CHESTNUT COMMONS ATLANTIC AVE. SITE

KINGS COUNTY

BROOKLYN, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

334-336 East 110th Street

New York, New York 10029

Prepared by:

ROUX ENVIRONMENTAL ENGINEERING & GEOLOGY, D.P.C.

209 Shafter Street

Islandia, New York

631-232-2600

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

NOVEMBER 2020

CERTIFICATION STATEMENT

I, Brian P. Morrissey, P.E., certify that I am currently a NYS registered professional engineer 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).

STATE OF NEW YORK
BRIAN P. MORRISSEY
No. 062617
LICENSED PROFESSIONAL ENGINEER

Brian P. Morrissey __________________ P.E.

11/18/2020 __________________ DATE

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LIST OF ACRONYMS

ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	Certificate of Completion
DER	Division of Environmental Remediation
EC	Engineering Control
ELAP	Environmental Laboratory Approval Program
HASP	Health and Safety Plan
IC	Institutional Control
NYCDOHMH	New York City Department of Health and Mental Hygiene
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP/FSP	Quality Assurance Project Plan/Field Sampling Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RIR	Remedial Investigation Report
RP	Remedial Party
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SSDS	Sub-Slab Depressurization System
SVI	Soil Vapor Intrusion
TAL	Target Analyte List

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:

Site Identification:	NYSDEC BCP Site No. C224276 Chestnut Commons Atlantic Ave. Site 110 Dinsmore Place, Brooklyn, New York 11208
Institutional Controls:	1. The property may be used for residential, restricted residential, commercial, and industrial use;
	3. All ECs must be operated and maintained as specified in this SMP;
	4. All ECs must be inspected at a frequency and in a manner defined in the SMP;
	5. The use of 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 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;
	6. Soil vapor and other environmental or public health monitoring must be performed as defined in this SMP;
	7. Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
	9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this 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 the Environmental Easement.; and
	11. 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.
Engineering Controls:	1. Sub-slab Depressurization System (SSDS)

Inspections:	Frequency
1. Site-Wide Inspection	Annually
2. SSDS Performance Criteria (Monitoring Points, Vacuum Blower, Piping)	Monthly
Monitoring:	
1. SSDS Performance Criteria (Monitoring Points, Vacuum Blower, Piping)	Monthly
2. SSDS Monitoring	One sample from effluent discharge stack and indoor air sample collected upon SSDS start-up. Quarterly sampling of sub-slab vapor monitoring points and indoor air thereafter. SSDS is the only active mitigation technology.
Maintenance:	
1. Routine SSDS Detailed Operation Inspection	Quarterly
2. Non-Routine SSDS Detailed Operation Inspection	As needed
Reporting:	
1. SSDS Operating Log	Inspection to occur monthly, reports provided Annually in the Periodic Review Report
2. Periodic Review Report	First report 16 months after COC is issued, then annually, or as other determined by the Department

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 for the Chestnut Commons Atlantic Avenue Site located in East New York section of Brooklyn, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP) Site No. C224276 which is administered by New York State Department of Environmental Conservation (NYSDEC).

Chestnut Commons Apartments LLC entered into a Brownfield Cleanup Agreement (BCA) on September 14, 2018 with the NYSDEC as a Volunteer to remediate the Site. A figure showing the Site location and boundaries is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A. BCA Amendment #1 was executed on April 29, 2019 to change the Site address from 3629 Atlantic Avenue to 110 Dinsmore Place. BCA Amendment #2 was executed on September 17, 2019 to change the fee title owner to Chestnut Commons Housing Development Fund Corporation and to document that the Volunteer is eligible for tangible property tax credits after an agreement was executed with New York City Housing Development Corporation and City of New York.

After completion of the remedial work, some contamination was left at this Site, which is 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 granted to the NYSDEC, and recorded with the New York City Office of the City Register, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP 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 Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Index #C224276-08-29; Site #C224276) for the site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Chestnut Commons Apartments LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the Site.

1.2 Revisions

Revisions to this plan 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 the site conditions. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner 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 that are 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.

- Notice within 48-hours of any damage or defect to the foundation, structures or EC 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 Brownfield Cleanup Agreement (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 embedded Table 1.3 below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1.3: Notifications*

Name	Contact Information
Nigel Crawford, P.E. Project Manager, NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-7778 nigel.crawford@dec.ny.gov
Jane O'Connell Chief, NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-4599 jane.oconnell@dec.ny.gov
Kelly Lewandowski Chief, NYSDEC Division of Environmental Remediation, Site Control Section	(518) 402-9569 kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

2.2.1 Land Use

The Site is currently zoned M1-4 (manufacturing) with an R8A (residential) overlay and is currently undergoing construction of a fourteen-story mixed-use building. The building will include 274 affordable housing units for extremely low-, very low-, and low-income households, and will also include community space and one cellar level across the entire Site footprint. Outdoor open/recreational space will be located in a courtyard above the first level of the building. The building is currently in the superstructure phase of construction with the anticipated completion in September 2021.

The properties adjoining the Site and located in the neighborhood surrounding the Site consist of a mix of urban industrial and commercial properties, with major thoroughfares located to the south. The table below provides details on surrounding property usage adjacent to the Site.

Surrounding Property Uses	
North	Dinsmore Place; commercial buildings; aboveground subway line
South	Atlantic Avenue and South Conduit Avenue; underground Long Island Rail Road line
East	Chestnut Street; vacant property that is also enrolled in the NYSDEC BCP (BCP Site #C224236).
West	NYCSCA redevelopment project (under construction)

2.2.2 Geology

The land surface elevation is approximately 40 feet relative to the North American Vertical Datum of 1988 (NAVD88) at the northwest corner of the Site, and slopes downward to an elevation of approximately 36 feet at the southeast corner.

Based on the environmental soil borings completed, the Site is covered by approximately 5 to 15 feet of historic fill material, consisting of sand, silt, and brick. Native soils beneath the fill layer consist of varying amounts of sand and trace gravel. Site specific boring logs are provided in Appendix C.

Bedrock was not encountered during the investigations performed at the Site. As referenced in the 2015 Phase I ESA, according to the 1994 bedrock and engineering geology maps set by Charles A. Baskerville, the depth to bedrock in the area is estimated to be approximately 450 feet below ground surface (ft bls). Brooklyn is located within the Atlantic Coastal lowland's physiographic province of New York State. The subsurface bedrock geology of Kings County (Brooklyn) is characterized by bedrock consisting of gneiss and schist of Precambrian age. Soil and bedrock stratigraphy throughout Brooklyn typically consist of a layer of historical fill that overlies glacial outwash sediments, decomposed unconsolidated bedrock, and bedrock.

2.2.3 Hydrogeology

The depth to groundwater in the monitoring wells was between approximately 26 to 32 ft bls (elevations ranging from +9.68 to +9.43 ft NAVD88) during the Remedial Investigation (RI). Based on this data, groundwater flow is presumed to be toward the southwest.

A groundwater contour map is shown in Figure 3. Groundwater elevation data is provided in Table 1. Groundwater monitoring well construction logs are provided in Appendix C.

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.

According to previously completed Phase I and Phase II Environmental Site Assessments (ESAs), past uses of the Site included a portion of the Ridgewood Engine House as early as the 1860s, which was a coal-fired municipal water pumping station with a large building, storage sheds, and large stacks that was used by the Brooklyn Water Works. Features located on the Site included an open-air coal shed and part of the facility's "oil house" located on the Site between 1887 until 1902 according to Certified Sanborn Maps and available information. The Site was in use by the Brooklyn Water Works through the 1920s and was generally vacant until its demolition by the city in the late 1960s. The Site was used as an automobile, trailer, and heavy equipment storage and repair facility from approximately 1980 to 1992 and the site has been vacant since 2006.

The following environmental investigations that have been performed at the Site are discussed in detail in the sections below.

- Phase I ESA – TRC Environmental Corporation (TRC) on behalf of the NYCSCA, September 2015.
- Phase II ESA – Roux Environmental Engineering and Geology, D.P.C. (Roux) on behalf of MHANY Management, Inc., August 2018.
- Remedial Investigation Report/Remedial Action Work Plan (RIR/RAWP), prepared by Roux provided to the NYSDEC on behalf of MHANY Management, Inc., December 2019.

2.3.1 Phase I ESA – TRC, September 2015

In 2015, on behalf of the NYCSCA, TRC completed a Phase I ESA for the entirety of Block 4142, Lot 32 (including the Site), which included (in an appendix) a Phase I ESA performed by Holzmacher, McLendon and Murrell, P.C. (H2M) in 2009 (2009 Phase I ESA). The 2009 Phase I ESA referenced a 1994 Phase II ESA. The referenced 1994 Phase II ESA is reported to have determined soil at the Site was contaminated with polycyclic aromatic hydrocarbons (PAHs), chlorinated solvents, and lead; however, the 1994 Phase II ESA was not included in the supporting documentation.

2.3.2 Phase II ESA– Roux, August 2018

A Phase II ESA was completed by Roux in 2018 during separate field sampling events performed in February and July 2018. The purpose of the Phase II was to investigate the Site based upon the findings of the TRC Phase I ESA, determine the environmental conditions on the Site, and evaluate the eligibility of the Site for consideration for acceptance into the NYSDEC BCP. The results of the Phase II ESA are summarized below in the RIR discussion.

2.3.3 RIR/RAWP – Roux, December 2019

The completed RI included a total of 53 discrete soil samples submitted for laboratory analysis. Three temporary monitoring wells and five permanent groundwater monitoring wells were installed and eight total groundwater samples were collected and submitted for laboratory analysis. A total of 11 soil vapor samples were collected and submitted for laboratory analysis.

Soil and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), and pesticides. Groundwater samples were also analyzed for Emerging Contaminants. Soil vapor samples were analyzed for VOCs. Based upon this investigation, the primary contaminants of concern are VOCs, SVOCs and metals.

Soil

VOCs were detected above NYSDEC Unrestricted Use SCOs (UUSCOs) including benzene at a maximum concentration of 4.2 parts per million (ppm) as compared to the UUSCO of 0.6 ppm, and toluene at 2.7 ppm (compared to UUSCO of 0.7 ppm). tetrachloroethylene (PCE) and trichloroethene (TCE) were detected at concentrations below the UUSCOs. SVOCs were detected at concentrations exceeding the UUSCOs including benzo(a)anthracene at 2.8 ppm (UUSCO is 1 ppm), benzo(a)pyrene at 2.4 ppm (UUSCO is 1 ppm), benzo(b)fluoranthene at 3.1 ppm (UUSCO is 1 ppm), chrysene at 3.4 ppm (UUSCO is 1 ppm), and indeno(1,2,3-cd)pyrene at 1.4 ppm (UUSCO is 0.5 ppm). Metals detected in exceedance of UUSCOs include lead at 487 ppm (UUSCO is 63 ppm), arsenic at 21.8 ppm (UUSCO is 13 ppm), and mercury at 0.51 ppm (UUSCO is 0.18 ppm). Pesticides and herbicides were detected at concentrations above UUSCOs, including dieldrin at 0.031 ppm (UUSCO is 0.005 ppm), and 4,4-DDT at 0.08 ppm (UUSCO is 0.0033 ppm). PCBs were not detected in any soil samples at concentrations exceeding UUSCOs. Data does not indicate any off-site impacts in soil related to this Site.

Groundwater

VOCs were detected at concentrations above their respective ambient water quality standards (AWQSs) including PCE at a maximum concentration of 22 micrograms per liter (µg/L) as compared to the AWQS of 5 µg/L, and TCE at a maximum concentration of 5.4 µg/L (AWQS is 5 µg/L). One SVOC, bis(2-ethylhexyl)phthalate, was detected at 18 µg/L (AWQS is 5 µg/L). Only two dissolved metals were detected at concentrations exceeding their AWQS: sodium and manganese. These are naturally-occurring metals and are not site-related contaminants. One pesticide, chlordane, was detected at a concentration of 1.4 µg/L (AWQS is 0.05 µg/L). The data does not indicate any off-site impacts in groundwater related to this Site.

Soil Vapor

Several VOCs were detected in soil vapor samples throughout the Site, including benzene at a maximum concentration of 57 micrograms per cubic meter (µg/m^3), toluene at 150 µg/m^3, xylenes at 190 µg/m^3, TCE at 4,600 µg/m^3, and PCE at 13,000 µg/m^3. Data indicates that the VOCs in soil vapor are migrating onto the site from an off-site source to the east (BCP site no. C224236).

Based on the results of the RI, Roux prepared a RAWP to support the redevelopment plans. The RAWP proposed a Track 1 unrestricted use cleanup remedy that included excavation of approximately 21,285 cubic yards (CY) of contaminated soil. The intent of the remedy is to achieve a Track 1 unrestricted use; however, since a short-term engineering control (sub-slab depressurization system [SSDS]) is needed to address soil vapor intrusion, an environmental easement and SMP are required. A Track 1 cleanup can only be achieved if the mitigation system or other required action is no longer needed within 5 years of the date of the Certificate of Completion. In the event that Track 1 unrestricted use is not achieved, including achievement of soil vapor remedial objectives, the remedy will achieve a Track 2 residential cleanup.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated December 2019 are as follows:

2.4.1 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

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

2.4.2 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.

2.4.5 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 a site.

2.5 Remaining Contamination

The Remedial Action (RA) was designed to reduce on-site contamination through excavation and off-site disposal of contaminant source areas. A Conditional Track 1 remedy was achieved for the Site based on the excavation and off-site disposal of soils exceeding UUSCOs. This was confirmed by the collection and laboratory analysis of endpoint soil samples during the RI (pre-excavation) and post-excavation.

2.5.1 Soil

As discussed above, a Track 1 remedy was achieved for soil and there is no remaining soil contamination to address.

2.5.2 Groundwater

VOCs were detected at concentrations above their respective ambient water quality standards (AWQSs) including PCE at a maximum concentration of 22 µg/L as compared to the AWQS of 5 µg/L, and TCE at a maximum concentration of 5.4 µg/L (AWQS is 5 µg/L). One SVOC, bis(2-ethylhexyl)phthalate, was detected at 18 µg/L (AWQS is 5 µg/L). Only two dissolved metals were detected at concentrations exceeding their AWQS: sodium and manganese. These are naturally-occurring metals and are not site-related contaminants. One pesticide, chlordane, was detected at a concentration of 1.4 µg/L (AWQS is 0.05 µg/L). Data does not indicate any off-site impacts in groundwater related to this Site.

Tables 2 through 7 and Figure 4 summarize the results of all samples of groundwater collected during the RI that exceed their AWQS.

2.5.3 Soil Vapor

As described above in Section 2.3.3, several VOCs were detected in soil vapor samples including benzene at a maximum concentration of 57 µg/m^3, toluene at 150 µg/m^3, xylenes at 190 µg/m^3, TCE at 4,600 µg/m^3, and PCE at 13,000 µg/m^3. As discussed in the Final Engineering Report (FER), VOC soil vapors are migrating onto the Site from contaminated groundwater under an adjacent, off-site BCP site. Mitigation of the potential for soil vapor intrusion through installation and temporary operation of an active SSDS below the Site building, including a vapor barrier system (minimum thickness 20-mil) under the building foundation's slab and up the foundation walls will prevent any exposure to soil vapor from off-Site exposure pathways. As of the date of this SMP, installation of the vapor barrier system is complete and the sub-slab components of the SSDS have been installed. As construction of the building continues, installation will continue for the roof leader piping and blower assembly. Blower installation is anticipated to be completed by September 2021. SSDS startup, testing, and balancing will occur under this SMP (see Section 5.3.1).

Table 8 and Figure 5 summarize the results of all samples of soil vapor collected during the RI.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining soil vapor contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs 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 Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Site to residential, restricted residential, commercial, and industrial uses only. Since a Track 1 Unrestricted Use cleanup was achieved for soil, the ICs discussed in this Site Management Plan pertain to remaining groundwater and soil vapor contamination only. However, since a short-term engineering control is needed to address soil vapor intrusion from an off-site source, an Environmental Easement will be temporarily placed on the property. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. In the event that NYSDEC determines that the active SSDS may be removed as an EC for the Site, the Environmental Easement will be terminated, and the Site use will no longer be limited. ICs identified in the

Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2. These ICs are:

- All ECs must be operated and maintained as specified in this SMP;
- All ECs 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 New York State Department of Health (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;
- Soil vapor and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this 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 property owner to assure compliance with the restrictions identified by the Environmental Easement; and
- 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.

3.3 Engineering Controls

The only Engineering Control being implemented for this project is the SSDS as described in the following sections. Since the remaining soil on-Site has met Track 1 requirements there is no future need for a Health and Safety Plan (HASP) or Community Air Monitoring Plan (CAMP).

