of analytical equipment for detection of vapors and gases, as well as the use of PPE to aid in the control of many exposures.

3.6 Fire Safety Hazards

There is minimal fire hazards currently present on site. Fire hazards include exposures to underground utilities and gases. Volatile organic compounds are present in the soil and the groundwater. Vapor and LEL monitoring will be necessary during on-site activities where flammable/ combustible exposures exist.

3.7 Electrical Utilities

Langan will implement the following utility clearance procedure for subsurface electrical utilities:

Review site plans for work involving activities at or near utilities.

If previous utility mark-outs performed by others are deemed inadequate, Langan's utility mark-out subcontractor will conduct a geophysical survey around all proposed sampling locations to identify subsurface electric utilities and mark the centerline of underground lines.

The drilling contractor will notify the NYC One Call Center at (800) 272-4480, in accordance with Code 753, a minimum of 5 working days prior to any drilling on streets and sidewalks.

Electronic utility screening surveys may not be reliable in all locations at the Site. If electronic surveys fail to provide reliable information, utility clearance will be based on available drawings, the locations of manhole covers, and the Owner's personnel knowledge about the site and equipment. Workers engaged in these activities shall wear approved PPE for the applicable voltage.

3.8 Drilling Operations

Operation of drilling equipment and advancement of soil borings and well installation is inherently dangerous. Depending on the particular drill rig employed, these operations can present exposure to the following:

Flying objects (chipped asphalt or concrete, soil) and dust. Measures used to control such exposures will include use of water misting apparatus to keep dust down, or use of a guard installed around the drill to protect against flying objects and dust.

Underground utilities present fire, electrocution, burn and explosion hazards. Positions of gas, electric and steam utility lines will be verified as described in Section 3.7. If possible, all lines in the area of drilling should be de-energized, locked-out, and tested before work begins.

All subsurface utility lines in the area of drilling shall be identified jointly with Langan's utility mark-out subcontractor and NYC One-Call Center.

Chemical exposure may occur as workers encounter soil and groundwater across the Site, or are exposed to products used at the Site for drilling purposes including gasoline, diesel and motor oil.

3.10 Hearing Conservation

Under the construction industry standard, the maximum permissible occupational noise exposure is 90 dbA (8-hour TWA), and noise levels in excess of 90 dbA must be reduced through feasible administrative and engineering controls. (29 CFR 1926.52). To determine if noise levels have been exceeded, dosimetry for such exposures shall be conducted using a

Quest 2900 (or equivalent) noise monitor. Appendix G provides information on permissible noise exposure limits as well as procedures for monitoring noise.

The Contractor will be required to develop a Noise Mitigation Plan based on the New York City Department of Environmental Protection's revised New York City Noise Control Plan and the anticipated scope-of-work. No work will be allowed to be performed on the site without this site-specific document.

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 General Safety Equipment

Entry into confined spaces is not anticipated on this project. If confined-space entry is required, an operation specific HASP should be prepared.

4.2 Levels of Protection Per Task

Personal safety protection will be required during all site activities at most of the site locations unless information is obtained indicating that contaminants are not present. Conditions may develop that would require increased protective measures that would require the SSHO/SSC/SSM to stop operations and evaluate the situation. Respirators will likely not be needed on this project. It is anticipated that most work will be performed under Level D protection that consists of the following:

Level D

a) Work attire (e.g., work pants and shirt, overalls)
b) Steel-toe work boots (metatarsal protectors are required for those saw-cutting or jack-hammering)
c) Hard hat
d) Safety glasses
e) Hearing protection
f) Nitrile gloves
g) OSHA-compliant Safety Vests

If excessive vapors are detected or direct contact with grossly contaminated media is expected, workers may need to upgrade to modified level D protection or level C protection. Modified level D protection is the same as level D but includes Tyvek coveralls and inner at outer chemical resistant gloves.

Level C protection will consist of:

a) Full body disposable suits appropriate for chemical resistant exposure
b) Chemical resistant work boots
c) Hard hat
d) Safety glasses
e) Hearing protection
f) Inner and outer chemical resistant gloves
g) Half-face or full-face Air Purifying Respirator, equipped with organic vapor/HEPA cartridges. Cartridges will be replaced daily.
h) OSHA-compliant Safety Vests

Levels A, B or C are not expected to be required for this project.

5.0 TRAINING

5.1 Site Training Requirements

The following training requirements shall be addressed for Langan employees and all subcontractors. Copies of all training rosters and agendas, and required training certificates shall be forwarded for the review of the SSHO.

- HAZWOPER – for those employees involved in emergency response to chemical incidents and those performing site investigations on a potentially uncontrolled hazardous waste site
- *Respirator Protection* – for those workers required to use respirators
- Personal Protective Equipment Training
- Hearing Conservation
- Trade Specific Requirements

The SSHO, SSCs, and other supervisory personnel must have attended additional site-specific training to:

- Comply with all laws, rules, and regulations required to safeguard the health and safety of all employees, the public, and the environment;
- Increase the ability of employees to react responsibly and safely under normal conditions and during emergency situations; and
- Educate personnel relative to potential site hazards, adverse chemical effects, and the importance of good safety and industrial hygiene practices.

Formal safety training programs may be held periodically to refresh employees' health and safety awareness.

5.1.1 HAZWOPER Training

The SSC and any other designated worker that is expected to respond to chemical incidents in an emergency operation or perform site investigations on a potentially uncontrolled hazardous waste site must have 40-hour HAZWOPER Training as defined in OSHA 29 CFR 1926.65. Certificates of completion of 40-hour HAZWOPER, 8-hour refresher and 8-hour supervisor training for those workers requiring it must be presented to the SSHO and maintained in the project file for the duration of the project.

5.1.2 Respirator Protection Training

In areas where respiratory protection is required, employees are required to have annual training and documentation completed. This is only a part of other requirements mandated to include a medical clearance and respirator fit testing. Please refer to Appendix H for the Respiratory Protection Program.

5.1.3 Personal Protective Equipment Training

Workers are required to have this training at least initially before beginning work. PPE training is again required when the job task changes and different chemical or physical exposures are encountered. Employers should keep records of all training and any updated training efforts. These records shall be available to the SSHO for review.

5.1.4 Hearing Conservation Training

For those employees exposed to an 8-hour time-weighted average noise exposure of 90 dbA or more, hearing conservation training is required on an annual basis. Additionally, annual medical evaluations and engineering corrections and/or provision of hearing protection is necessary. Exposures to impulse/impact noise shall not exceed a 140 dbA peak sound pressure level.

5.1.5 Trade Specific Requirements

Specialized training shall be provided when serious hazards are present for which employees lack the specific training to do the job safely. Examples of this would include hazard-specific training related to excavating test pits or drill rig operation.

5.2 Tool Box Safety Talks

Toolbox safety talks will take place daily, before the job begins, in order to review the best methods used for tasks scheduled that day, tool selection, and anticipated problems. Each worker will be provided access to a copy of the site safety plan and the plan will be reviewed with each worker performing work on-site. Workers assigned a respirator shall have been fit-tested with their individual respirator. Fit testing will be performed in accordance with 29 CFR 1926.1128. (Fit testing will occur only if it is determined that an upgrade to Level C PPE is required, and will occur prior to Level C work.).

On-site personal hygiene will be reviewed to prevent contaminants from being brought off site on clothing or footwear. Decontamination procedures will be reviewed and demonstrated when necessary. A review of the area(s) that will be classified as restricted access area(s) and the methods employed to designate these areas. Tool Box Safety Talks shall be documented, minimally, with an attendance roster and the content of each meeting.

6.0 EMERGENCY PROCEDURES

Should outside assistance be needed for accidents, fire, or release of hazardous substances, the emergency numbers will be available and posted at the site (Appendix D). The SSC will have a cellular telephone that is available for emergency use.

Also, in the event of an incident where a team member becomes exposed or suffers from an acute symptom from contact with site materials and has to be taken to a hospital, a short medical data sheet for that individual will be made available to the attending physician. The medical data sheet will include the following:

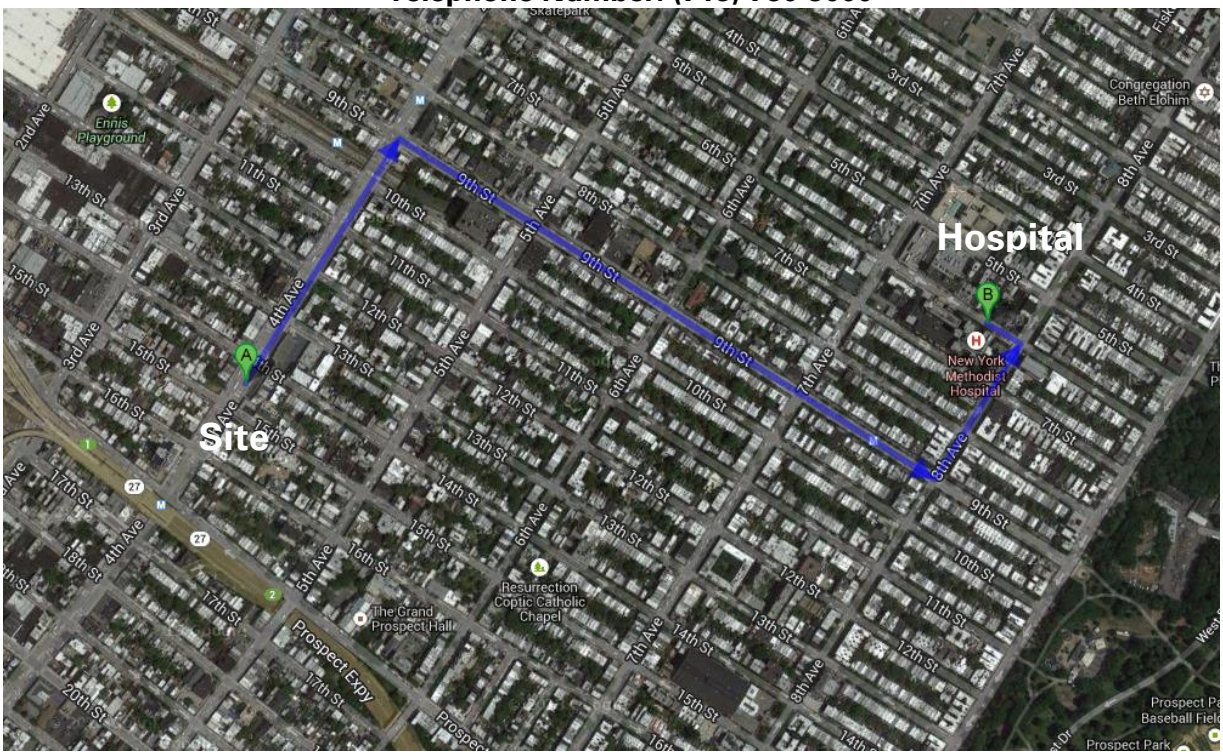
- Name, address, home phone
- Age, height, weight
- Name of person to be notified in case of an accident
- Allergies
- Particular sensitivities
- Does he/she wear contact lenses
- Short checklist of previous illness
- Name of personal physician and phone
- Name of company physician and phone
- Prescription and non-prescription medications currently used.