3.3.1 Sub-Slab Depressurization System

An active SSDS is currently being installed at the Site as construction of the building proceeds. Currently, all below grade vapor barrier, SSDS header piping, perforated piping, valves, monitoring points, and appurtenances have been installed. As construction of the building continues, the sub-slab piping network will be connected to an Ametek 7.5 horsepower (Hp) explosion-proof regenerative vacuum blower on the roof via a 6” steel building ventilation exhaust louver pipe which will contain a 6” steel discharge stack. The regenerative blower will have a low vacuum switch, knock-out tank with high level alarm, high temperature alarm, and an in-line air filter on the inlet. A warning light will be provided for the building and will be located to allow for the notification of the building superintendent if the blower is not operating. Upon completion of the SSDS, the system will be evaluated for effectiveness under the SMP.

Active SSDS operation will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the active SSDS is no longer required, a proposal to discontinue the SSDS will be submitted by the property owner to the NYSDEC and the NYSDOH. Conditions that warrant discontinuing the SSDS include:

(1) Sub-slab and vapor intrusion monitoring and sampling plan to achieve SSDS decommissioning as indicated in Section 4.3.3.

(2) monitoring data have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC, or

(3) the NYSDEC has determined that the SSDS has reached the limit of its effectiveness.

The system will remain in place and operational until permission to discontinue use is granted in writing by the NYSDEC.

Procedures for operating and maintaining the SSDS are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). An as-built SSDS drawing, signed and sealed by a professional engineer, is included in Appendix D and shows the location of the EC for the Site.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that 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.

The EC will be terminated upon a determination by NYSDEC and New York State Department of Health (NYSDOH) that the remedial objectives for soil vapor have been met by following the monitoring and sampling plan located in Section 4.3.3 or by remediation of the source of contamination on the adjacent BCP site.

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 only be revised 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/Field Sampling Plan (QAPP/FSP) provided in Appendix E.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of indoor air and soil vapor;
- Assessing compliance with applicable NYSDOH standards, criteria and guidance;
- Assessing achievement of the remedial performance criteria;
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the soil vapor monitoring activities.

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

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Reporting requirements;
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed on an annual basis. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices.

During these inspections, an inspection form will be completed as provided in Appendix F – Site Management Forms. The form 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; and
- Confirm that 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.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed 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 at the Site, 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 must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 SSDS Monitoring

Monitoring of the SSDS will be performed on a routine basis, as identified in Table 4.3.1 SSDS Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components included in Table 4.3.1 below.

Table 4.3.1 - SSDS Monitoring Requirements and Schedule

SSDS Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Monitoring Points	Vacuum	>0.001 inches of water column	Quarterly
Vacuum Blower	Flow Rate/ Vacuum	~240 cfm 40-50 inches of water column	Quarterly
Piping	Visual Inspection		Quarterly

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix F- Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 SSDS System Sampling

Samples shall be collected from the sub-slab vapor monitoring points and indoor air sample locations on a routine basis. Sampling locations are shown on Figure 6, required analytical parameters, and schedule are provided in Table 4.3.2 – SSDS Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC. One effluent soil vapor sample from the discharge stack will be collected during system start-up to confirm if any vapor treatment is necessary. Quarterly monitoring of the performance of the remedy and overall reduction in soil vapor contamination on-site will be conducted. Trends in contaminant levels in indoor air and soil vapor will be evaluated to determine if the remedy continues to be effective in achieving remedial goals.

Table 4.3.2 – SSDS Sampling Requirements and Schedule

Sampling Location	Analytical Parameter	Schedule
Effluent Discharge Stack	TO-15	Single event during start-up
Sub-slab Vapor Monitoring Points	TO-15	Quarterly
Indoor Air	TO-15	Single event during start-up and then quarterly thereafter

Detailed sample collection and analytical procedures and protocols are provided in Appendix E –QAPP/FSP.

4.3.3 Sub-Slab Vapor Sampling

Sub-slab vapor sampling will be performed quarterly to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of on-site sub-slab vapor sample locations, which is comprised of two sub-slab vapor monitoring points, has been designed based on the soil vapor sample results obtained during the RI and layout of the new building construction. The sub-slab vapor monitoring point locations and typical details are shown on the as-built drawing located in Appendix D and on Figure 6.

The following sampling schedule will be used to determine whether the SSDS is required to continue operation at the Site or if the SSDS can be decommissioned.

Table 4.3.3 – Sub-slab Vapor Sampling Schedule

Quarter	System Status	Sample Result
Quarters 1 through 4	12 months of continuous operation, sampling quarterly	If indoor air concentrations and sub-slab concentrations result in a “No Further Action” (NFA) condition as per the NYSDOH Matrices for four consecutive quarters (NFA Condition), then proceed with schedule as below. If NFA condition is not met, continue quarterly sampling with full system operation.

Quarter	System Status	Sample Result
Quarter 5 following NFA Condition	2 mos. operation, shut down 1 mo. prior to sampling	If indoor air concentrations and sub-slab concentrations result in a NFA condition as per the NYSDOH Matrices, then proceed with testing schedule as below. If concentrations require mitigation as per NYSDOH Matrices, SSDS will operate continuously for 3 mos. prior to next sampling event
Quarter 6 following NFA Condition	1 mo. operation, shut down 2 mos. prior to sampling	If indoor air concentrations and sub-slab concentrations result in an NFA condition as per the NYSDOH Matrices, then proceed with testing schedule as below. If not, SSDS will operate as described in Quarter 5.
Quarter 7 following NFA Condition	Shut down	If indoor air concentrations and sub-slab concentrations result in an NFA condition as per the NYSDOH Matrices, then proceed with testing schedule as below. If not, SSDS will operate as described in Quarter 6.
Quarter 8 following NFA Condition	Shut down	If indoor air concentrations and sub-slab concentrations result in an NFA condition as per the NYSDOH Matrices, then proceed with request for decommissioning. If not, SSDS will operate as described in Quarter 6.

Field sampling procedures for sub-slab vapor sampling are provided in Appendix E – QAPP/FSP.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC. The need for additional sub-slab vapor sample locations will be evaluated in the future based upon site conditions and available monitoring results.

Deliverables for the sub-slab vapor sampling program are specified in Section 7.0 – Reporting Requirements.

4.3.4 Soil Vapor Intrusion Sampling

Soil vapor intrusion indoor air sampling will be performed to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The on-site soil vapor intrusion indoor air sample location has been designated based on the building cellar floor plan, spaces of high occupancy, and with bias to the areas of the Site with the highest detections of contamination. One indoor air quality sample will be collected after SSDS start-up but prior to building occupancy. The proposed indoor air sampling location is provided on Figure 6. An indoor air sample will also be collected concurrent with the quarterly sub-slab vapor samples as described in the above Table 4.3.3. and will be collected in accordance with procedures specified by NYSDOH Guidance and field sampling procedures described in Appendix E – QAPP/FSP. The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

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

4.3.5 Monitoring and Sampling Protocol

Completion of building construction is anticipated to be during September 2021, at which point the SSDS installation will be completed and started up. Monitoring and sampling activities will be recorded in a field book and associated sampling log as provided in Appendix F - Site Management Forms. Other observations (e.g., monitoring point integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

Additional detail regarding monitoring and sampling protocols are provided in the site-specific QAPP/FSP provided as Appendix E of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the SSDS;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS is operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS is provided in Appendix D - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 SSDS Performance Criteria

The SSDS blower assembly will include a 7.5 HP Ametek Rotron Model EN858BA72WL regenerative blower with a low vacuum switch, knock-out tank with high level alarm, high temperature alarm, and an in-line air filter on the inlet. The blower assembly will be able to provide a suction of 50 inches of water column at a flowrate of 240 cfm to meet the design needs of the SSDS. The SSDS will provide vacuum influence below the building slab that will monitored at the sub-slab vapor monitoring points using a micro-manometer to ensure a minimum of 0.001 inches of water column is achieved. These values are provided in Table 5.2 below:

Table 5.2 – SSDS Performance Criteria and Schedule

SSDS Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Monitoring Points	Vacuum	>0.001 inches of water column	Quarterly
Vacuum Blower	Flow Rate/ Vacuum	~240 cfm 40-50 inches of water column	Quarterly

5.3 Operation and Maintenance of Sub-slab Depressurization System

The following sections provide a description of the operations and maintenance of the SSDS. Cut-sheets and an as-built drawing for the SSDS are provided in Appendix D – SSDS As-Built and Component Manual.

5.3.1 System Start-Up and Testing

Upon completion of the new building construction the SSDS blower assembly will be installed and tested during start-up. The blower assembly inlet vacuum will be measure with the dilution valve set to 100% closed to document the baseline vacuum. Additionally, the two sub-slab vapor monitoring points will be tested with a micromanometer to measure the sub-slab vacuum readings and documented accordingly on an inspection form and field book. As described in Section 4.3.2. a sample will be collected from the SSDS discharge stack as part of the start-up testing to determine whether vapor treatment is needed.

The system testing described above will be conducted if, in the course of the SSDS lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

The routine maintenance activities include monthly visual inspections, operating data collection and general maintenance by building management personnel, who will serve as the SSDS operators, and who will report the monthly inspection and maintenance results to the Engineer of Record. Visual inspection will be implemented as a routine part of the SSDS operator’s activities. The system operator will note any conditions which present a potential hazard or could cause future system shutdown on an Operating Log (Appendix F). In the field, special attention will be paid to the condition of the blower and appurtenances, and the above slab discharge piping and supports. Special attention should be given to any unusual or excessive noise or vibrations from the piping and blower. The piping and valves will be inspected for leaks.

All equipment maintenance will be performed in accordance with manufacturer's instructions. Specific routine maintenance tasks are outlined below:

- Inspect blower piping to confirm operation of appropriate valves (i.e., dilution valve);
- Inspect vacuum/pressure gauges for proper operation;
- Check and clean air filter on knockout tank; and
- Check for the presence of water in the knockout tank.

5.3.3 Non-Routine Operation and Maintenance

Non-routine equipment maintenance consists of maintenance activities that will be performed with less frequency than the routine maintenance (i.e., semi-annually) on several system components. Non-routine equipment maintenance will be performed in accordance with manufacturer's instructions and will be recorded on a Non-routine Maintenance Form (Appendix F). Specific non-routine maintenance tasks are outlined below:

- Check float switch in knockout tank for proper operation;
- Replacement of vacuum/pressure gauges; and
- Change bearings on blowers after 15,000 hours of operation.

If water accumulates in a knockout tank, the high-level float switch will shut down the blower. A manual drain has been provided on the bottom of each knockout tank. The water in the knockout tank will be sampled for VOCs for disposal purposes. Following receipt of the water sample results, a hose will be attached to the manual drain and the manual drain valve will be opened and the knockout water will be gravity drained to a 55-gallon drum and properly disposed of off-site.

Table 5.3.3. below provides a summary and schedule of monitoring, inspection, and sampling including routine maintenance.

Table 5.3.3 – Monitoring, Inspection, and Sampling and Schedule

Monitoring Program	Frequency*
Site-Wide Inspection	Annually. First inspection no more than 16 months after issuance of the COC. After emergencies (e.g. fire or flood) and after a severe weather event.
SSDS System Status	Alarm light located in the building - to be monitored by superintendent. After discovery of any damage or defect to SSDS.
Sub-slab Vapor and Soil Vapor Intrusion	Quarterly following SSDS start-up testing and sampling protocol described in Section 4.3.3.
Routine SSDS Detailed Operation Inspection	Monthly
Non-Routine SSDS Detailed Operation Inspection	As needed, following manufacturer's specifications

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

5.3.4 System Monitoring Devices and Alarms

The SSDS has warning devices to indicate that the system is not operating properly. The regenerative blower will have a low vacuum switch, knock-out tank with high level alarm, and an in-line air filter on the inlet. A warning light will be provided for the building and will be located in the building manager's office to allow for the notification of the building superintendent if the blower is not operating. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

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 during periodic assessments, and briefly summarizes the vulnerability of the Site and/or engineering controls to severe storms/weather events and associated flooding.

Since the new building construction at the Site encompasses building coverage of the entire property, most potential areas of vulnerabilities can be considered little to no risk.

- Flood Plain: Site is located within a FEMA Zone X (Area of Minimal Flood Hazard), and therefore the Site has little to no risk.
- Site Drainage and Storm Water Management: Site is covered entirely by building construction and will be connected to NYC sewer system, and therefore the Site has little to no risk.
- Erosion: Site is covered entirely by building construction and will have no areas susceptible to erosion, and therefore the Site has little to no risk.
- High Wind: Site is covered entirely by building construction and will have no areas abnormally susceptible to damage from wind or falling objects, and therefore the Site has little to no risk.
- Electricity: Site is covered entirely by building construction in accordance with NYC Building Code and will have typical susceptibility to infrequent power loss, dips or surges, and therefore the Site has little to no risk.

- Spill/Containment Release: Site is covered entirely by building construction in accordance with NYC Building Code and will have no areas abnormally susceptible to spills or containment release due to storm-related damage caused by flooding, erosion, high winds or loss of power, and therefore the Site has little to no risk.

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).

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. Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

6.2.4 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. Monthly system checks are to be conducted by building management personnel as opposed to a third party or the environmental consultant which saves fuel from transportation because they are already on-site to conduct building maintenance activity.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- 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.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

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

All 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 Table 7.1 and summarized in the Periodic Review Report.

Table 7.1: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Monthly
Periodic Review Report	Annually, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the 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);
- Any 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 activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- 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,
- Other 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 activities;
- 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
- Other 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^{TM} 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 (16) months after the Certificate of Completion 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 that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report 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 Periodic Review Report. 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.
- All 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 (soil vapor), 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. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS^{TM} database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the Site-specific RAWP and 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; and
  - 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.
  - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the Site, I certify that 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;*

- *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, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] for the Site."

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report 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 Periodic Review Report may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that 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. A general outline for the RSO report is provided in Appendix G. The RSO report will document the research/ investigation and data gathering that was 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 may also 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

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

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

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).

TRC Environmental Corporation (TRC), 2015. Phase I ESA. September 2015.

Roux Environmental Engineering and Geology, D.P.C., 2018. Phase II ESA. August 2018

Roux Environmental Engineering and Geology, D.P.C., 2019. Remedial Investigation/Remedial Action Work Plan. December 2019

TABLES

Table 1. Summary of Water Level Measurements, Chestnut Commons, Brooklyn, New York

Monitoring Well Identification	Measurement Date	Measuring Point Elevation (ft NAVD 88)	Depth to Water (ft below measuring point)	Water Level Elevation (ft NAVD 88)
MW-4	4/19/2019	38.33	28.65	9.68
MW-5	4/19/2019	39.56	29.89	9.67
MW-6	4/19/2019	42.78	33.35	9.43
MW-7	4/19/2019	42.12	32.61	9.51
MW-8	4/19/2019	40.93	31.41	9.52

Notes:

ft - Feet

NAVD 1988 - North American Vertical Datum of 1988

Notes Utilized Throughout Tables	
Groundwater Tables	
J -	Estimated Value
U -	Compound was analyzed for but not detected
T -	Indicates that a quality control parameter has exceeded laboratory limits
P -	The RPD between the results for the two columns exceeds the method-specified criteria
N -	Spiked sample recovery was not within control limits
FD -	Duplicate sample
µg/L -	Micrograms per liter
ng/L -	Nanograms per liter
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available
NA -	Compound was not analyzed for by laboratory
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs	
Soil Vapor	
J -	Estimated value
E -	Indicates value exceeded calibration range
T -	Indicates that a quality control parameter has exceeded laboratory limits
U -	Indicates that the compound was analyzed for but not detected
FD -	Duplicate sample
µg/m^3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 2. Summary of Volatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4	MW-5	MW-6	MW-7	MW-8
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit										
1,1,1-Trichloroethane (TCA)	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	1	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-Chloropropane	0.04	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	3	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	0.6	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	1	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	3	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	3	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane (P-Dioxane)	--	--	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Hexanone	--	50	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	--	50	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	1	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	--	50	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.66 J
Bromoform	--	50	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bromomethane	5	--	µg/L	1 UJ	1 UJ	1 UJ	1 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U
Carbon Disulfide	--	60	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	**7**	--	µg/L	1.6	1.5	3.5	1.5	**18**	**18**	2.3	3.8	**14**	**23**
Chloromethane	--	--	µg/L	1 U	1 U	0.41 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,2-Dichloroethylene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cis-1,3-Dichloropropene	--	5	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cyclohexane	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	--	50	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Isopropylbenzene (Cumene)	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
m,p-Xylene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methyl Acetate	--	--	µg/L	5 UT	5 UT	5 UT	5 UT	5 U	5 U	5 U	5 U	5 U	5 U
Methyl Ethyl Ketone (2-Butanone)	--	50	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylcyclohexane	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
O-Xylene (1,2-Dimethylbenzene)	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tert-Butyl Methyl Ether	--	10	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Tetrachloroethylene (PCE)	**5**	--	µg/L	0.43 J	0.31 J	**22**	0.74 J	1.9	1.8	4.7	1.6	**7.3**	**6.2**
Toluene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,2-Dichloroethene	5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trans-1,3-Dichloropropene	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U
Trichloroethylene (TCE)	**5**	--	µg/L	1 U	1 U	2.1	**5.4**	0.37 J	0.35 J	0.46 J	3.3	2.1	1.4
Trichlorofluoromethane	5	--	µg/L	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U
Vinyl Chloride	2	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit						
1,2,4,5-Tetrachlorobenzene	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	--	--	µg/L	NA	NA	NA	NA	0.2 U	0.2 U
2,3,4,6-Tetrachlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	--	50	µg/L	10 UT	10 UT	10 UT	10 UT	10 U	10 U
2,4-Dinitrophenol	--	10	µg/L	21 U	21 U	21 U	21 U	20 U	20 U
2,4-Dinitrotoluene	5	--	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
2,6-Dinitrotoluene	5	--	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
2-Chloronaphthalene	--	10	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	--	µg/L	10 U	10 U	10 UJ	10 U	10 U	10 U
3-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	--	--	µg/L	21 U	21 U	21 U	21 U	20 U	20 U
4-Bromophenyl Phenyl Ether	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Nitrophenol	--	--	µg/L	21 U	21 U	21 U	21 U	20 UT	20 UT
Acenaphthene	--	20	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	--	20	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Acetophenone	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Atrazine	--	--	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 UT	2 UT