A sample medical data sheet is included in Appendix J. A map showing the directions to the nearest hospital is included as Figure 6-1. Emergency contact is included as Table 6-1.

FIGURE 6-1: Driving Directions to New York Methodist Hospital: Hedayatnia Mehrdad MD

Work Site Location: 535 4th Avenue, Brooklyn, New York

Hospital Location: New York Methodist Hospital: Hedayatnia Mehrdad MD
506 6th St
Brooklyn, NY
Telephone Number: (718) 780-3000



6.1 Driving Directions to New York Methodist Hospital: Hedayatnia Mehrdad MD

1. Head northeast on 4th Ave toward 14th St	0.3 mi
2. Turn right onto 9th St	0.6 mi
3. Turn left onto 8th Ave	0.1 mi
4. Turn left at the 3rd cross street onto 6th St	194 ft

TABLE 6-1: EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the Field Team Leader (or designee) and the Site Safety Officer, who will notify emergency personnel who will then contact the appropriate response teams. This emergency contacts list must be in an easily accessible location at the site.

Emergency Contacts	**Phone Number**
Fire Department:	911
Police:	911
New York City-Long Island One Call Center: (3 day notice required for utility mark outs)	(800) 272-4480
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
Medical Emergency	
Ambulance Service:	911
Hospital Name:	New York Methodist Hospital: Hedayatnia Mehrdad MD
Hospital Emergency Room Number:	(718) 780-3000
Hospital Address:	506 6th Avenue, Brooklyn, NY
Route to Hospital:	See Figure 6-1
Travel Time From Site:	1.0 miles, 4 minutes
Langan Contacts	
Principal/Associate:	Michael Burke (212) 479-5413
Project Manager:	Brian Gochenaur (212) 479-5579
Health & Safety Officer:	Anthony Moffa (215) 491-6545
Field Safety Officer	Alan Mason (845) 741-5421

6.2 Emergency Site Evacuation Procedure

In the event that an emergency situation arises, including but not limited to fire, explosion or significant toxic gas release into the ambient atmosphere, the SSC/SSM will implement an immediate evacuation of all project personnel due to immediate or impending danger.

- The SSC/SSM will initiate evacuation procedures by signaling to leave the site.
- All personnel in the work area should evacuate the area and meet in the common designated area.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.

- The SSC/SSM will then give further instruction.

6.3 Designated Assembly Locations

All personnel will evacuate the site and assemble at a designated assembly location. The assembly location will be designated by Langan personnel.

6.4 Accounting for Personnel

All contractor and subcontractor supervisors are responsible for the accounting of all personnel assembled at the designed assembly area.

7.0 MEDICAL PROCEDURES

All Langan employees will be required to complete the Employee Medical Data Sheet, attached in Appendix J. This sheet is especially useful should a worker become non-coherent as the result of an accident. It would provide valuable medical data to hospital staff. This sheet should be forwarded to the hospital in the event of the hospitalization of an employee.

7.1 Physical Examination Documents

Employees whose work assignments require their presence at a hazardous work site are required to have a baseline medical evaluation prior to commencement of hazardous work activity. The baseline medical evaluation consists of the following [*=Required; •=Preferred]:

- Medical and Occupational History*
- Physical Examination*
- Pulmonary Function*
- Urinalysis
- CBC (with differential and RCB) Chem 24 (SMAC)
- RBC Cholinesterase
- Urine Heavy Metal Panel
- Blood Lead with zinc protoporphyrin (zpp)
- Chest X-Ray (2-view)
- EKG (over 40 years of age)*
- Audiometry

The annual medical evaluation consists of the following [*=Required; •=Preferred]:

- Physical Examination and History*
- Pulmonary Function*
- Urinalysis
- CBC (with differential and RCB) Chem 24 (SMAC)
- RBC Cholinesterase
- Blood Lead with zpp
- EKG (Over 40 years of age)
- Audiometry

Additional tests that may be performed as part of the annual examination include the following [*=Required; •=Preferred]:

- Cholinesterase - plasma
- Urine - heavy metal
- Blood - PCB
- Chest X-Ray (2-view)

Based upon this examination and a review of the employee's job description, the physician identifies any medical restrictions that would affect an employee's ability to safely perform his/her job. If no restrictions are imposed, the physician certifies the employees as capable of full participation in the work program. A form such as the one attached in Appendix I, Medical Evaluation Form, should be used.

If an employee suspects exposure to a toxic chemical or other hazard while performing project tasks, additional tests may be ordered immediately following the exposure period. Individuals are encouraged to discuss changes in their health status with their respective corporate safety manager and/or physician.

7.2 Access to Exposure and Medical Records

Instructions regarding the existence, location, and availability of employee medical records shall be provided to the employee for all medical exams conducted as a result of their employment; Employee access to records shall be provided in a reasonable time, place and manner, but on no event later than fifteen days after the request is received.

7.3 Physical Examination and Respirator Approval

Medical clearance from a physician for the respirator type to be used is required for each employee before they are allowed to don respiratory protection. Additionally, each employer must select a respirator acceptable for use and that will provide the correct protection for the specific exposure. The employer is responsible for administering fit tests for all new respirators used by employees, and must administer training on a yearly basis.

7.4 Emergency First Aid

All accidents or near miss incidents will be dealt with in a manner to minimize further injury to the individual or others. In the event that an accident does occur, the following general procedures should be followed:

First aid and other appropriate action shall be given by the qualified individual closest to the event.

Contact hospital and arrange for ambulance if necessary.

Should the individual require hospital treatment, forward a copy of the Employee Medical Data Sheet, attached in Appendix J, to provide needed information to the medical staff.

As soon as practicable, the incident shall be reported to the SSHO and the Project Manager. The SSC/SSM and the SSHO shall be responsible for making all decisions concerning treatment, and/or other appropriate action.

The accident investigation reports/forms as provided in Appendix A will be completed and forwarded to the Langan SSC/SSHO and will be kept in the project file.

7.5 Heat Stress

Heat stress is a result of a build-up of heat in the body. This can occur when the body produces heat at a greater rate than it is dispersed by conduction, radiation, and evaporation of sweat from the surface of the skin. The internal heat of the body is brought to the surface by blood. When heat build-up occurs, the body temperature is raised causing a fever. When this condition exists it produces a cycle that further aggravates the situation. The fever causes certain body functions to accelerate. This generates excess heat that must be dispersed in addition to the normal heat generated by a person's body. Heat loss from the body is slow during conditions of high temperature and high humidity, such as a hot, humid day. These conditions, however, can be artificially caused by the wearing of non-porous, protective clothing. Therefore, caution should be exercised during field activities performed within high temperature environments.

Based on the allowable work periods (minutes per hour), a work rest regimen should be established based upon ambient conditions at the start of the job, and the acclimatization of the workforce in those conditions. Temperature extremes, as determined by a globe thermometer device (WBGT or equivalent) may require scaling back work cycles within the regimen. Greater active work times are allowable, so long as no symptoms of heat stress are noted. Heat stress symptoms are discussed in detail below.

There are three classes or types of heat stress: heat exhaustion, heat cramps, and heat stroke.

7.5.1 Heat Exhaustion

Heat exhaustion is brought about by the concentration of blood in the vessels of the skin. This condition may lead to an inadequate return of blood to the heart and, eventually, to physical collapse. The symptoms are:

- General weakness
- Excessive perspiration

- Dizziness
- Appearance of having fainted
- Pale and clammy skin
- Weak pulse
- Rapid and shallow breathing

To treat for heat exhaustion, place the individual in a cool place and remove as much clothing as possible. The individual should drink cool water, "Gatorade", or other similar liquid. The individual should be fanned, however, do not over cool or allow chilling. Treat the individual for shock and remove to medical facility if condition persists.

7.5.2 Heat Cramps

Heat cramps are usually caused by loss of salt when an individual has perspired a great deal. Drinking iced liquids quickly or in large amounts can also cause cramps usually in the leg and abdominal muscles. The systems of heat cramps are as follows:

- Pain and cramps in legs or abdomen
- Faintness
- Profuse perspiration

7.5.3 Heat Stroke

Heat stroke is a breakdown of the body heat-regulating mechanism causing high fever and collapse. This condition can result in unconsciousness, convulsions, and even death. Persons in poor physical condition or of advanced age are particularly susceptible. The symptoms of heat stroke are:

- Muscle twitching or convulsions
- Dry hot skin
- Flushed skin
- Suddenness of condition
- High body temperature
- Loss of consciousness
- Deep breathing, then shallow or absent
- Dilated pupils

Heat stroke is an immediate medical emergency for which an individual should be transported to a medical facility immediately. In the interim the following steps can be taken. The individual should be removed to a cool environment and the body temperature

should be reduced promptly by dousing the body with water or by wrapping in a wet sheet. If ice is available, it should be placed under the arms and around the neck and ankles. Drinking water should be provided. Intake of these liquids will be monitored by supervision so as not to be excessive. Steps should be taken to protect patient from injury during convulsions, especially from biting the tongue.

To avoid problems from heat stress during conditions of high temperature and humidity, supervisors should insure that the employees drink plenty of fluids; should provide breaks in accordance with the previously outlined guidance and monitoring; and should revise work schedules as necessary to take advantage of the cooler parts of the day. Some basic guidelines for maintaining workers' body fluids at normal levels during conditions of high temperature and humidity are as follows:

- Have workers drink 16 ounces of fluid before beginning work.
- Have workers drink 4 to 8 ounces of fluid every 15 to 20 minutes, or at each scheduled break. A total of 1 to 1.6 gallons of fluid per day are recommended, but more may be necessary to maintain body weight.