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit						
Benzaldehyde	--	--	µg/L	10 U	10 U	10 U	10 U	10 UT	10 UT
Benzo(A)Anthracene	--	0.002	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(A)Pyrene	0	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Benzo(B)Fluoranthene	--	0.002	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
Benzo(G,H,I)Perylene	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(K)Fluoranthene	--	0.002	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Benzyl Butyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Biphenyl (Diphenyl)	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	**5**	--	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
Caprolactam	--	--	µg/L	10 U	10 U	10 U	10 U	10 UT	10 UT
Carbazole	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	--	0.002	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
Dibenz(A,H)Anthracene	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Dibenzofuran	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Diethyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Dimethyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Di-N-Octylphthalate	--	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	0.04	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	--	µg/L	10 UT	10 UT	10 UT	10 UT	10 U	10 U
Hexachloroethane	5	--	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 UT	2 UT
Indeno(1,2,3-C,D)Pyrene	--	0.002	µg/L	2.1 U	2.1 U	2.1 U	2.1 U	2 U	2 U
Isophorone	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	--	10	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	0.4	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit						
N-Nitrosodi-N-Propylamine	--	--	µg/L	1 U	1 U	1 U	1 U	1 U	1 U
N-Nitrosodiphenylamine	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	1	--	µg/L	21 U	21 U	21 U	21 U	20 U	20 U
Phenanthrene	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	1	--	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	--	50	µg/L	10 U	10 U	10 U	10 U	10 U	10 U

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-5	MW-6	MW-7	MW-8
			Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit				
1,2,4,5-Tetrachlorobenzene	--	--	µg/L	10 U	10 U	10 U	10 U
1,4-Dioxane (P-Dioxane)	--	--	µg/L	0.2 U	0.64	0.2 U	0.2 U
2,3,4,6-Tetrachlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	5	--	µg/L	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	--	50	µg/L	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	--	10	µg/L	20 U	20 U	20 U	20 U
2,4-Dinitrotoluene	5	--	µg/L	2 U	2 U	2 U	2 U
2,6-Dinitrotoluene	5	--	µg/L	2 U	2 U	2 U	2 U
2-Chloronaphthalene	--	10	µg/L	10 U	10 U	10 U	10 U
2-Chlorophenol	--	--	µg/L	10 U	10 U	10 U	10 U
2-Methylnaphthalene	--	--	µg/L	10 U	10 U	10 U	10 U
2-Methylphenol (O-Cresol)	--	--	µg/L	10 U	10 U	10 U	10 U
2-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U
2-Nitrophenol	--	--	µg/L	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	--	µg/L	10 U	10 U	10 U	10 U
3-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	--	--	µg/L	20 U	20 U	20 U	20 U
4-Bromophenyl Phenyl Ether	--	--	µg/L	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	--	--	µg/L	10 U	10 U	10 U	10 U
4-Chloroaniline	5	--	µg/L	10 U	10 U	10 U	10 U
4-Chlorophenyl Phenyl Ether	--	--	µg/L	10 U	10 U	10 U	10 U
4-Methylphenol (P-Cresol)	--	--	µg/L	10 U	10 U	10 U	10 U
4-Nitroaniline	5	--	µg/L	10 U	10 U	10 U	10 U
4-Nitrophenol	--	--	µg/L	20 UT	20 UT	20 UT	20 UT
Acenaphthene	--	20	µg/L	10 U	10 U	10 U	10 U
Acenaphthylene	--	20	µg/L	10 U	10 U	10 U	10 U
Acetophenone	--	--	µg/L	10 U	10 U	10 U	10 U
Anthracene	--	50	µg/L	10 U	10 U	10 U	10 U
Atrazine	--	--	µg/L	2 UT	2 UT	2 UT	2 UT

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-5	MW-6	MW-7	MW-8
			Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit				
Benzaldehyde	--	--	µg/L	10 UT	10 UT	10 UT	10 UT
Benzo(A)Anthracene	--	0.002	µg/L	1 U	1 U	1 U	1 U
Benzo(A)Pyrene	0	--	µg/L	1 U	1 U	1 U	1 U
Benzo(B)Fluoranthene	--	0.002	µg/L	2 U	2 U	2 U	2 U
Benzo(G,H,I)Perylene	--	--	µg/L	10 U	10 U	10 U	10 U
Benzo(K)Fluoranthene	--	0.002	µg/L	1 U	1 U	1 U	1 U
Benzyl Butyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U
Biphenyl (Diphenyl)	--	--	µg/L	10 U	10 U	10 U	10 U
Bis(2-Chloroethoxy) Methane	5	--	µg/L	10 U	10 U	10 U	10 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	--	µg/L	1 U	1 U	1 U	1 U
Bis(2-Chloroisopropyl) Ether	5	--	µg/L	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl) Phthalate	**5**	--	µg/L	2 U	**18**	2 U	2 U
Caprolactam	--	--	µg/L	10 UT	10 UT	10 UT	10 UT
Carbazole	--	--	µg/L	10 U	10 U	10 U	10 U
Chrysene	--	0.002	µg/L	2 U	2 U	2 U	2 U
Dibenz(A,H)Anthracene	--	--	µg/L	1 U	1 U	1 U	1 U
Dibenzofuran	--	--	µg/L	10 U	10 U	10 U	10 U
Diethyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U
Dimethyl Phthalate	--	50	µg/L	10 U	10 U	10 U	10 U
Di-N-Butyl Phthalate	50	--	µg/L	10 U	10 U	10 U	10 U
Di-N-Octylphthalate	--	--	µg/L	10 U	10 U	10 U	10 U
Fluoranthene	--	50	µg/L	10 U	10 U	10 U	10 U
Fluorene	--	50	µg/L	10 U	10 U	10 U	10 U
Hexachlorobenzene	0.04	--	µg/L	1 U	1 U	1 U	1 U
Hexachlorobutadiene	0.5	--	µg/L	1 U	1 U	1 U	1 U
Hexachlorocyclopentadiene	5	--	µg/L	10 U	10 U	10 U	10 U
Hexachloroethane	5	--	µg/L	2 UT	2 UT	2 UT	2 UT
Indeno(1,2,3-C,D)Pyrene	--	0.002	µg/L	2 U	2 U	2 U	2 U
Isophorone	--	50	µg/L	10 U	10 U	10 U	10 U
Naphthalene	--	10	µg/L	10 U	10 U	10 U	10 U
Nitrobenzene	0.4	--	µg/L	1 U	1 U	1 U	1 U

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-5	MW-6	MW-7	MW-8
			Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit				
N-Nitrosodi-N-Propylamine	--	--	µg/L	1 U	1 U	1 U	1 U
N-Nitrosodiphenylamine	--	50	µg/L	10 U	10 U	10 U	10 U
Pentachlorophenol	1	--	µg/L	20 U	20 U	20 U	20 U
Phenanthrene	--	50	µg/L	10 U	10 U	10 U	10 U
Phenol	1	--	µg/L	10 U	10 U	10 U	10 U
Pyrene	--	50	µg/L	10 U	10 U	10 U	10 U

Table 4. Summary of Metals in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4	MW-4	MW-4	MW-5	MW-5	MW-6
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	FD	FD	N	N	N	N	N	N	FD	FD	N	N	N
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit															
Aluminum	--	--	µg/L	515 J	40 UJ	98.3 J	40 UJ	569	40 UJ	104000	40 UJ	40 U	40 UJ	40 U	40 UJ	28.5 J	40 UJ	9810
Antimony	3	--	µg/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Arsenic	25	--	µg/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	24.3	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	3.8
Barium	1000	--	µg/L	35.1	31 J	33	30.8 J	57.6	52 J	759	44.1 J	9	9.8 J	10.1	10.6 J	49.7	52.6 J	154
Beryllium	--	**3**	µg/L	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	**6.5**	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.56 J
Cadmium	5	--	µg/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	0.87 J	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Calcium	--	--	µg/L	42400	41900 J	43300	41700 J	39900	38300 J	73700	63700 J	16700	16400 J	16200	16300 J	91300	87500 J	69500
Chromium, Hexavalent	50	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	10 U	NA	3.1 J	NA	20 U
Chromium, Total	**50**	--	µg/L	1.7 J	4 UJ	4 U	4 UJ	3.2 J	4 UJ	**402**	4 UJ	4 U	4 UJ	4 U	4 UJ	4 U	4 UJ	31.3
Cobalt	--	--	µg/L	3 J	2.1 J	2.4 J	1.9 J	2.5 J	1.4 J	154	1.4 J	4 U	4 UJ	4 U	4 UJ	4 U	4 UJ	17.4
Copper	**200**	--	µg/L	2.2 J	4 UJ	4 U	4 UJ	2.1 J	4 UJ	**254**	4 UJ	4 U	4 UJ	4 U	4 UJ	4 U	4 UJ	36.1
Cyanide	200	--	µg/L	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U
Iron	**300**	--	µg/L	**898 J**	120 UJ	177 J	120 UJ	**1070**	120 UJ	**216000**	120 UJ	120 U	120 UJ	120 U	120 UJ	98.8 J	120 UJ	**21300**
Lead	**25**	--	µg/L	0.55 J	1.2 UJ	1.2 U	1.2 UJ	1.5	1.2 UJ	**100**	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 UJ	**36.2**
Magnesium	--	**35000**	µg/L	7930	6910 J	7940	6930 J	5550	4720 J	**52200**	7050 J	2260	2150 J	2190	2190 J	11600	11000 J	14300
Manganese	**300**	--	µg/L	**575**	**507 J**	**512**	**441 J**	**954 J**	**793 J**	**10100**	**546 J**	9.5	8.6 J	9.7	8.2 J	32.7	27 J	**1380**
Mercury	0.7	--	µg/L	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ	0.2 U
Nickel	**100**	--	µg/L	16.7	12.7 J	14.9	11.5 J	15	10.4 J	**503**	3.5 J	4 U	4 UJ	4 U	4 UJ	4 U	4 UJ	41.3
Potassium	--	--	µg/L	4790	4670 J	4540	4430 J	5010	4690 J	19800	6210 J	2050	1910 J	1970	1990 J	4520	4270 J	6260
Selenium	10	--	µg/L	1.3 J	1.4 J	1.4 J	1.5 J	1.6 J	1.7 J	1.6 J	1.5 J	10 U	10 UJ	10 U	10 UJ	10 U	10 UJ	10 U
Silver	50	--	µg/L	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U	2 UJ	2 U
Sodium	**20000**	--	µg/L	**51100**	**45900 J**	**52500**	**46300 J**	**111000**	**99600 J**	**21500**	19900 J	**25400 J**	**25500 J**	**48100 J**	**22500 J**	**107000**	**101000 J**	**42900**
Thallium	--	**0.5**	µg/L	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	**1.3**	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ	0.25 J
Vanadium	--	--	µg/L	1.2 J	4 UJ	4 U	4 UJ	1.3 J	4 UJ	283	4 UJ	4 U	4 UJ	4 U	4 UJ	4 U	4 UJ	25.9
Zinc	--	2000	µg/L	16 U	16 UJ	16 U	16 UJ	16 U	5.4 J	405	16 UJ	16 U	16 UJ	16 U	16 UJ	16 U	16 UJ	84.6

Table 4. Summary of Metals in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-6	MW-7	MW-7	MW-8	MW-8
			Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	N	N	N
				Dissolved	Total	Dissolved	Total	Dissolved
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit					
Aluminum	--	--	µg/L	45.5 J	5330	40 UJ	266	40 UJ
Antimony	3	--	µg/L	2 UJ	2 U	2 UJ	2 U	2 UJ
Arsenic	25	--	µg/L	2 UJ	1.5 J	2 UJ	2 U	2 UJ
Barium	1000	--	µg/L	41.3 J	62.6	23.8 J	12.3	11 J
Beryllium	--	**3**	µg/L	0.8 UJ	0.29 J	0.8 UJ	0.8 U	0.8 UJ
Cadmium	5	--	µg/L	2 UJ	2 U	2 UJ	2 U	2 UJ
Calcium	--	--	µg/L	57300 J	36500	37000 J	24200	22900 J
Chromium, Hexavalent	50	--	µg/L	NA	20 U	NA	10 U	NA
Chromium, Total	**50**	--	µg/L	4 UJ	20.8	4 UJ	4 U	4 UJ
Cobalt	--	--	µg/L	4 UJ	7.8	4 UJ	4 U	4 UJ
Copper	**200**	--	µg/L	4 UJ	19.5	4 UJ	4 U	4 UJ
Cyanide	200	--	µg/L	NA	10 U	NA	10 U	NA
Iron	**300**	--	µg/L	54.5 J	**11300**	120 UJ	**443**	120 UJ
Lead	**25**	--	µg/L	2.1 J	7	1.2 UJ	1.2 U	1.2 UJ
Magnesium	--	**35000**	µg/L	8710 J	12000	10200 J	8140	7510 J
Manganese	**300**	--	µg/L	**304 J**	**944**	**425 J**	71.1	24.3 J
Mercury	0.7	--	µg/L	0.2 UJ	0.2 U	0.2 UJ	0.2 U	0.2 UJ
Nickel	**100**	--	µg/L	3.3 J	21.4	2.6 J	4 U	4 UJ
Potassium	--	--	µg/L	4210 J	4070	3130 J	1830	1680 J
Selenium	10	--	µg/L	10 UJ	10 U	10 UJ	10 U	10 UJ
Silver	50	--	µg/L	2 UJ	2 U	2 UJ	2 U	2 UJ
Sodium	**20000**	--	µg/L	**47700 J**	**34400**	**35400 J**	**37800**	**34600 J**
Thallium	--	**0.5**	µg/L	0.8 UJ	0.8 U	0.8 UJ	0.8 U	0.8 UJ
Vanadium	--	--	µg/L	4 UJ	12.3	4 UJ	1.1 J	4 UJ
Zinc	--	2000	µg/L	24.8 J	27.3	16 UJ	16 U	16 UJ

Table 5. Summary of Polychlorinated Biphenyls in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4	MW-5	MW-6	MW-7	MW-8
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit										
PCB-1016 (Aroclor 1016)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1221 (Aroclor 1221)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1232 (Aroclor 1232)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1242 (Aroclor 1242)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1248 (Aroclor 1248)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1254 (Aroclor 1254)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1260 (Aroclor 1260)	--	--	µg/L	0.4 U	0.4 U	0.4 UJ	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1262 (Aroclor 1262)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
PCB-1268 (Aroclor 1268)	--	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Polychlorinated Biphenyl (PCBs)	0.09	--	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U

Table 6. Summary of Pesticides and Herbicides in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-1	MW-1	MW-2	MW-3	MW-4	MW-4
			Sample Date:	07/25/2018	07/25/2018	07/25/2018	07/25/2018	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	FD	N	N	N	FD
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit						
2,4-D (Dichlorophenoxyacetic Acid)	50	--	µg/L	NA	NA	NA	NA	1.2 U	1.2 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	µg/L	NA	NA	NA	NA	1.2 U	1.2 U
Aldrin	0	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Alpha Endosulfan	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Beta Endosulfan	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chlordane	**0.05**	--	µg/L	**1.4 NJ**	**1.2 NJ**	0.5 U	0.5 U	0.5 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Dieldrin	0.004	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endosulfan Sulfate	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endrin	0	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endrin Aldehyde	5	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Endrin Ketone	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Gamma Bhc (Lindane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor	0.04	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Methoxychlor	35	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDD	0.3	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDE	0.2	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDT	0.2	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Silvex (2,4,5-TP)	0.26	--	µg/L	NA	NA	NA	NA	1.2 U	1.2 U
Toxaphene	0.06	--	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Table 6. Summary of Pesticides and Herbicides in Groundwater, Chestnut Commons, Brooklyn, New York