To measure the effectiveness of the heat recovery rest periods, the employee heart rate should be monitored as follows:

- Count the pulse rate for the last 30 seconds of the first minute of a three-minute period, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- Double the count to obtain an equivalent one-minute rate.
- If the first rate is less than 100 beats/minute and the second two readings are at least 10 beats/minute less than the previous reading than the rest periods should be considered adequate. Otherwise, the rest periods should be extended.

Another method of measuring the effectiveness of the rest periods is to take oral temperatures. If body temperature exceeds 100°F, then the rest periods should be extended.

If heat stress may be a factor due to ambient temperature and humidity, then it is recommended that both methods be used. In addition, these tests should be performed in the morning prior to any work to establish a background level.

7.6 Cold Stress

The single most important aspect of hypothermia (cold stress) is the fall in the deep core temperature of the body. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F). Lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for all workers when severe shivering becomes evident. Useful physical, or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air at temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided. Adequate insulating clothing to maintain core temperatures above 36°C must be provided to workers if work is performed in air temperatures below 4°C (40°F). In addition, it should be kept in mind that, the higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

If fine work is to be performed with bare hands for more than 10-20 minutes in an environment below 16°C (60°F), special provisions should be established for keeping the workers' hands warm. Metal handles or tools and control bars should be covered with thermal insulating material at temperatures below -1°C (30°F).

If the air temperature falls below 16°C (60°F) for sedentary, 4°C (40°F) for light, -7°C (20°F) for moderate work and fine manual dexterity is not required, then the workers must use gloves. Winter "Monkey-grip" gloves consisting of a cotton lining with a textured PVC coating are typically used in cold weather. To prevent contact frostbite, the workers should wear anti-contact gloves.

Provisions for additional body protection is required if work is performed in an environment at or below 4°C (40°F). The workers shall wear cold protective clothing appropriate for the level of cold and physical activity:

If the air velocity at the job sites is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind shall be reduced by shielding the work area, or by wearing an easily removable outer windbreak layer garment.

If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent and the outerwear should be changed as it becomes wetted. The SSC/SSM should assure that adequate replacement garments are available for use by the employees.

If the available clothing does not give adequate protection to prevent hypothermia or frostbite, the SSC/SSM can suspend work on the site until adequate clothing is available or until weather conditions improve.

Workers handling evaporative liquids (gasoline, alcohols, solvents, etc.) at air temperatures below 4°C (40°F) shall take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

7.7 Emergency Medical Procedures

Should an accident occur during a job related activity in which personnel are injured, the following actions will be taken:

- The SSC/SSM will assume control, and will notify emergency personnel by calling 911 to request an ambulance.
- Emergency personnel shall be notified via telephone.
- The SSC/SSM should designate a person to flag down the ambulance and direct it to the injured person.
- Companion personnel who are unaffected by the incident or personnel partially dressed in protective gear but outside the work zone will be alerted to rescue any workers whose health or safety is endangered.
- Under no circumstances shall rescue be attempted without first obtaining help, and re-assessment of hazardous conditions.
- The buddy system will be enforced. Victims will be located and their conditions will be assessed. If possible, the hazardous situation will be brought under complete or temporary control and victims will be assisted or removed from the area.
- The SSC/SSM will determine, based on the type and severity of the illness or injury, whether or not to decontaminate the victim, and whether the victim needs to be stabilized.

Should the individual require hospital treatment, forward a copy of the Employee Medical Data Sheet, attached in Appendix J, to provide needed information to the medical staff.

The SSC/SSM will insure that well-stocked first aid kits are present at the work site at all times. Eyewash solution will be maintained in sealed and dated 64-ounce disposable bottles by Langan near the work area. In the event of a chemical eye exposure, eyes will be washed immediately for at least 15 minutes, using large amounts of water and lifting the lower and upper lids occasionally to help flush the eye.

7.8 Accident and Injury Report Forms

7.8.1 Accident/Incident Report

All injuries, no matter how slight, shall be reported to the SSC/SSM representative. An accident/incident report form, attached in Appendix A will be filled out on all accidents by the applicable contractor supervision personnel, or the SSC. Copies of all accident/incident reports shall be kept on-site and available for review. Project personnel will be instructed on the

location of the first aid station, hospital, doctor and ambulance service near the job. The emergency telephone numbers will be conspicuously posted in site vehicles near the work zone. First aid supplies will be centrally located and conspicuously posted between restricted and non-restricted areas to be readily accessible to all on the site.

7.8.2 First Aid Treatment Record

This form (Appendix K) will be used for recording all non-lost time injuries treated by the project first-aid attendant, the local physician or hospital will be entered in detail on this record. "Minor" treatment of scratches, cuts, etc. will receive the same recording attention as treatment of more severe injuries.

7.8.3 OSHA Form 300

An OSHA Form 300 will be kept at the Langan Corporate Office in Elmwood Park, New Jersey. All recordable injuries or illnesses will be recorded on this form. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The Incident Report form used to capture the details of work-related injuries/illnesses meets the requirements of the OSHA Form 301 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

8.0 ENVIRONMENTAL CONSIDERATIONS

8.1 Hazardous Substance Assessments

Hazardous Substance Assessments are to be completed for each phase of work as required by OSHA, 29 CFR 1926.65. All contractors involved in operations where there is a possibility of an exposure to their employees of a hazardous discharge will discuss procedures necessary to guard against an occurrence at the weekly safety meetings.