			Sample Designation:	MW-5	MW-6	MW-7	MW-8
			Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019
			Normal or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Ambient Water-Quality Standards	NYSDEC Ambient Water-Quality Guidance Values	Unit				
2,4-D (Dichlorophenoxyacetic Acid)	50	--	µg/L	1.2 U	1.2 U	1.2 U	1.2 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	µg/L	1.2 U	1.2 U	1.2 U	1.2 U
Aldrin	0	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Alpha Endosulfan	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Beta Bhc (Beta Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Beta Endosulfan	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Chlordane	**0.05**	--	µg/L	0.5 U	0.5 U	0.5 U	0.5 U
Delta BHC (Delta Hexachlorocyclohexane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Dieldrin	0.004	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Endosulfan Sulfate	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Endrin	0	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Endrin Aldehyde	5	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Endrin Ketone	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Gamma Bhc (Lindane)	--	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor	0.04	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Heptachlor Epoxide	0.03	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Methoxychlor	35	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDD	0.3	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDE	0.2	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDT	0.2	--	µg/L	0.02 U	0.02 U	0.02 U	0.02 U
Silvex (2,4,5-TP)	0.26	--	µg/L	1.2 U	1.2 U	1.2 U	1.2 U
Toxaphene	0.06	--	µg/L	0.5 U	0.5 U	0.5 U	0.5 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Groundwater, Chestnut Commons, Brooklyn, New York

	Sample Designation:	MW-4	MW-4	MW-5	MW-6	MW-7	MW-8
	Sample Date:	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019
	Normal or Field Duplicate:	N	FD	N	N	N	N
Parameter	Unit						
2-(N-methyl perfluorooctanesulfonamido) acetic acid	ng/L	1.57 U	1.56 U	7.49 U	7.94 U	1.5 U	1.56 U
N-Ethyl-N-((heptadecafluorooctyl)sulphonyl) glycine	ng/L	1.39 U	1.37 U	6.61 U	7 U	1.33 U	1.38 U
Perfluorobutanesulfonic acid (PFBS)	ng/L	0.45 U	0.45 U	30.4	2.32 J	3.68	2.05
Perfluorobutanoic Acid	ng/L	0.92 U	0.92 U	15	15.6	12.8	9.18
Perfluorodecane Sulfonic Acid	ng/L	0.83 U	0.82 U	3.97 U	4.2 U	0.8 U	0.83 U
Perfluorodecanoic acid (PFDA)	ng/L	4.67	4.41	3.39 U	3.59 U	1.15 J	0.71 U
Perfluorododecanoic acid (PFDoA)	ng/L	0.54 U	0.54 U	2.6 U	2.75 U	0.52 U	0.54 U
Perfluoroheptane Sulfonate (PFHPS)	ng/L	0.88 U	0.87 U	4.19 U	4.43 U	0.84 U	0.87 U
Perfluoroheptanoic acid (PFHpA)	ng/L	6.74	5.94	9.28	10.8	93.3	73.5
Perfluorohexanesulfonic acid (PFHxS)	ng/L	0.74 U	0.73 U	7.84 J	7.35 J	2.74	1.23 J
Perfluorohexanoic acid (PFHxA)	ng/L	3.84	3.53	14.1	8.06 J	37.5	26.5
Perfluorononanoic acid (PFNA)	ng/L	3.61	3.19	3.08 J	3.4 J	6.18	6.33
Perfluorooctane Sulfonamide (FOSA)	ng/L	0.59 U	0.59 U	2.82 U	2.99 U	0.57 U	0.59 U
Perfluorooctanesulfonic acid (PFOS)	ng/L	37.2	35.2	32.6	24.7	47.3	32
Perfluorooctanoic acid (PFOA)	ng/L	14.8	14.6	80.8 J	71.4 J	44.6	34.7
Perfluoropentanoic Acid (PFPeA)	ng/L	5.3	4.12	14.7	19.1	31.1	30.4
Perfluorotetradecanoic acid (PFTA)	ng/L	0.85 U	0.84 U	4.05 U	4.29 U	0.81 U	0.84 U
Perfluorotridecanoic Acid (PFTriA)	ng/L	0.55 U	0.55 U	2.64 U	2.8 U	0.53 U	0.55 U
Perfluoroundecanoic Acid (PFUnA)	ng/L	0.49 U	0.49 U	2.34 U	2.47 U	0.47 U	0.49 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	ng/L	2.68 U	2.65 U	12.8 U	13.5 U	2.56 U	2.66 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	ng/L	4.36 J	4.21 U	20.3 U	21.5 U	4.07 U	4.22 U

Table 8. Remaining Soil Vapor Sample Detections, Chestnut Commons, Brooklyn, New York

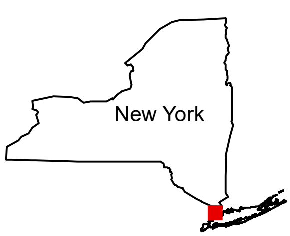
Sample Designation:		SV-1	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	SV-8	SV-9	SV-9	SV-10	SV-11
Sample Date:		07/24/2018	07/24/2018	07/24/2018	07/24/2018	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	05/07/2019
Normal or Field Duplicate:		N	FD	N	N	N	N	N	N	N	N	FD	N	N
Parameter	Unit													
1,1,1-Trichloroethane (TCA)	μg/m^3	**3**	**3.3**	**3.1**	68 U	**0.9 J**	5.5 U	**1.3**	**0.73 J**	2.2 U	2.2 U	4.4 U	**0.57 J**	51 U
1,1,2,2-Tetrachloroethane	μg/m^3	2.7 U	**2.9**	2.7 U	86 U	1.4 U	6.9 U	1.4 U	1.4 U	2.7 U	2.7 U	5.5 U	1.4 U	64 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	μg/m^3	3.1 U	3.1 U	3.1 U	95 U	**0.37 J**	7.7 U	**0.42 J**	**0.43 J**	**0.49 J**	**0.61 J**	6.1 U	**0.47 J**	72 U
1,1,2-Trichloroethane	μg/m^3	2.2 U	2.2 U	2.2 U	68 U	1.1 U	5.5 U	1.1 U	1.1 U	2.2 U	2.2 U	4.4 U	1.1 U	51 U
1,1-Dichloroethane	μg/m^3	1.6 U	1.6 U	1.6 U	50 U	0.81 U	4 U	0.81 U	0.81 U	1.6 U	1.6 U	3.2 U	0.81 U	38 U
1,1-Dichloroethene	μg/m^3	1.6 U	1.6 U	1.6 U	49 U	0.14 U	0.7 U	0.14 U	**0.55**	0.28 U	0.28 U	0.56 U	0.14 U	6.5 U
1,2,4-Trichlorobenzene	μg/m^3	7.4 U	7.4 U	7.4 U	230 U	3.7 U	19 U	3.7 U	3.7 U	7.4 U	7.4 U	15 U	3.7 U	170 U
1,2,4-Trimethylbenzene	μg/m^3	**40**	**57**	**37**	61 U	**0.41 J**	4.9 U	0.98 U	0.98 U	2 U	2 U	3.9 U	**0.46 J**	46 U
1,2-Dibromoethane (Ethylene Dibromide)	μg/m^3	3.1 U	3.1 U	3.1 U	96 U	1.5 U	7.7 U	1.5 U	1.5 U	3.1 U	3.1 U	6.1 U	1.5 U	72 U
1,2-Dichlorobenzene	μg/m^3	2.4 U	2.4 U	2.4 U	75 U	1.2 U	6 U	1.2 U	1.2 U	2.4 U	2.4 U	4.8 U	1.2 U	56 U
1,2-Dichloroethane	μg/m^3	1.6 U	1.6 U	1.6 U	50 U	0.81 U	4 U	0.81 U	0.81 U	1.6 U	1.6 U	3.2 U	0.81 U	38 U
1,2-Dichloropropane	μg/m^3	1.8 U	1.8 U	1.8 U	58 U	0.92 U	4.6 U	0.92 U	0.92 U	1.8 U	1.8 U	3.7 U	0.92 U	43 U
1,2-Dichlorotetrafluoroethane	μg/m^3	2.8 U	2.8 U	2.8 U	87 U	1.4 U	7 U	1.4 U	1.4 U	2.8 U	2.8 U	5.6 U	1.4 U	65 U
1,3,5-Trimethylbenzene (Mesitylene)	μg/m^3	**13**	**17**	**12**	61 U	0.98 U	4.9 U	0.98 U	0.98 U	2 U	2 U	3.9 U	0.98 U	46 U
1,3-Butadiene	μg/m^3	**18 J**	**10 J**	**4.2**	28 U	0.44 U	**2.8**	**0.67**	0.44 U	0.88 U	**0.79 J**	**0.95 J**	**0.3 J**	**6.8 J**
1,3-Dichlorobenzene	μg/m^3	2.4 U	2.4 U	2.4 U	75 U	1.2 U	6 U	1.2 U	1.2 U	2.4 U	2.4 U	4.8 U	1.2 U	56 U
1,4-Dichlorobenzene	μg/m^3	2.4 U	2.4 U	2.4 U	75 U	1.2 U	6 U	1.2 U	1.2 U	2.4 U	2.4 U	4.8 U	1.2 U	56 U
1,4-Dioxane (P-Dioxane)	μg/m^3	36 U	36 U	36 U	1100 U	18 U	90 U	18 U	18 U	36 U	36 U	72 U	18 U	840 U
2,2,4-Trimethylpentane	μg/m^3	**14 J**	**5.6 J**	**11**	58 U	**0.47 J**	4.7 U	0.93 U	**0.47 J**	1.9 U	**0.86 J**	3.7 U	**0.6 J**	44 U
2-Chlorotoluene	μg/m^3	2.1 U	2.1 U	2.1 U	65 U	1 U	5.2 U	1 U	1 U	2.1 U	2.1 U	4.1 U	1 U	48 U
2-Hexanone	μg/m^3	**19**	**21**	4.1 U	130 U	2 U	**240**	**5.3**	2 U	**6**	4.1 U	8.2 U	**7.4**	**220**
4-Ethyltoluene	μg/m^3	**12**	**16**	**12**	61 U	0.98 U	4.9 U	0.98 U	0.98 U	2 U	2 U	3.9 U	0.98 U	46 U
Acetone	μg/m^3	**2200 ET**	**2100 ET**	**1800 ET**	**2200 T**	**34**	**960 D**	**320 D**	**84**	**280 D**	**160**	**160**	**130 D**	**3300**
Allyl Chloride (3-Chloropropene)	μg/m^3	3.1 U	3.1 U	3.1 U	97 U	1.6 U	7.8 U	1.6 U	1.6 U	3.1 U	3.1 U	6.3 U	1.6 U	73 U
Benzene	μg/m^3	**28 J**	**18 J**	**40**	40 U	**0.87**	3.2 U	**0.48 J**	**0.8**	**0.7 J**	**0.85 J**	2.6 U	**0.67**	30 U
Benzyl Chloride	μg/m^3	2.1 U	2.1 U	2.1 U	65 U	1 U	5.2 U	1 U	1 U	2.1 U	2.1 U	4.1 U	1 U	48 U
Bromodichloromethane	μg/m^3	2.7 U	2.7 U	2.7 U	83 U	1.3 U	**16**	1.3 U	1.3 U	2.7 U	2.7 U	5.4 U	1.3 U	63 U
Bromoform	μg/m^3	4.1 U	4.1 U	4.1 U	130 U	2.1 U	10 U	2.1 U	2.1 U	4.1 U	4.1 U	8.3 U	2.1 U	97 U
Bromomethane	μg/m^3	1.6 U	1.6 U	1.6 U	48 U	0.78 U	3.9 U	0.78 U	0.78 U	1.6 U	1.6 U	3.1 U	0.78 U	36 U
Butane	μg/m^3	**44 J**	**27 J**	**24**	**100**	**3.5**	**42**	**5.4**	**3.3**	**6.7**	**11**	**9.3**	**8.5**	**60**
Carbon Disulfide	μg/m^3	**4.5**	3.1 U	**9.1**	97 U	**1.9**	7.8 U	**2.6**	**1.5 J**	**3.1**	**2.5 J**	**3.1 J**	**2.9**	73 U
Carbon Tetrachloride	μg/m^3	0.5 U	0.5 U	0.5 U	16 U	**0.53**	1.1 U	**0.2 J**	**0.45**	**0.54**	**0.38 J**	0.88 U	**0.37**	10 U
Chlorobenzene	μg/m^3	1.8 U	1.8 U	1.8 U	57 U	0.92 U	4.6 U	0.92 U	0.92 U	1.8 U	1.8 U	3.7 U	0.92 U	43 U
Chlorodifluoromethane	μg/m^3	3.5 U	3.5 U	3.5 U	110 U	1.8 U	8.8 U	1.8 U	**1.6 J**	3.5 U	3.5 U	7.1 U	1.8 U	83 U
Chloroethane	μg/m^3	2.6 U	2.6 U	2.6 U	82 U	1.3 U	6.6 U	1.3 U	1.3 U	2.6 U	2.6 U	5.3 U	1.3 U	62 U
Chloroform	μg/m^3	**2.9**	**3.3**	**3**	61 U	**1.2**	**300**	**5**	**5.4**	**3.1**	**9.9**	**12**	**3.3**	46 U
Chloromethane	μg/m^3	2.1 U	2.1 U	2.1 U	64 U	**0.66 J**	5.2 U	1 U	1 U	2.1 U	2.1 U	4.1 U	1 U	48 U
Cis-1,2-Dichloroethylene	μg/m^3	1.6 U	1.6 U	1.6 U	**74**	0.2 U	1 U	**2.8**	**550 D**	**1.4**	0.4 U	0.8 U	0.2 U	9.3 U
Cis-1,3-Dichloropropene	μg/m^3	1.8 U	1.8 U	1.8 U	57 U	0.91 U	4.5 U	0.91 U	0.91 U	1.8 U	1.8 U	3.6 U	0.91 U	42 U
Cyclohexane	μg/m^3	**9.4 J**	**4.1 J**	**7.3**	43 U	**0.43 J**	3.4 U	0.69 U	0.69 U	1.4 U	**0.48 J**	2.8 U	0.69 U	32 U
Cymene	μg/m^3	2.2 U	2.2 U	2.2 U	68 U	1.1 U	5.5 U	1.1 U	1.1 U	2.2 U	2.2 U	4.4 U	1.1 U	51 U
Dibromochloromethane	μg/m^3	3.4 U	3.4 U	3.4 U	110 U	1.7 U	8.5 U	1.7 U	1.7 U	3.4 U	3.4 U	6.8 U	1.7 U	80 U
Dichlorodifluoromethane	μg/m^3	4.9 U	4.9 U	4.9 U	150 U	**2.1 J**	**5.2 J**	**2.8**	**3.8**	**2.4 J**	**3.2 J**	9.9 U	**2.5**	120 U
Dichloroethylenes	μg/m^3	3.2 U	3.2 U	3.2 U	99 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	μg/m^3	**47**	**34**	**42**	54 U	**1.9**	**2.6 J**	**1.6**	**2.3**	**1.9**	**3.2**	**3.1 J**	**2.4**	41 U
Hexachlorobutadiene	μg/m^3	4.3 U	4.3 U	4.3 U	130 U	2.1 U	11 U	2.1 U	2.1 U	4.3 U	4.3 U	8.5 U	2.1 U	100 U
Isopropanol	μg/m^3	25 U	25 U	25 U	770 U	12 U	**90**	**5.9 J**	12 U	25 U	25 U	49 U	**8.6 J**	570 U
Isopropylbenzene (Cumene)	μg/m^3	**2.9**	**2.6**	**3**	61 U	0.98 U	4.9 U	0.98 U	0.98 U	2 U	2 U	3.9 U	0.98 U	46 U
m,p-Xylene	μg/m^3	**140**	**110**	**130**	140 U	**8**	**8.9 J**	**4.8**	**10**	**7.7**	**12**	**11**	**8.8**	100 U
Methyl Ethyl Ketone (2-Butanone)	μg/m^3	**82**	**100**	**60**	92 U	**42**	**540 D**	**120**	**46**	**160**	**91**	**100**	**130 D**	**1600 B**

Table 8. Remaining Soil Vapor Sample Detections, Chestnut Commons, Brooklyn, New York