8.2 Site Air Monitoring

Air monitoring is not assumed to be necessary during investigation activities. However, it may become necessary to monitor the atmospheric conditions during on-site work activities to identify and quantify airborne contaminants; to assist in defining work zones; and, to determine the level of worker protection needed. Air monitoring must be performed wherever the possibility of worker exposure to hazardous substances exists. Air monitoring for chemical exposure will be performed at the worker's breathing zone. Oxygen deficiency will be monitored in and around the excavation. Upgrades/downgrades to personal protective equipment (PPE) will be made based on air monitoring results in the breathing zone. In general, work shall be initiated in Level D PPE with a contingency to upgrade the level of PPE based on action levels.

8.3 Decontamination Procedures

Equipment decontamination will take place in designated areas only. The Contractor or Subcontractor will construct a decontamination pad of heavy (6-mil) polyethylene plastic sheeting bolstered on the perimeter with wood, hay bales, or other materials so as to contain all decontamination water. The pad will be large enough to accommodate the equipment to be decontaminated and cleaning personnel and will adequately collect all decontamination fluids. Decontamination fluids will then be transferred from inside the pad into a 55-gallon drum.

8.3.1 Decontamination of Equipment

Decontamination equipment may include the following, as appropriate:

- Wash tubs (1 wash, 1 rinse)
- Several scrub brushes
- Disposable towels
- Seating to facilitate boot removal
- Decontamination solution (e.g., non-phosphate detergent)
- Duct tape
- Hand soap
- Skin wash water source

- Special rinse solutions for hand sampling tools

Material Safety Data Sheets (MSDS) for all decontamination supplies will be provided prior to them being brought on site. MSDS are provided in Appendix L.

8.3.2 Personal Decontamination Procedures

The following describes procedures to be employed for personal and equipment decontamination.

PERSONAL DECONTAMINATION PROCEDURES FOR LEVEL D PROTECTION	
1.	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, cool down stations may be set up within this area.
2.	Remove outer gloves and deposit in waste container.
3.	Remove inner gloves and deposit in container with liner.
4.	If clothing has become contaminated, remove it and place it into a poly bag.
5.	Wash hands and face.
6.	Re-dress (as necessary) or put on clean clothes.

PERSONAL DECONTAMINATION PROCEDURES FOR LEVEL C PROTECTION	
1.	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clip- boards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross- contamination. During hot weather operations, cool down stations may be set up within this area.
2.	Scrub outer boot covers and gloves with decon solution or detergent/ water.
3.	Rinse off decon solution from Station 2.
4.	Remove tape around boots and gloves and deposit in waste container.
5.	Remove boot covers and deposit in waste container.
6.	Remove outer gloves and deposit in waste container.
7.	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped. Worker returns to duty.

PERSONAL DECONTAMINATION PROCEDURES FOR LEVEL C PROTECTION	
8.	Remove safety boots and place in area with plastic liner.
9.	With assistance of helper, remove splash suit. Deposit in waste container.
10.	Remove respirator. Deposit in container with plastic liner. Avoid touching face with fingers.
11.	Remove inner gloves and deposit in waste container.
12.	If inner clothing has become contaminated, remove it and place it into a poly bag.
13.	Wash hands and face if shower is not available.
14.	Put on clean clothes.

8.3.3 Investigation-Derived Waste

Investigation-Derived Waste (IDW) will be placed into DOT certified 55-gallon drums and left onsite until it has been appropriately characterized. Langan will be responsible for collection and analysis of waste characterization samples. Transportation and disposal of IDW will be the responsibility of the Primary contractor and affiliates.

ATTACHMENT J

SMDS COMPONENT MANUALS

TILCON-NY **Mt. Hope Quarry** Fax 973-659-3978

625 Mount Hope Rd. • Wharton, N.J. 07946 • 973-366-7741

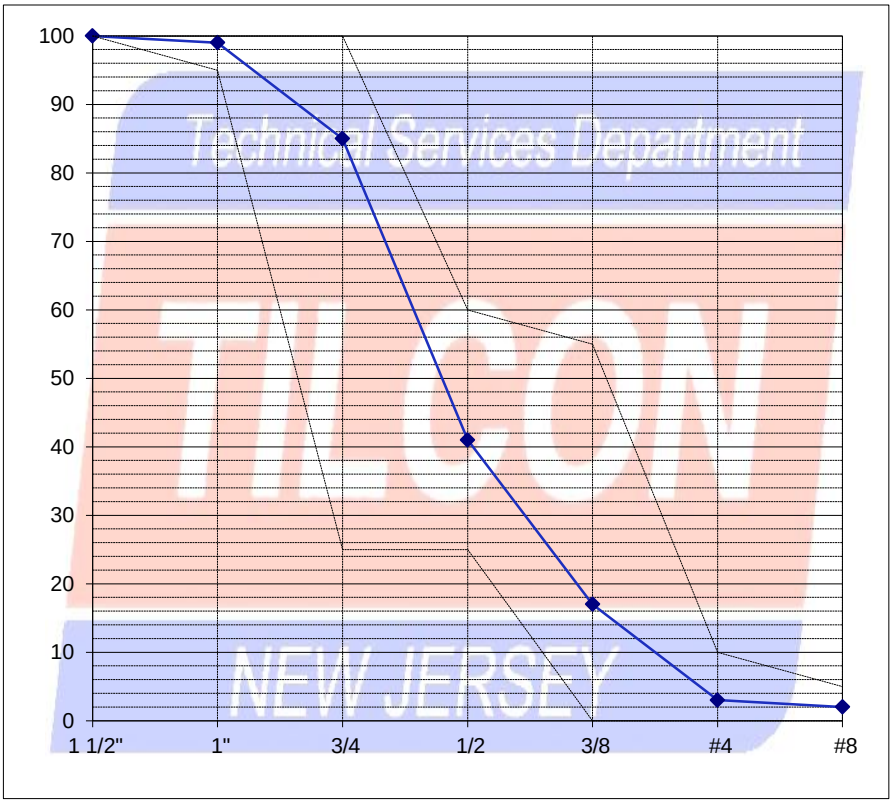
Typical Gradation,#57 (3/4" Clean)