Sample Designation:		SV-1	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	SV-8	SV-9	SV-9	SV-10	SV-11
Sample Date:		07/24/2018	07/24/2018	07/24/2018	07/24/2018	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	04/30/2019	05/07/2019
Normal or Field Duplicate:		N	FD	N	N	N	N	N	N	N	N	FD	N	N
Parameter	Unit													
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	$\mu g/m^3$	**5.3**	4.1 U	4.1 U	130 U	2 U	10 U	2 U	2 U	4.1 U	4.1 U	8.2 U	2 U	96 U
Methyl Methacrylate	$\mu g/m^3$	4.1 U	4.1 U	4.1 U	130 U	2 U	10 U	2 U	2 U	4.1 U	4.1 U	8.2 U	2 U	96 U
Methylene Chloride	$\mu g/m^3$	3.5 U	**6.1**	3.5 U	110 U	**83**	**8.5 J**	1.7 U	**0.85 J**	3.5 U	**1.9 J**	6.9 U	1.7 U	81 U
Naphthalene	$\mu g/m^3$	5.2 U	5.2 U	5.2 U	160 U	2.6 U	13 U	2.6 U	2.6 U	5.2 U	5.2 U	10 U	2.6 U	120 U
N-Butylbenzene	$\mu g/m^3$	**3**	**3.2**	2.2 U	68 U	1.1 U	5.5 U	1.1 U	1.1 U	2.2 U	2.2 U	4.4 U	1.1 U	51 U
N-Heptane	$\mu g/m^3$	**32 J**	**16 J**	**51**	51 U	**0.96**	**19**	**1.1**	0.82 U	**1.4 J**	**1.9**	3.3 U	**4.6**	38 U
N-Hexane	$\mu g/m^3$	**35 J**	**17 J**	**30**	44 U	**38**	**21**	**1.2**	**0.61 J**	**1.6**	**2.5**	2.8 U	**3.2**	33 U
N-Propylbenzene	$\mu g/m^3$	**10**	**11**	**9.3**	61 U	0.98 U	4.9 U	0.98 U	0.98 U	2 U	2 U	3.9 U	0.98 U	46 U
O-Xylene (1,2-Dimethylbenzene)	$\mu g/m^3$	**52**	**45**	**50**	54 U	**1.4**	**1.8 J**	**0.55 J**	**1.4**	**0.92 J**	**2.3**	**2 J**	**1.7**	41 U
Sec-Butylbenzene	$\mu g/m^3$	2.2 U	2.2 U	2.2 U	68 U	1.1 U	5.5 U	1.1 U	1.1 U	2.2 U	2.2 U	4.4 U	1.1 U	51 U
Styrene	$\mu g/m^3$	**2.4**	**2.4**	1.7 U	53 U	**0.37 J**	4.3 U	0.85 U	0.85 U	1.7 U	1.7 U	3.4 U	0.85 U	40 U
T-Butylbenzene	$\mu g/m^3$	2.2 U	2.2 U	2.2 U	68 U	1.1 U	5.5 U	1.1 U	1.1 U	2.2 U	2.2 U	4.4 U	1.1 U	51 U
Tert-Butyl Alcohol	$\mu g/m^3$	30 U	30 U	30 U	940 U	**21**	**220**	**41**	**27**	**48**	**54**	**38 J**	**65**	**440 J**
Tert-Butyl Methyl Ether	$\mu g/m^3$	1.4 U	1.4 U	1.4 U	45 U	0.72 U	3.6 U	0.72 U	0.72 U	1.4 U	1.4 U	2.9 U	0.72 U	34 U
Tetrachloroethene (PCE)	$\mu g/m^3$	**31 J**	**62 J**	**320**	**13000**	**3**	**130**	**7.3**	**7**	**3.9**	**5.5**	**10**	**3.6**	**15 J**
Tetrahydrofuran	$\mu g/m^3$	29 U	29 U	29 U	920 U	15 U	74 U	15 U	15 U	29 U	29 U	59 U	15 U	690 U
Toluene	$\mu g/m^3$	**150 J**	**76 J**	**120**	**100**	**5.1**	**14**	**1.5**	**1.6**	**2.8**	**2.2**	**2.4 J**	**2.1**	35 U
Trans-1,2-Dichloroethene	$\mu g/m^3$	1.6 U	1.6 U	1.6 U	49 U	0.79 U	4 U	0.79 U	**2.8**	1.6 U	1.6 U	3.2 U	0.79 U	37 U
Trans-1,3-Dichloropropene	$\mu g/m^3$	1.8 U	1.8 U	1.8 U	57 U	0.91 U	4.5 U	0.91 U	0.91 U	1.8 U	1.8 U	3.6 U	0.91 U	42 U
Trichloroethene (TCE)	$\mu g/m^3$	**150**	**230**	**210**	**4600**	**1.6**	**34**	**56**	**130**	**680 D**	**730 J**	**1800 J**	**470 D**	**1700**
Trichlorofluoromethane	$\mu g/m^3$	**39**	**40**	**21**	70 U	**6.3**	**5.3 J**	**8.3**	**4**	**4.3**	**2.6**	**2.8 J**	**4.1**	52 U
Vinyl Bromide	$\mu g/m^3$	1.7 U	1.7 U	1.7 U	55 U	0.87 U	4.4 U	0.87 U	0.87 U	1.7 U	1.7 U	3.5 U	0.87 U	41 U
Vinyl Chloride	$\mu g/m^3$	0.2 U	0.2 U	0.2 U	6.4 U	0.2 U	1 U	0.2 U	**0.88**	0.4 U	0.4 U	0.8 U	0.2 U	9.3 U
Xylenes, Total	$\mu g/m^3$	**190**	**160**	**180**	190 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

FIGURES

QUADRANGLE LOCATION



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1,000 0 1,000'

Title:

SITE LOCATION MAP

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: E.B.	Date: 07/23/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	1
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.1.mxd		

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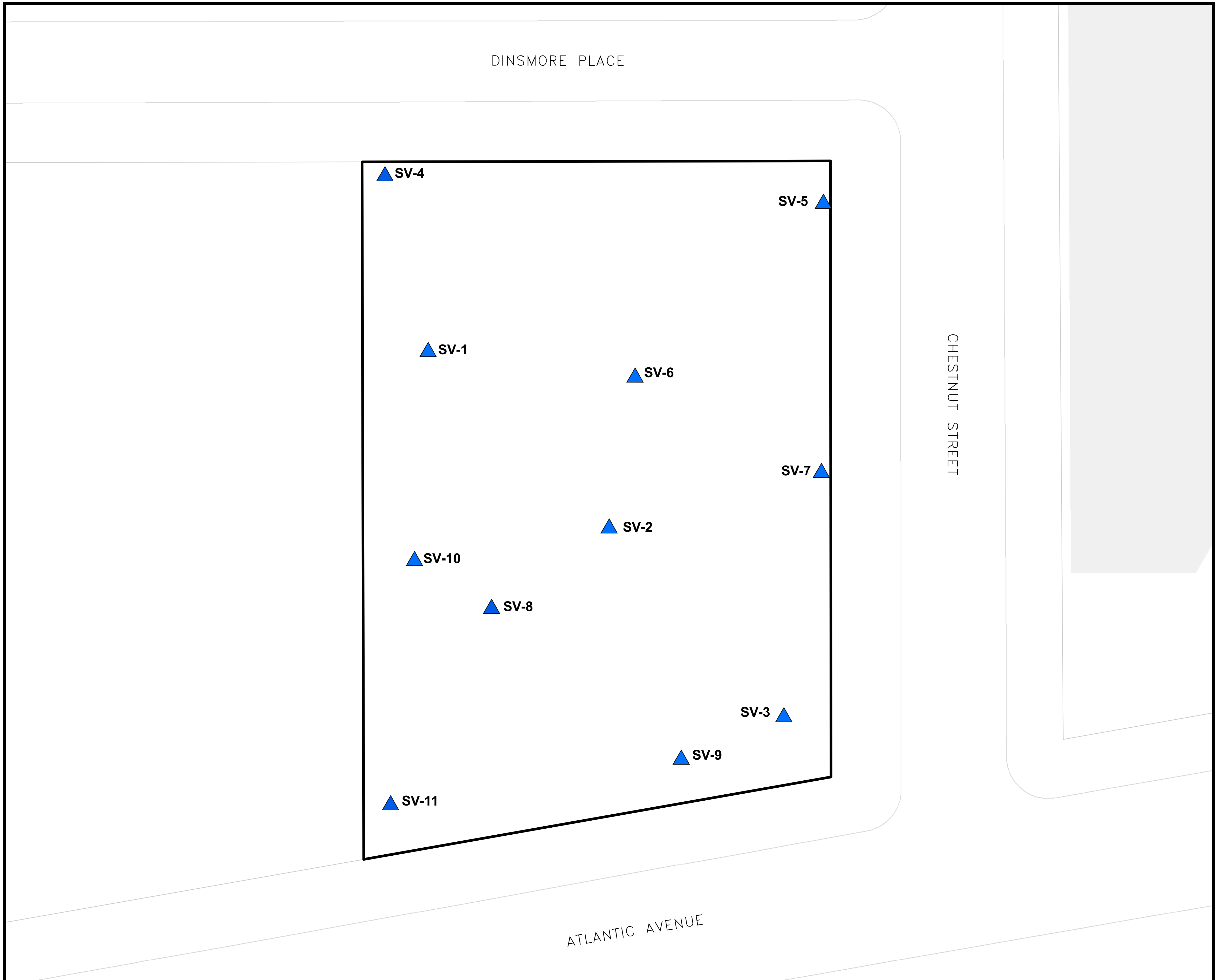

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LEGEND

LOCATION OF RI SOIL VAPOR SAMPLE

SITE/INSTITUTIONAL CONTROL BOUNDARY

30 0 30'

Title:

SITE LAYOUT AND INSTITUTIONAL CONTROL BOUNDARY MAP

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: E.B.	Date: 07/23/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	2
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.2.mxd		

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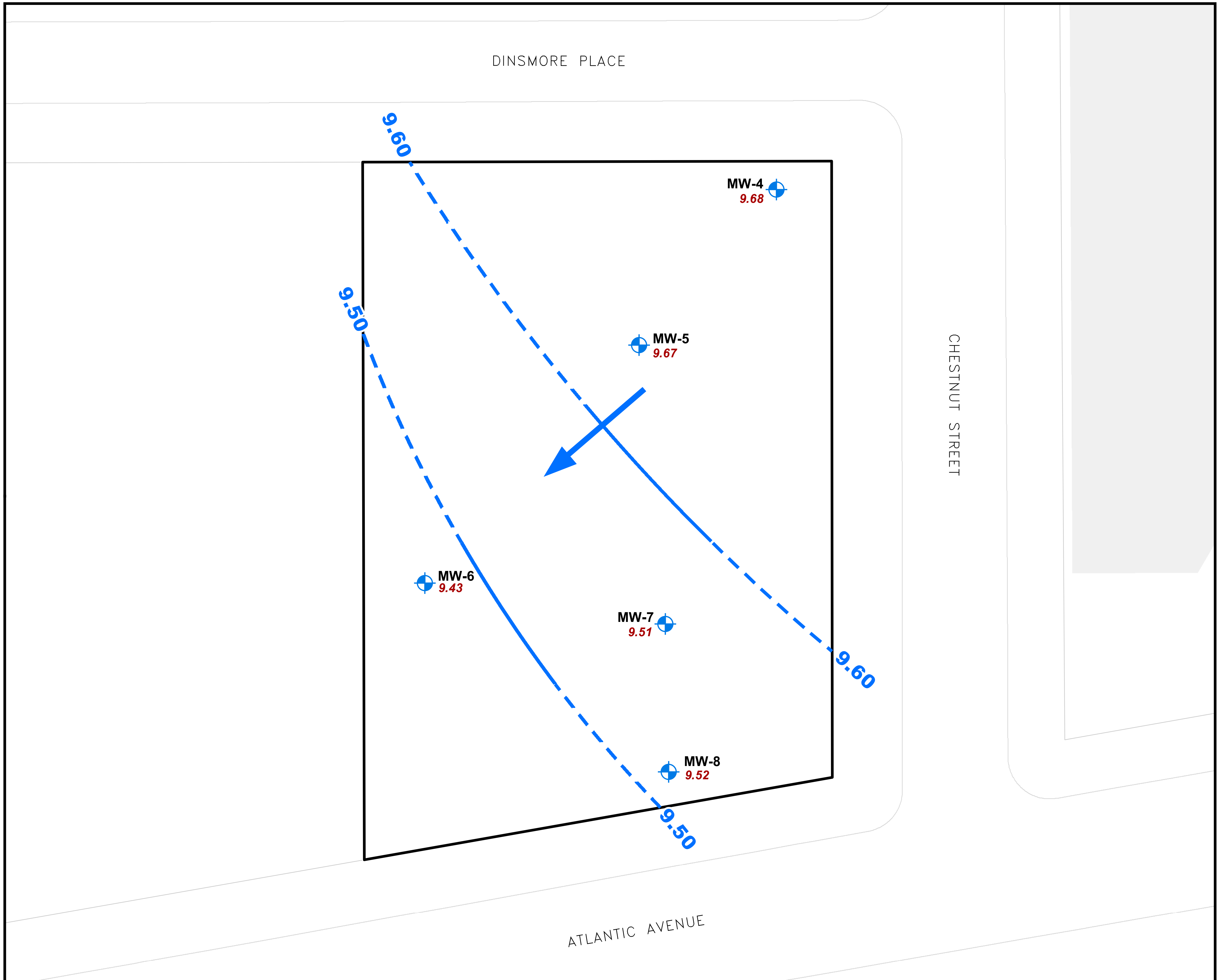

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LEGEND

⊕	LOCATION OF MONITORING WELL COMPLETED IN 2019
-9.50-	LINE OF EQUAL GROUNDWATER ELEVATION (DASHED WHERE INFERRED) (NAVD1988)
➔	INFERRED GROUNDWATER FLOW DIRECTION
▭	SITE BOUNDARY
1.51	GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (NAVD1988)

NOTES

1. GROUNDWATER ELEVATIONS BASED ON GAUGING DATA COLLECTED ON MAY 24, 2019
2. NAVD88 REFERS TO NORTH AMERICAN VERTICAL DATUM OF 1988

30 0 30'

Title:

GROUNDWATER ELEVATION CONTOUR MAP

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: E.B.	Date: 07/23/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.3.mxd		

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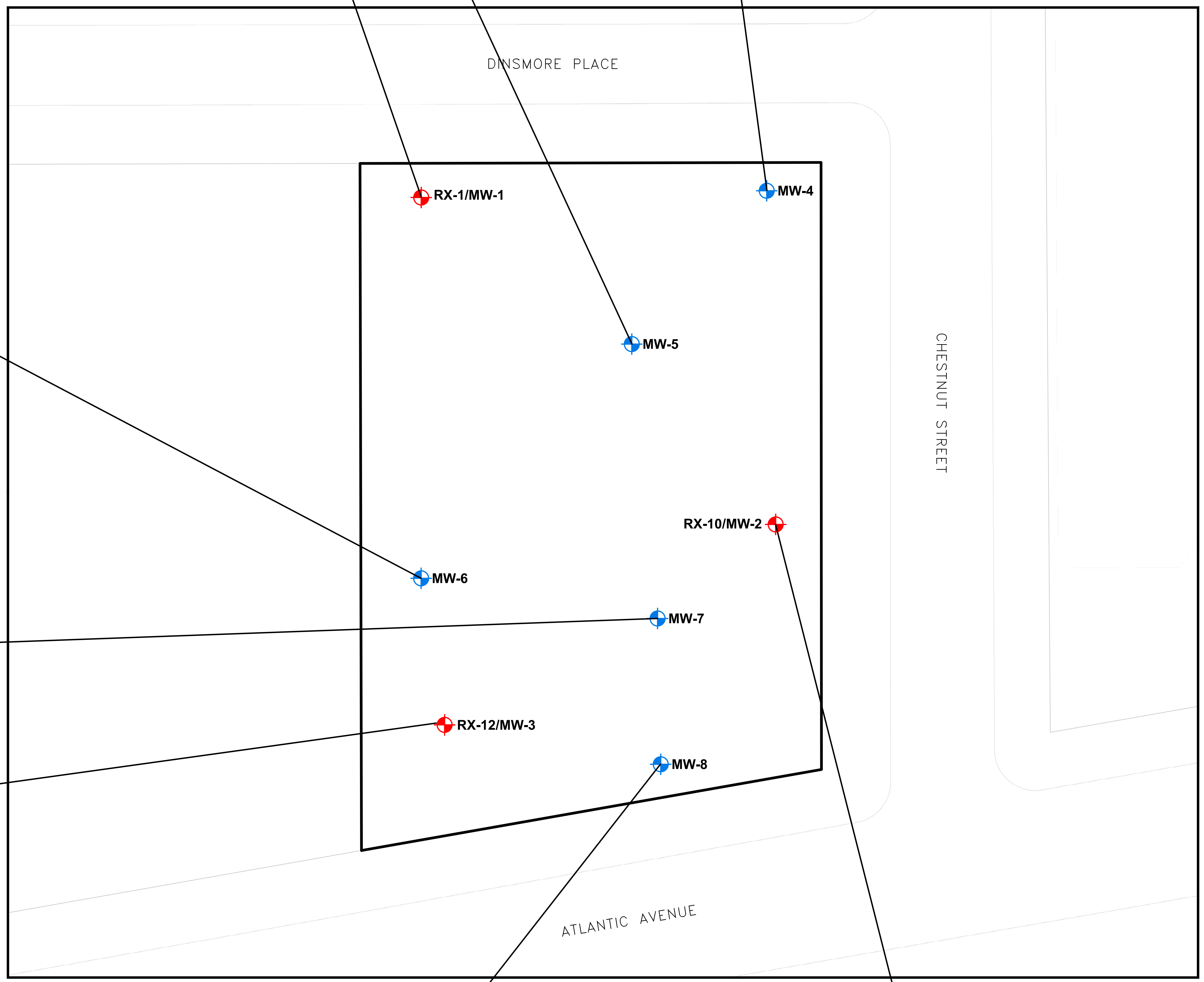
MW-1	7/25/18	7/25/18 DUP
Metals, Total		
Iron	**898**	NE
Manganese	**575**	**512**
Sodium	**51100**	**52500**
Metals, Dissolved		
Manganese	**507**	**441**
Sodium	**45900**	**46300**
Pesticides		
Chlordane	**1.4 P**	**1.2 P**

MW-5	4/30/19
Metals, Total	
Sodium	**107000**
Metals, Dissolved	
Sodium	**101000**

MW-4	4/30/19	4/30/19 DUP
VOCs		
Chloroform	**18**	**18**
Metals, Total		
Sodium	**25400**	**48100**
Metals, Dissolved		
Sodium	**25500**	**22500**



MW-6	4/30/19
SVOCs	
Bis(2-ethylhexyl) phthalate	**18**
Metals, Total	
Iron	**21300**
Lead	**36.2**
Manganese	**1380**
Sodium	**42900**
Metals, Dissolved	
Manganese	**304**
Sodium	**47700**

MW-7	4/30/19
VOCs	
Chloroform	**14**
Tetrachloroethene	**7.3**
Metals, Total	
Iron	**11300**
Manganese	**944**
Sodium	**34400**
Metals, Dissolved	
Manganese	**425**
Sodium	**35400**

MW-3	7/25/18
VOCs	
Trichloroethene	**5.4**
Metals, Total	
Beryllium	**6.5**
Chromium	**402**
Copper	**254**
Iron	**216000**
Lead	**100**
Magnesium	**52200**
Manganese	**10100**
Nickel	**503**
Sodium	**21500**
Thallium	**1.3**
Metals, Dissolved	
Manganese	**546**

MW-8	4/30/19
VOCs	
Chloroform	**23**
Tetrachloroethene	**6.2**
Metals, Total	
Iron	**443**
Sodium	**37800**
Metals, Dissolved	
Sodium	**34600**

MW-2	7/25/18
VOCs	
Tetrachloroethene	**22**
Metals, Total	
Iron	**1070**
Manganese	**954**
Sodium	**111000**
Metals, Dissolved	
Manganese	**793**
Sodium	**99600**

N

LEGEND

- LOCATION OF SOIL BORING, TEMPORARY MONITORING WELL, AND SOIL VAPOR POINT COMPLETED IN 2018
- LOCATION OF MONITORING WELL COMPLETED IN 2019
- SITE BOUNDARY

Parameter	NYSDEC AWQSGVS
VOCs	
Chloroform	**7**
Tetrachloroethene	**5**
Trichloroethene	**5**
SVOCs	
Bis(2-ethylhexyl) phthalate	**5**
Metals	
Beryllium	**3**
Chromium	**50**
Copper	**200**
Iron	**300**
Lead	**25**
Magnesium	**35000**
Manganese	**300**
Nickel	**100**
Sodium	**20000**
Thallium	**0.5**
PCBs	NE
Pesticides	
Chlordane	**0.05**

NOTES

1. CONCENTRATIONS IN MICROGRAMS PER LITER (µG/L)
2. BOLD DATA INDICATES AN EXCEEDANCE OF NYSDEC AWQSGVS

AWQSGVS - AMBIENT WATER-QUALITY STANDARDS AND GUIDANCE VALUES
NYSDEC - NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DUP - DUPLICATE SAMPLE
P - THE RPD BETWEEN THE RESULTS FOR THE TWO COLUMNS EXCEED THE METHOD-SPECIFIED CRITERIA
NE - NO EXCEEDANCE
PCBS - POLYCHLORINATED BIPHENYLS
SVOC - SEMIVOLATILE ORGANIC COMPOUNDS
VOCS - VOLATILE ORGANIC COMPOUNDS

30 0 30'

Title:

SUMMARY OF EXCEEDANES IN GROUNDWATER

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: L.C.	Date: 11/16/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	4
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.4.mxd		

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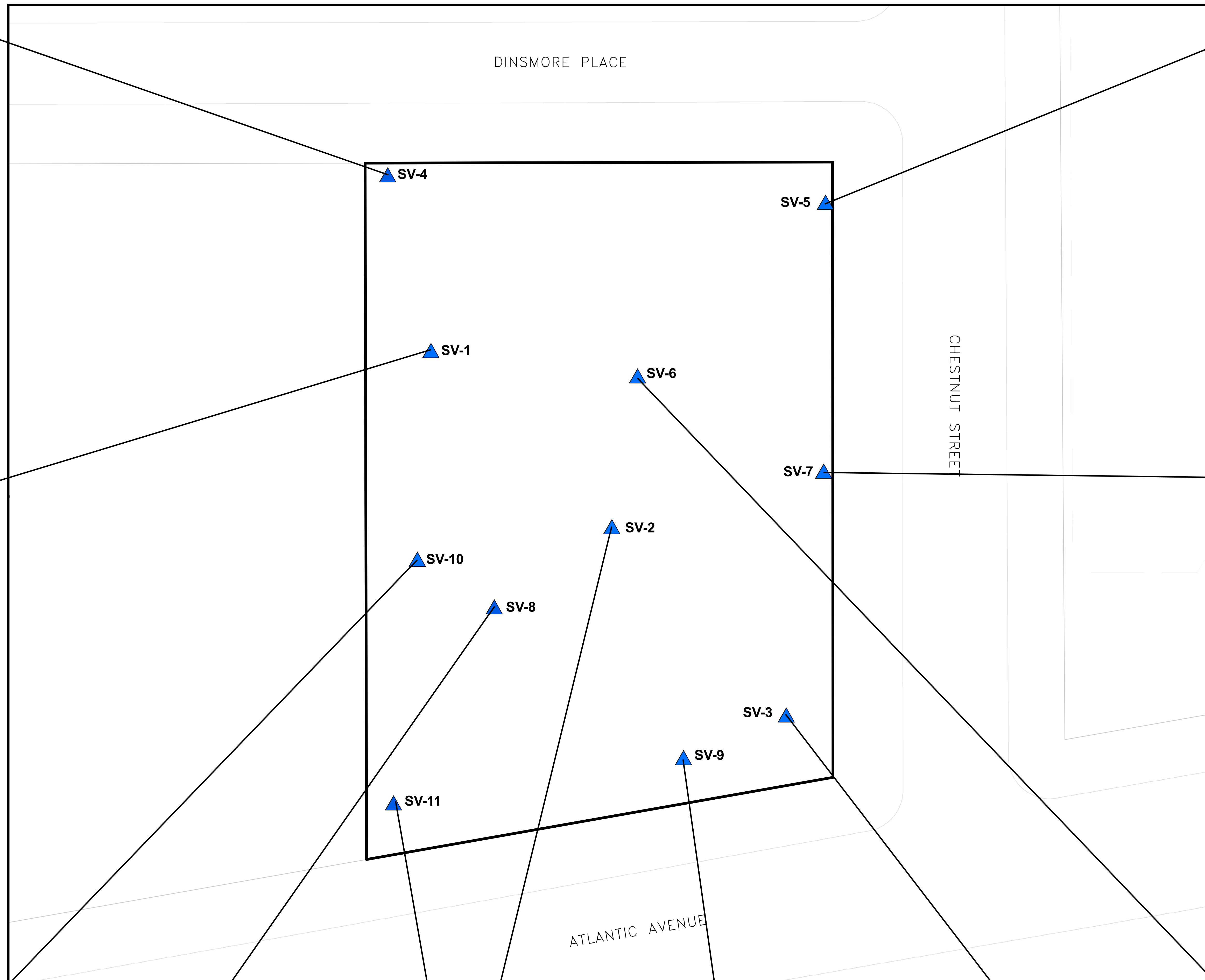

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SV-4	4/30/19
VOCs	
1,1,1-Trichloroethane	0.90 J
1,2,4-Trimethylbenzene	0.41 J
2-Butanone (MEK)	42
Acetone	34
Benzene	0.87
Butane	3.5
Carbon disulfide	1.9
Carbon tetrachloride	0.53
Chloroform	1.2
Chloromethane	0.66 J
Cyclohexane	0.43 J
Dichlorodifluoromethane	2.1 J
Ethylbenzene	1.9
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.37 J
2,2,4-Trimethylpentane	0.47 J
m+p-Xylene	8
Methylene chloride	83
n-Heptane	0.96
n-Hexane	38
o-Xylene	1.4
Styrene	0.37 J
t-Butyl Alcohol	21
Tetrachloroethene	3
Toluene	5.1
Trichloroethene	1.6
Trichlorofluoromethane	6.3

SV-1	7/24/18	7/24/2018 DUP
VOCs		
1,1,1-Trichloroethane	3	3.3
1,1,2,2-Tetrachloroethane	ND	2.9
1,2,4-Trimethylbenzene	40	57
1,3,5-Trimethylbenzene	13	17
1,3-Butadiene	18 J	10 J
2,2,4-Trimethylpentane	14 J	5.6 J
2-Butanone (MEK)	82	100
2-Hexanone	19	21
4-Ethyltoluene	12	16
4-Methyl-2-Pentanone	5.3	ND
Acetone	2200 ET	2100 ET
Benzene	28 J	18 J
Butane	44	27
Carbon disulfide	4.5	ND
Chloroform	2.9	3.3
Cyclohexane	9.4	4.1
Ethylbenzene	47 J	34 J
Isopropanol	2.9	2.6
m+p-Xylene	140	110
Methylene chloride	ND	6.1
N-Butylbenzene	3	3.2
n-Heptane	32 J	16 J
n-Hexane	35 J	17 J
N-Propylbenzene	10	11
o-Xylene	52	45
Styrene	2.4	2.4
Tetrachloroethene	31	62
Toluene	150 J	76 J
Trichloroethene	150	230
Trichlorofluoromethane	39	40
Xylenes, Total	190	160

SV-5	4/30/19
VOCs	
1,3-Butadiene	2.8
2-Butanone (MEK)	540 D
2-Hexanone	240
Acetone	960 D
Bromodichloromethane	16
Butane	42
Chloroform	300
Dichlorodifluoromethane	5.2 J
Ethylbenzene	2.6 J
Isopropanol	90
m+p-Xylene	8.9 J
Methylene chloride	8.5 J
n-Heptane	19
n-Hexane	21
o-Xylene	1.8 J
t-Butyl Alcohol	220
Tetrachloroethene	130
Toluene	14
Trichloroethene	34
Trichlorofluoromethane	5.3 J

SV-7	4/30/19
VOCs	
1,1,1-Trichloroethane	0.73 J
1,1-Dichloroethene	0.55
2-Butanone (MEK)	46
Acetone	84
Benzene	0.8
Butane	3.3
Carbon disulfide	1.5 J
Carbon tetrachloride	0.45
Chlorodifluoromethane	1.6 J
Chloroform	5.4
cis-1,2-Dichloroethene	550 D
Dichlorodifluoromethane	3.8
Ethylbenzene	2.3
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.43 J
2,2,4-Trimethylpentane	0.47 J
m+p-Xylene	10
Methylene chloride	0.85 J
n-Hexane	0.61 J
o-Xylene	1.4
t-Butyl Alcohol	27
Tetrachloroethene	7
Toluene	1.6
trans-1,2-Dichloroethene	2.8
Trichloroethene	130
Trichlorofluoromethane	4
Vinyl chloride	0.88

LEGEND

LOCATION OF RI SOIL VAPOR SAMPLE

SITE/INSTITUTIONAL CONTROL BOUNDARY

NOTES

1. CONCENTRATIONS IN MICROGRAMS PER CUBIC METER (µg/m^3)

ND - NO DETECTION
B - THE ANALYTE WAS FOUND IN AN ASSOCIATED BLANK AS WELL AS IN THE SAMPLE
D - A SECONDARY ANALYSIS AFTER DILUTION DUE TO EXCEEDANCE OF THE CALIBRATION RANGE IN THE ORIGINAL SAMPLE
E - INDICATES VALUE EXCEEDED CALIBRATION RANGE
J - ESTIMATED VALUE
T - INDICATES THAT A QUALITY CONTROL PARAMETER HAS EXCEEDED LABORATORY LIMITS
VOCS - VOLATILE ORGANIC COMPOUNDS

SV-10	4/30/19
VOCs	
1,1,1-Trichloroethane	0.57 J
1,2,4-Trimethylbenzene	0.46 J
1,3-Butadiene	0.30 J
2-Butanone (MEK)	130 D
2-Hexanone	7.4
Acetone	130 D
Benzene	0.67
Butane	8.5
Carbon disulfide	2.9
Carbon tetrachloride	0.37
Chloroform	3.3
Dichlorodifluoromethane	2.5
Ethylbenzene	2.4
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.47 J
2,2,4-Trimethylpentane	0.60 J
Isopropanol	8.6 J
m+p-Xylene	8.8
n-Heptane	4.6
n-Hexane	3.2
o-Xylene	1.7
t-Butyl Alcohol	65
Tetrachloroethene	3.6
Toluene	2.1
Trichloroethene	470 D
Trichlorofluoromethane	4.1

SV-8	4/30/19
VOCs	
2-Butanone (MEK)	160
2-Hexanone	6
Acetone	280 D
Benzene	0.70 J
Butane	6.7
Carbon disulfide	3.1
Carbon tetrachloride	0.54
Chloroform	3.1
cis-1,2-Dichloroethene	1.4
Dichlorodifluoromethane	2.4 J
Ethylbenzene	1.9
Freon 113	0.49 J
m+p-Xylene	7.7
n-Heptane	1.4 J
n-Hexane	1.6
o-Xylene	0.92 J
t-Butyl Alcohol	48
Tetrachloroethene	3.9
Toluene	2.8
Trichloroethene	680 D
Trichlorofluoromethane	4.3

SV-11	5/7/19
VOCs	
1,3-Butadiene	6.8 J
2-Butanone (MEK)	1600 B
2-Hexanone	220
Acetone	3300
Butane	60
t-Butyl Alcohol	440 J
Tetrachloroethene	15 J
Trichloroethene	1700

SV-2	7/24/18
VOCs	
1,1,1-Trichloroethane	3.1
1,2,4-Trimethylbenzene	37
1,3,5-Trimethylbenzene	12
1,3-Butadiene	4.2
2,2,4-Trimethylpentane	11
2-Butanone (MEK)	60
4-Ethyltoluene	12
Acetone	1800 ET
Benzene	40
Butane	24
Carbon disulfide	9.1
Chloroform	3
Cyclohexane	7.3
Ethylbenzene	42
Isopropylbenzene	3
m+p-Xylene	130
n-Heptane	51
n-Hexane	30
N-Propylbenzene	9.3
o-Xylene	50
Tetrachloroethene	320
Toluene	120
Trichloroethene	210
Trichlorofluoromethane	21
Xylenes, Total	180

SV-9	4/30/19	4/30/19 DUP
VOCs		
1,3-Butadiene	0.79 J	0.95 J
2-Butanone (MEK)	91	100
Acetone	160	160
Benzene	0.85 J	ND
Butane	11	9.3
Carbon disulfide	2.5 J	3.1 J
Carbon tetrachloride	0.38 J	ND
Chloroform	9.9	12
Cyclohexane	0.48 J	ND
Dichlorodifluoromethane	3.2 J	ND
Ethylbenzene	3.2	3.1 J
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.61 J	ND
2,2,4-Trimethylpentane	0.86 J	ND
m+p-Xylene	12	11
Methylene chloride	1.9 J	ND
n-Heptane	1.9	ND
n-Hexane	2.5	ND
o-Xylene	2.3	2.0 J
t-Butyl Alcohol	54	38 J
Tetrachloroethene	5.5	10
Toluene	2.2	2.4 J
Trichloroethene	730 D	1800 D
Trichlorofluoromethane	2.6	2.8 J