Project
535 4th Avenue Brooklyn, NY

Contractor
APM - Earth Structures

Sp. Gr	**2.68**
Loose	**84**
Rodded	**95**

	Typical	Prod. Target	
1 1/2"	**100**	100	100
1"	**99**	95	100
3/4	**85**	25	100
1/2	**41**	25	60
3/8	**17**		55
#4	**3**		10
#8	**2**		5



Tilcon Inc confirms that #57 (3/4" Clean) available at Mt. Hope Quarry conforms to section 901 of the ***New Jersey Department of Transportation StandardSpecifications for Road and Bridge Construction.*** The material is defined as virgin Gneiss mined at Mt. Hope Quarry, 625 Mount Hope Road, Block 20001-Lot 6.01 Wharton Borough, Morris County NJ. The material is identified on the job with Tilcon delivery tickets.

The unit weights and voids are for process control and should be verified by the contractor before use.

N-12®
SaniTite® HP
HP Storm
MEGA GREEN™
Single Wall
ADS Triple Wall® / Smoothwall
Low Head Pipe
ADS PolyFlex™
Duraslot®
AdvanEdge®
Bend-A-Drain

Water Management Product Catalog
Click here to view.

Residential, Irrigation & Landscaping Product Catalog
Click here to view.

Single Wall

ADS single wall corrugated HDPE pipe is ideal for drainage projects where flexibility, light weight and low cost are important.

Multiple Drainage Applications
ADS single wall corrugated pipe has kept farms, golf courses, parks and playing fields dry for decades by channeling away excess underground moisture.

Homeowners find it to be an economical, easy–to–install solution to all kinds of residential storm water drainage problems: downspouts run offs, foundation and window well drains, driveway culverts and wet spots on the lawn. ADS single wall HDPE pipe is also used for highway edge drains, culverts and other construction applications where economy and durability are important.

Perforated and non–perforated plastic drainage pipe
For subsurface water collection or leaching action, ADS corrugated HDPE pipe is offered with uniform slots and drilled holes. Non–perforated pipe is available when water must be moved by gravity flow from one point to another.

Single Wall Plastic Corrugated Pipe Product Information	
Diameters Available:	3"–24"
Lengths Available:	(See Product Catalog)
Joint Performance:	Soil–tight
Joining System:	Cleated bell, split, internal and snap couplers
Specifications:	AASHTO M 252 AASHTO M 294 ASTM F 405 ASTM F 606

Search

Quick Links

- Drainage Handbook
- CAD Drawings
- Request an Estimate

Single Wall Resources

ADS Product Brochures
ADS Technical Notes
General Specifications
Miscellaneous Details
Product Notes