SV-3	7/24/18
VOCs	
Acetone	2200 T
Butane	100
Cis-1,2-Dichloroethylene	74
Tetrachloroethene	13000
Toluene	100
Trichloroethene	4600

SV-6	4/30/19
VOCs	
1,1,1-Trichloroethane	1.3
1,3-Butadiene	0.67
2-Butanone (MEK)	120
2-Hexanone	5.3
Acetone	320 D
Benzene	0.48 J
Butane	5.4
Carbon disulfide	2.6
Carbon tetrachloride	0.20 J
Chloroform	5
cis-1,2-Dichloroethene	2.8
Dichlorodifluoromethane	2.8
Ethylbenzene	1.6
Freon 113	0.42 J
Isopropanol	5.9 J
m+p-Xylene	4.8
n-Heptane	1.1
n-Hexane	1.2
o-Xylene	0.55 J
t-Butyl Alcohol	41
Tetrachloroethene	7.3
Toluene	1.5
Trichloroethene	56
Trichlorofluoromethane	8.3

30 0 30'

Title:

SUMMARY OF DETECTIONS IN SOIL VAPOR

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: E.B.	Date: 11/16/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	5
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.5.mxd		

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LEGEND

- LOCATION OF SSDS SOIL VAPOR MONITORING POINT
- APPROXIMATE LOCATION OF PROPOSED INDOOR AIR SAMPLING
- SITE/INSTITUTIONAL CONTROL BOUNDARY

NOTES

1. ALL LOCATIONS ARE APPROXIMATE
2. BASEMAP SOURCED FROM DATTNER ARCHITECTS D.P.C., DRAWING A-100.00, DATED 5/8/2020

Title:

SOIL VAPOR AND INDOOR AIR SAMPLING LOCATIONS

CHESTNUT COMMONS ATLANTIC AVE. SITE
BLOCK 4142, LOT 34, BROOKLYN, NY
NYSDEC BCP SITE C224276

Prepared for:

CHESTNUT COMMONS APARTMENTS, LLC

ROUX

Compiled by: L.C.	Date: 11/16/20	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	6
Project Mgr: L.C.	Project: 3002.0004Y000	
File: 3002.0004Y133.6.mxd		

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APPENDICES

A. Environmental Easement

B. List of Site Contacts

C. Boring and Monitoring Well Logs

D. SSDS As-Built and Component Manual

E. Quality Assurance Project Plan/ Field Sampling Plan

F. Site Management Forms

G. Remedial System Optimization Table of Contents

APPENDIX A

Environmental Easement

TITLE NO. BTA76646

ENVIRONMENTAL EASEMENT SURVEY

SURVEY NO. 51417–10
51417–10.DWG
51417–8.CRD

VICINITY MAP
NOT TO SCALE

PAST DEED LEGAL DESCRIPTION OF FORMER LOT 32 ENCOMPASSING BCP SITE LOT 34

BEGINNING at the corner formed by the intersection of the southerly line of Dinsmore Place and the westerly line of Chestnut Street;

RUNNING THENCE southerly along the said westerly line of Chestnut Street, 189 feet 7 1/2 inches to the northerly line of Atlantic Avenue;

THENCE RUNNING westerly along the said northerly line of Atlantic Avenue, 337 feet 10 7/8 inches to a point;

THENCE RUNNING northwesterly along a line forming an interior angle of 97 degrees 36 minutes 44 seconds with the said northerly line of Atlantic Avenue, 258 feet 10 1/4 inches to the said southerly line of Dinsmore Place;

THENCE RUNNING easterly along the said southerly line of Dinsmore Place, 410 feet 4 1/2 inches to the point of BEGINNING.

The new lot 34 comprises a portion of the former lot 32.

BCP SITE LOT 34 LEGAL DESCRIPTION & ENVIRONMENTAL EASEMEMENT LEGAL DESCRIPTION

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

BEGINNING at the corner formed by the intersection of the westerly side of Chestnut Street (66 feet wide) with the northerly side of Atlantic Avenue (irregular width);

RUNNING THENCE westerly along the northerly side of Atlantic Avenue 143.08 feet (143.18 feet U.S.) to a point at the division line with lands now or formerly of the NYC Department of Education (the division line between now or formerly Tax Lots 34 and 32);

RUNNING THENCE northerly along said division line and parallel to Chestnut Street (66 feet wide) 215.39 feet (215.55 feet U.S.) per survey (213.92 feet per tax map) to the southerly side of Dinsmore Place (50 feet wide);

RUNNING THENCE easterly along the southerly side of Dinsmore Place (50 feet wide) 141.00 feet (141.10 feet U.S) to the westerly side of Chestnut Street (66 feet wide);

RUNNING THENCE southerly along the westerly side of Chestnut Street (66 feet wide) 191.09 feet (191.23 feet U.S.) per survey (189.62 feet per tax map) to the point or place of BEGINNING.

SCHEDULE "B" ITEMS

2. One Dollar ($1) Condemnation award clause contained in the deed from the City of New York in Liber 1193 Page 1690.
4. Covenants, conditions, and restrictions contained in the Zoning Lot Development Agreement dated as of 12/20/2019 made by and between The City of New York, Chestnut Commons Housing Development Fund Corporation and Chestnut Commons Apartments LLC and to be recorded in the New York City Register's Office- Kings County.
6. Terms, covenants and conditions contained in the Deed made by City of New York, acting by and through its Department of Housing Preservation and Development to Chestnut Commons Housing Development Fund Corporation, dated as of 12/20/2019 and to be recorded in the New York City Register's Office- Kings County.
7. Land Disposition Agreement made by and among The City of New York, acting by and through its Department of Housing Preservation and Development, Chestnut Commons Housing Development Fund Corporation, and Chestnut Commons Apartments LLC dated as of 12/20/2019 and to be recorded in the New York City Register's Office- Kings County

CERTIFIED TO:

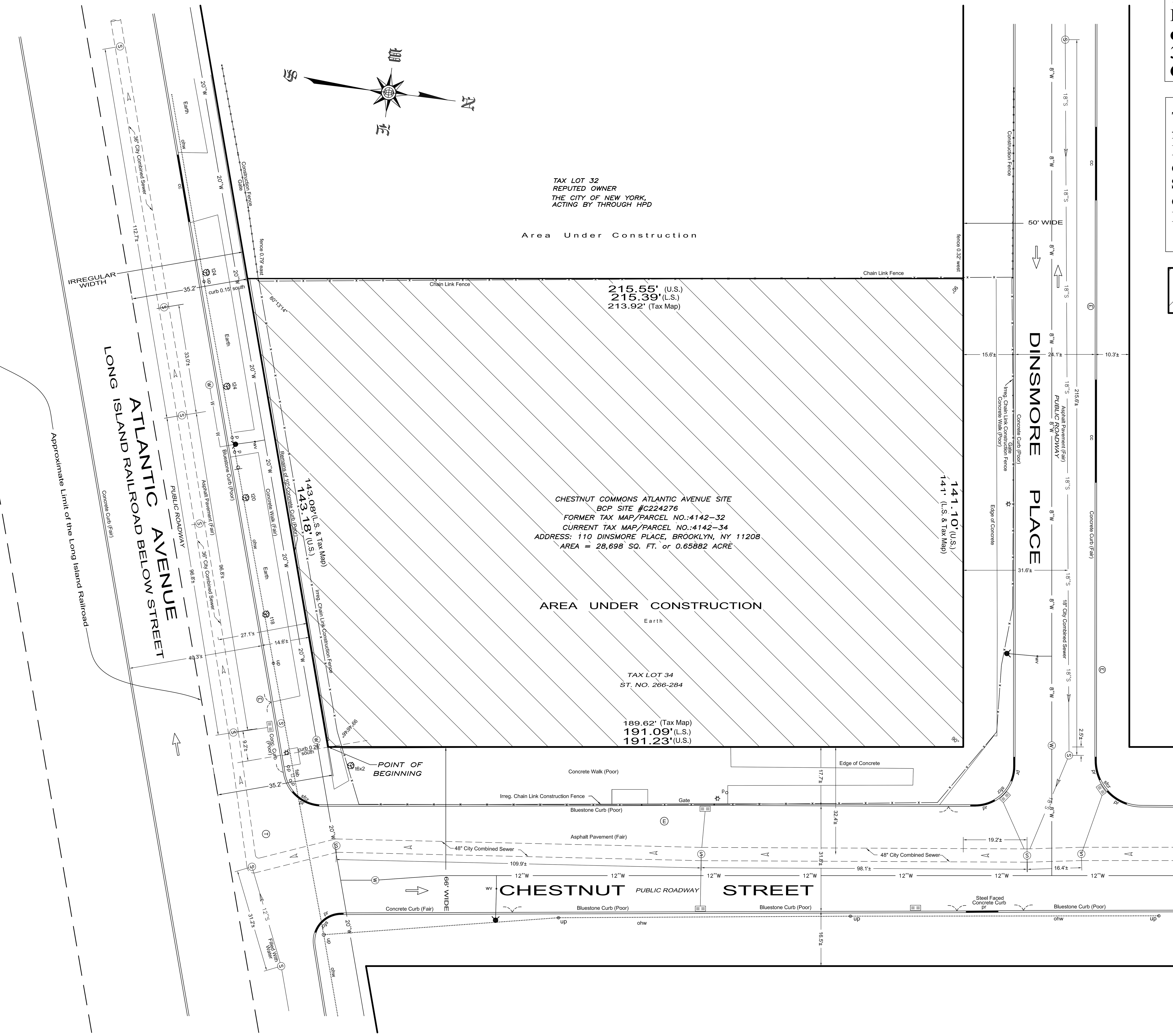
The People of the State of New York acting through its Commissioner of the Department of Environmental Conservation, Chestnut Commons Apartments LLC and Knauf Shaw LLP.

GENERAL NOTES

1. SIZES AND LOCATIONS OF WATER MAINS SHOWN HEREON AS SUPPLIED BY THE DEPARTMENT OF WATER SUPPLY, BOROUGH OF BROOKLYN. LOCATIONS OF WATER SUPPLY MANHOLES, HYDRANTS AND WATER VALVES AS OBTAINED FROM FIELD MEASUREMENT.
2. SIZES AND TYPES OF SEWERS SHOWN HEREON AS OBTAINED FROM THE BOROUGH OF BROOKLYN SEWER DEPARTMENT RECORDS. SEWER MANHOLE RIM AND INVERT ELEVATIONS SHOWN HEREON OBTAINED BY FIELD MEASUREMENTS UNLESS INDICATED (*) WHICH DENOTES INVERT INACCESSIBLE OR MANHOLE NOT FOUND IN FIELD. INFORMATION SHOWN IN THIS MANNER IS AS OBTAINED FROM THE BOROUGH OF BROOKLYN SEWER DEPARTMENT RECORDS.
3. LOCATIONS OF ALL UTILITIES AND SUBSTRUCTURES ARE APPROXIMATE ONLY. THE INFORMATION GIVEN ON THE SURVEY PERTAINING TO UTILITIES AND SUBSTRUCTURES IS NOT CERTIFIED AS TO ACCURACY OR COMPLETENESS. CONSULT WITH THE APPROPRIATE COMPANY OR AGENCY BEFORE DESIGNING IMPROVEMENTS.
4. THE OWNER, CONTRACTOR AND/OR HIS AGENTS MUST NOTIFY THE APPROPRIATE UTILITY COMPANIES AND/OR AGENCIES AT LEAST 72 HOURS PRIOR TO ANY CONSTRUCTION IN ACCORDANCE WITH INDUSTRIAL CODE RULE 753.
5. NO EVIDENCE OF EXISTING STREAMS, CREEKS, DITCHES OR WATER COURSES ON/OR CROSSING PROPERTY SURVEYED.
6. NOT ALL SUBSURFACE INFORMATION PLOTTED.
7. U.S. STANDARD OF MEASUREMENT EXCEPT WHERE NOTED L.S. WHICH DENOTES LOCAL STANDARD.

16 0 16 32 48
GRAPHIC SCALE – FEET

METRIC SCALE: 1 CM=1.92 METERS (6.30 FEET)
0 1.92 3.84 5.76 7.68 9.60



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 New York Environmental Conservation Law.

THE ENGINEERING AND INSTITUTIONAL CONTROLS for the Easement are set forth in more detail in the Site Management Plan ("SMP"). A copy of the SMP must be obtained by any party with an interest in the property. The SMP may be obtained from the New York State Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov.

ENVIRONMENTAL EASEMENT BOUNDARY

ENVIRONMENTAL EASEMENT AREA ACCESS

THE DEC OR THEIR AGENT MAY ACCESS THE ENVIRONMENTAL EASEMENT AREA AS SHOWN HEREON THROUGH ANY EXISTING STREET ACCESS OR BUILDING INGRESS/EGRESS ACCESS POINT.

ENGINEEERING CONTROLS

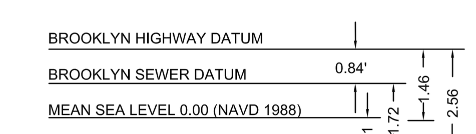
- **Soil Vapor Barrier and Site-Wide Cover System. The metes and bounds for the engineering controls are the same as the Site metes and bounds.**

LEGEND

ASPH.......ASPHALT	PR........PEDESTRIAN RAMP
BK............BRICK	RET......RETAINING
BSMT.......BASEMENT	RIM.......RIM ELEVATION SEWER MANHOLE
CC............CURB CUT	SFCR....STEEL FACED CURB ROUND
CCR..........CONCRETE CURB ROUND	STY.......STORY
CD............CELLAR DOOR	TB........TOP OF BANK ELEVATION
CLF...........CHAIN LINK FENCE	........TRAFFIC LIGHT
CO............CATCH BASIN CLEAN OUT	TEL.......TELEPHONE
CONC.......CONCRETE	TP........TREE PIT
CRF..........CHAIN ROPE FENCE	........TRAFFIC SIGN
CWA.........CELLAR WINDOW AREA	TW........ELEVATION AT TOP OF WALL
DR............DRAIN	UP........UTILITY POLE
EL.............ELEVATION	VU.........VALVE UNKNOWN
FAB...........FIRE ALARM BOX	VLTU......VAULT UNKNOWN
FC.............FILL CAP	VP.........VENT PIPE
FL EL........FLOOR ELEVATION	WV.........WATER VALVE
GP.............GUARD POLE	12"G......GAS MAIN WITH SIZE
GV............GAS VALVE	12"S......SEWER MAIN WITH SIZE
IF..............IRON FENCE	12"W......WATER MAIN WITH SIZE
INL............CATCH BASIN INLET ELEVATION	.......CATCH BASIN
INV...........SEWER INVERT ELEVATION	E E...ELECTRIC MANHOLE / VAULT
L.............LIGHT POLE	F ....FIRE MANHOLE
MB.............MAIL BOX	G ....GAS MANHOLE
MHU..........UNKNOWN MANHOLE	S ....SEWER MANHOLE
OF.............OIL FILL	T ....TELEPHONE MANHOLE
OHW.........OVERHEAD WIRES	W ....WATER MANHOLE
P...............POLE	TR ....TRAFFIC VAULT
PAVT.........PAVEMENT	.....HYDRANT
PM.............PARKING METER	T8.....TREE WITH SIZE
PMULT......POLE, MULTIPLE USAGE	....TRAFFIC FLOW
.............SPRINKLER	
............SIAMESE	

FLOOD HAZARD NOTE

THE PARCEL SURVEYED IS COMPRISED OF AREAS DESIGNATED AS
ZONE X (LESS THAN 0.2% CHANCE OF FLOODING)
FEDERAL EMERGENCY MANAGEMENT AGENCY
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
COMMUNITY PANEL NUMBER 360497 0217 F
AND
COMMUNITY PANEL NUMBER 360497 0236 F
EFFECTIVE DATE SEPTEMBER 5, 2007



NAVD 1988 DATUM IS 1.46 FEET BELOW THE BROOKLYN HIGHWAY DATUM

DRAWN: O.A.