Share

535 4th Ave - ES - SMDS pipe perforation

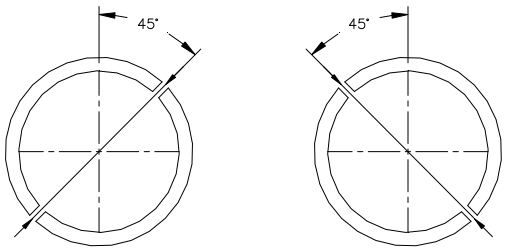
TECHNICAL NOTE

Single Wall HDPE Perforation Patterns

TN 1.02
October 2008

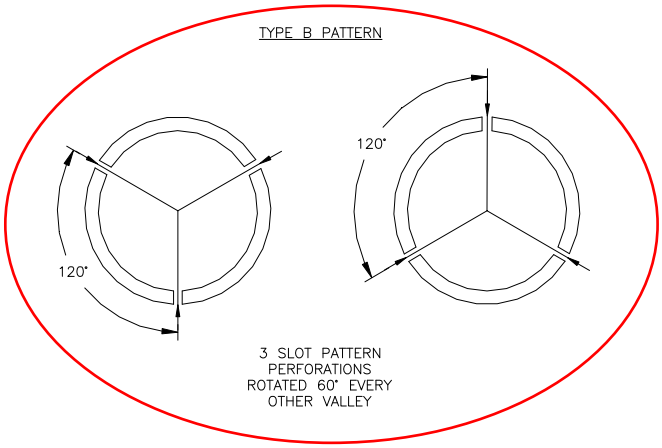
Nominal I.D.		Perforation Type	Maximum Slot Length or Diameter		Maximum Slot Width		Minimum Inlet Area		Pattern Type
in	mm		in	mm	in	mm	in^2/ft	cm^2/m	
3	75	Slot	0.875	22	0.120	3	1.0	21	A
4	100	Slot	0.875	22	0.120	3	1.0	21	B
5	125	Slot	0.875	22	0.120	3	1.0	21	B
6	150	Slot	0.875	22	0.120	3	1.0	21	B
8	200	Slot	1.18	30	0.120	3	1.0	21	B
10	250	Slot	1.18	30	0.120	3	1.0	21	B
12	300	Slot	1.50	38	0.118	3	1.5	32	B
12	300	Circular	0.313	8	-	-	1.5	32	C
15	375	Circular	0.313	8	-	-	1.5	32	C
18	450	Circular	0.313	8	-	-	1.5	32	C
24	600	Circular	0.313	8	-	-	2.0	42	D

TYPE A PATTERN



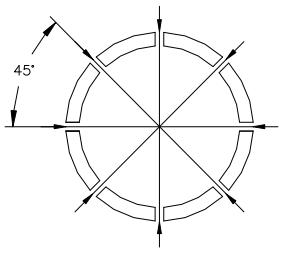
2 SLOT PATTERN
PERFORATIONS
ROTATED 90° EVERY
OTHER VALLEY

TYPE B PATTERN



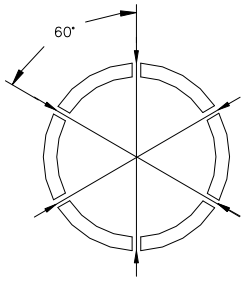
3 SLOT PATTERN
PERFORATIONS
ROTATED 60° EVERY
OTHER VALLEY

TYPE C PATTERN



8 HOLE PATTERN

TYPE D PATTERN



6 HOLE PATTERN

ADS FILTER SOCK SPECIFICATION

Scope

This specification describes 2- through 24-inch (50- to 600 mm) ADS SOCK synthetic wrap, as manufactured by Zodiac Fabrics, Inc., for drainage pipe.

Filter Fabric Requirements

The ADS SOCK shall meet the requirements of ASTM D6707.

Filter Fabric Properties

Property	Test Method	
Material	-	Polyester
Fabric	-	Knitted
Permitivity (min.)	ASTM D4491	5.5 sec^{-1}
Puncture Resistance (min.)	ASTM D6241	1000 N
AOS (max.)	ASTM D4751	0.600 mm 30 U.S. Sieve
FOS (max.)	CAN/CGSB-148.1, M10-94	450 microns
Mass (relaxed)	ASTM D3887	3.0-3.9 oz/yd^2
Mass (applied minimum)		2.7-3.5 oz/yd^2
Thickness (min.)	ASTM D4491	24.0 mils
Permeability (K) (min.)	ASTM D4491	0.390 cm/sec
Burst Strength (min.)	ASTM D3887	830 kpa
Air Permeability (min.)	ASTM D737	700 $ft^3/ft^2/min$
Water Flow Rate (min.)	ASTM D4491 (2" constant head)	300 $gal/min/ft^2$
Yarn Denier	-	150
Specific Gravity	-	1.3
Melt Temperature	-	450° F

September 8th 2015
Earth Structures - SMDS submittal
2" Black Tile Tape

More saving. More doing.

Your Store: **Manhattan West 23rd St #6175**
Use Current Location or find store

Advanced Drainage Systems | Model # 1137KA | Internet # 205155061

2 in. PVC Black Tile Tape

★★★★★ | **Write the First Review** | **Questions & Answers (1)**

Open Expanded View Click to Zoom

$5.95 /each

PRODUCT SOLD ONLINE ONLY

PRODUCT OVERVIEW

Model # 1137KA | Internet # 205155061

Advanced Drainage Systems is the world's largest producer of corrugated HDPE pipe and related drainage products. In addition to N-12 pipe, the company offers a complete line of fittings and other accessories including, Nyloplast drainage structures, and various geotextiles. Advanced Drainage Systems 2 in. tile tape provides a tight pipe connections and secure fit.

- Secures pipe/fitting joint for leak resistant joint
- Prevents root intrusion
- Withstands all weather conditions
- Heavy duty tape aids with installing corrugated pipe

SPECIFICATIONS

DIMENSIONS

Actual inside diameter (in.)	1	Product Height (in.)	2
Actual outside diameter (in.)	3.5	Product Length (ft.)	1500.000
Pipe Size	2"	Product Width (in.)	3.5
Product Depth (in.)	3.5		

DETAILS

Coiled	No	Pipe & Tubing Product Type	Drainage
Corrugated	No	Pipe or Fitting Product Type	Pipe & Tubing
Material	PVC	Product Weight (lb.)	.5 lb
Maximum Working Temperature (F)	-15	Rating	Soil drain
Maximum working pressure (psi)	0	Recommended function	DWV
Minimum working temperature (F)	150	Returnable	90-Day
Perforated	No	Wrapped	No

WARRANTY / CERTIFICATIONS

Certifications and Listings	No Certifications or Listings	Manufacturer Warranty	Warranted to be be free from defects in materials and workmanship in normal use and service