ESTABLISHED 1876 * SUCCESSOR TO:
B.G. MEINIKHEIM C.S.*C.U. POWELL C.E.,C.S.*L.C.L. SMITH C.S.*NATHAN CAMPBELL C.E.,C.S.*A.U. WHITSON C.E.,C.S.*
WILLIAM L. SAVACOOL C.E.,L.S.,C.S.*A.U. WHITSON INC. C.E.,C.S.*G. WEBER L.S.,C.S.*C. STIDOLPH R.A.,L.S.*WHITSON &
POWELL INC. P.E.,L.S.,C.S.*KELLER & POWELL P.E.,L.S.,C.S.*LOUIS MONTROSE C.E.,L.S.,C.S.*FRED J. POWELL P.E.,L.S.,C.S.*

REV	DATE	DESCRIPTION	ck

REV	DATE	DESCRIPTION	ck
	05/19/20	ENVIRONMENTAL EASEMENT SURVEY	

MONTROSE
SURVEYING CO., LLP.
CITY & LAND SURVEYORS
116 20 METROPOLITAN AVE * RICHMOND HILL NY 11418–1090 * (718) 849–0600

CITY OF NEW YORK
COUNTY: KINGS
TAX BLOCK 4142
TAX LOT 34

SCALE: 1" = 16'

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

THIS INDENTURE made this 5th day of October, 2024 between Owner(s), Chestnut Commons Housing Development Fund Corporation, (the "Grantor Fee Owner") having an office at c/o MHANY Management, Inc., 470 Vanderbilt Avenue, 9th Floor, Brooklyn, New York 11238, County of Kings, State of New York, and Chestnut Commons Apartments LLC, (the "Grantor Beneficial Owner), having an office at c/o MHANY Management, Inc., 470 Vanderbilt Avenue, 9th Floor, Brooklyn, New York 11238, County of Kings, 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 110 Dinsmore Place 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 4142 Lot 34, being the same as that property conveyed to Grantor by deed dated December 20, 2019 and recorded in the City Register of the City of New York as CRFN # 2019000426715. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.65882 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 19, 2020 prepared by Saeid Jalilvand, L.L.S. of Montrose Surveying Co. LLP, 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, Grantor Beneficial Owner, is the owner of the beneficial interest in the Controlled Property being the same as a portion of that beneficial interest conveyed to Grantor Beneficial Owner by means of a Declaration of Interest and Nominee Agreement dated December 19, 2019 and recorded in City Register of the City of New York as CRFN # 2019000426716; 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: C224276-08-29, 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:

Residential as described in 6 NYCRR Part 375-1.8(g)(2)(i), 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 raising livestock or producing animal products for human consumption, 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 by 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. <u>Right to Enter and Inspect</u>. 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.

4. <u>Reserved Grantor's Rights</u>. 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: C224276
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.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

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

Chestnut Commons Housing Development Fund Corporation:

By: ______________________

Print Name: Ismene Speliotis

Title: Executive Direct Date: 9/16/2020

Grantor's Acknowledgment

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

On the 16 day of September in the year 20 20, before me, the undersigned, personally appeared Ismene Speliotis, 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

CATHERINE MABINTA FONTALIO CLIFFORD
NOTARY PUBLIC
NO. 01FO6360812
My Comm. Expires
Jun 26, 2021
Qualified in New York County
STATE OF NEW YORK

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

Chestnut Commons Apartments LLC:

By: ______________________

Print Name: Ismene Speliotis

Title: Executive Direct Date: 9/16/2020

Grantor's Acknowledgment

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

On the 16 day of September, in the year 2020, before me, the undersigned, personally appeared Ismene Speliotis, 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

CATHERINE MABINTA FONTALIO CLIFFORD
NOTARY PUBLIC
NO. 01FO6360812
My Comm. Expires
Jun 26, 2021
Qualified in New York County
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: ______________________
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

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

On the 5th day of October, in the year 2020 before me, the undersigned, personally appeared Michael J. Ryan, 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.

Monica Kreshik
Notary Public - State of New York

MONICA KRESHIK, ESQ.
Notary Public, State of New York
No. 02KR6314659
Qualified in Rensselaer County
Commission Expires 11/17/2022

SCHEDULE "A" PROPERTY DESCRIPTION

LOT 34 & EASEMENT DESCRIPTION

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

BEGINNING at the corner formed by the intersection of the westerly side of Chestnut Street (66 feet wide) with the northerly side of Atlantic Avenue (irregular width);

RUNNING THENCE westerly along the northerly side of Atlantic Avenue 143.08 feet (143.18 feet U.S.) to a point at the division line with lands now or formerly of the NYC Department of Education (the division line between nor or formerly Tax Lots 34 and 32);

RUNNING THENCE northerly along said division line and parallel to Chestnut Street (66 feet wide) 215.39 feet (215.55 feet U.S.) per survey (213.92 feet per tax map) to the southerly side of Dinsmore Place (50 feet wide);

RUNNING THENCE easterly along the southerly side of Dinsmore Place (50 feet wide) 141.00 feet (141.10 feet U.S.) to the westerly side of Chestnut Street (66 feet wide);

RUNNING THENCE southerly along the westerly side of Chestnut Street (66 feet wide) 191.09 feet (191.23 feet U.S.) per survey (189.82 feet per tax map) to the point or place of BEGINNING.

Encompassing 0.65882 acres.

APPENDIX B

List of Site Contacts

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Ismene Speliotis MHANY Management, Inc.	(718) 246-8080 ext. 203 ispeliotis@mutualhousingny.org
Matthew Gross Urban Builders Collaborative/Lettire Construction Corp.	(212) 996-6640 mgross@lettire.com
Brian P. Morrissey, P.E. Roux Environmental Engineering and Geology, D.P.C.	(631) 232-2600 bmorrissey@rouxinc.com
Linda R. Shaw, Esq. Knauf Shaw LLP	(585) 546-8430 lshaw@nyenvlaw.com
Nigel Crawford, P.E. Project Manager NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-7778 nigel.crawford@dec.ny.gov
Jane O'Connell Chief NYSDEC Division of Environmental Remediation, Superfund and Brownfield Cleanup Section	(718) 482-4599 jane.oconnell@dec.ny.gov
Kelly Lewandowski Chief NYSDEC Division of Environmental Remediation, Site Control Section	(518) 402-9569 kelly.lewandowski@dec.ny.gov
Stephen Lawrence Project Manager NYSDOH Bureau of Environmental Exposure Investigation	(518) 402-7860 beei@health.ny.gov
Tenants - TBD	

APPENDIX C

Boring and Monitoring Well Logs

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

209 Shafter Street
Islandia, NY 11749
Telephone: (631) 232-2600
Fax: (631) 232-9898

SOIL BORING LOG

WELL NO. **RX-1/MW-1**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34** **Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**			
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/25/18-7/25/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–3.5	Brown, fine SAND and SILT, little coarse Gravel and Cobble, trace brick and glass (FILL); moist.		0.0	4' recovery. Collect groundwater sample MW-1 for VOCs, SVOCs, Pesticides, PCBs and TAL Metals. Collect grab sample RX-1_0-2 from 0' to 2' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
3.5–5	Dark brown, fine to medium SAND, some Silt and fine to coarse Gravel, little Cobble, trace brick and glass (FILL); moist.			
5–7	BRICK (FILL).			5' recovery.
7–10	Light brown, fine to coarse SAND, trace fine gravel; moist.		0.0	
10–15			0.0	5' recovery. Collect grab sample RX-1_13-15 from 13' to 15' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
15–20			0.0	5' recovery.
20–25			0.0	5' recovery.
25–30	Light brown, fine to coarse SAND, little fine Gravel; moist.		0.0	5' recovery.
30–35	Light brown, fine to coarse SAND, some fine Gravel, little Cobble and medium to coarse Gravel; wet.		0.0	5' recovery. End of boring at 35' bls.

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SOIL BORING LOG

WELL NO. **RX-10/MW-2**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34 Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**			
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/24/18-7/24/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Dark brown, fine to coarse SAND, some fine to coarse Gravel, trace brick (FILL); moist.	G	0.0	3' recovery. Collect grab sample RX-10_0-2 from 0' to 2' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals. Collect groundwater sample MW-2 for VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
5–7.5		Brown, fine to medium SAND, some Silt, little fine to coarse Gravel and Cobble, trace brick (FILL); moist.		0.0	4' recovery.
7.5–30		Light brown, fine to coarse SAND, trace fine gravel; moist.		0.0	
10				0.0	5' recovery.
				0.0	Collect grab sample RX-10_13-15 from 13' to 15' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
15				0.0	5' recovery.
20				0.0	5' recovery.
				0.0	
25				0.0	5' recovery.
30–31		Dark brown, fine to coarse SAND, some fine to coarse Gravel; moist.			5' recovery.
31–35		Light brown, fine to coarse SAND, trace fine gravel; moist.		0.0	End of boring at 35' bls.

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SOIL BORING LOG

WELL NO. **RX-12/MW-3**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34** **Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**	
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro-Core**	**7/24/18-7/24/18**

LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL
Not Measured	**Not Measured**	**Cuttings**

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–3	Brown, fine to medium SAND, some fine to coarse Gravel, little Silt (FILL); moist.		0.0	4.5' recovery. Collect grab sample RX-12_0-2 from 0' to 2' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals. Collect groundwater sample MW-3 for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
3–4	Grey, fine SAND and SILT (FILL); moist.			
4–9	Grey, COBBLE, some fine to coarse Sand and Gravel, little Brick (FILL); moist.		0.0	
5			0.0	3' recovery.
9–13	Dark brown, fine to medium SAND, some coarse Sand and fine Gravel, little Silt and Cobble; moist.			
10			0.0	4.5' recovery.
13–14	Brown, fine to medium SAND, little fine Gravel; moist.			Collect grab sample RX-12_13-15 from 13' to 15' bls for VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
14–15	Light brown, fine to coarse SAND; moist.		0.0	End of boring at 15' bls.
15				

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SOIL BORING LOG

WELL NO. **RX-14/SV-3**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34 Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**			
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/24/18-7/24/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–7		Dark brown, fine to medium SAND, some Silt and fine to coarse Gravel, little Cobble, trace glass, brick, debris (FILL); moist.		0.0	5' recovery. Collect soil vapor sample SV-3 for VOCs.
5					4' recovery.
7–10		Light brown, fine to medium SAND, some coarse Sand and fine Gravel; moist.		0.0	
10–15		Light brown, fine to coarse SAND, little fine Gravel; moist.		0.0	5' recovery. Collect grab sample RX-14_13-15 for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. End of boring at 15' bls.

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SOIL BORING LOG

WELL NO. **RX-3**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34 Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**			
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/25/18-7/25/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"		PID Values (ppm)	REMARKS
0–5		Dark brown, fine to medium SAND and fine GRAVEL, trace medium to coarse gravel and brick (FILL); moist.		G	0.0	3' recovery. Collect grab sample RX-3_0-2 from 0' to 2' bls for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. Collect grab sample RX-3 (3-5) from 3' to 5' bls for for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
5		Brown, SILT, some fine to medium Sand; moist.				4' recovery.
		Light brown, fine to coarse SAND; moist.			0.0	
10					0.0	5' recovery. Collect grab sample RX-3_13-15 from 13' to 15' bls for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. End of boring at 15' bls.
15						

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SOIL BORING LOG

WELL NO. **RX-5/SV-1**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34 Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**			
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/24/18-7/24/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace glass, brick (FILL); moist.		0	4' recovery. Collect soil vapor sample SV-1 for VOCs.
		Grey, COBBLE, some fine to coarse Sand (FILL); dry.			
		Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace glass, brick (FILL); moist.		0	
5		Grey, COBBLE, little fine to coarse Sand (FILL); dry.			4' recovery.
		Brown to grey, fine to coarse SAND, some fine to coarse Gravel, little Cobble, trace brick (FILL); moist.		0	
		Light brown, fine SAND, some Silt, trace cobble; moist.			
		Light brown, coarse SAND, some fine to medium Sand, little fine Gravel; moist.		0	
10		LIght brown, medium to coarse SAND, some fine Gravel, little fine Sand; moist.		0	4.5' recovery. Collect sample RX-5_13-15 from 13' to 15' bls for for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. End of boring at 15' bls.
15					

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SOIL BORING LOG

WELL NO. **RX-6**	LATITUDE **Not Measured**	LONGITUDE **Not Measured**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons Atlantic Ave.**		LOCATION **Block 4142 Lot 34 Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **C. Stowell**	
DRILLING CONTRACTOR/DRILLER **Trinity Environmental / Joe Sakellis**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **7720DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **7/25/18-7/25/18**
LAND SURFACE ELEVATION **Not Measured**	DEPTH TO WATER **Not Measured**	BACKFILL **Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–7		Brown, fine to coarse SAND, some fine to coarse Gravel and Cobble, little Silt, trace brick (FILL); moist.	G	0.0	4' recovery. Collect grab sample RX-6_0-2 from 0' to 2' bls for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
5				0.0	2.5' recovery.
7–7.5		BRICK (FILL).			
7.5–15		Brown, fine to coarse SAND, some fine to coarse Gravel and Cobble, little Silt, trace brick (FILL); moist.			
10					2.5' recovery.
13–15				0.0	Collect grab sample RX-6_13-15 from 13' to 15' bls for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. End of boring at 15' bls.
15					

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SOIL BORING LOG

WELL NO.	LATITUDE	LONGITUDE		
RX-9/SV-2	**Not Measured**	**Not Measured**		
PROJECT NO./NAME		LOCATION		
3002.0004Y000 / Chestnut Commons Atlantic Ave.		**Block 4142 Lot 34**		
APPROVED BY	LOGGED BY			
J. Taylor	**C. Stowell**	**Brooklyn, New York**		
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Trinity Environmental / Joe Sakellis				
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**7720DT / Geoprobe**	**2" Macro-Core**	**7/24/18-7/24/18**
LAND SURFACE ELEVATION	DEPTH TO WATER	BACKFILL		
Not Measured	**Not Measured**	**Cuttings**		

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–2.5	Brown, fine to medium SAND, some Silt, little coarse Sand and fine Gravel, trace brick (FILL); moist.		0.0	3' recovery. Collect grab sample RX-9_0-2 and soil vapor sample SV-2 for VOCs.
2.5–5	Dark brown, SILT, some fine to medium Sand, little fine Gravel (FILL); moist.	G	8.8 23.2	Collect grab sample RX-9_3-5 for for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals.
5	Brown, fine to coarse SAND, some fine to coarse Gravel, little Brick (FILL); moist.			2.5' recovery.
	Grey, COBBLE, some fine to coarse Gravel, little fine to coarse Sand; dry.			
	Dark brown, fine to medium SAND, little fine Gravel; moist.			
10	Dark brown, fine to medium SAND, some fine to coarse Gravel, little Silt and Cobble; moist.		0.0	2.5' recovery. Refusal at 10.5' bls, moved boring 4' east; continue drilling.
	Brown, fine to coarse SAND, some fine Gravel, little Silt, trace cobble; moist.		0.0	Collect grab sample RX-9_13-15 from 13' to 15' bls for analysis of VOCs, SVOCs, Pesticides, PCBs and TAL Metals. End of boring at 15' bls.
15				

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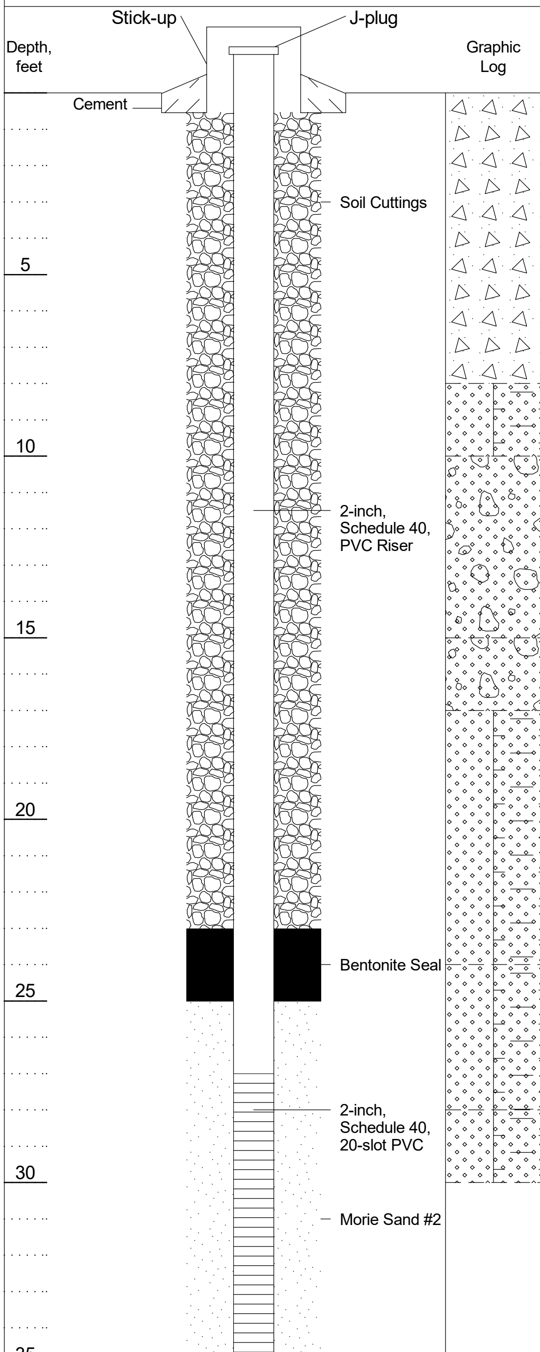
WELL CONSTRUCTION LOG

WELL NO. **MW-4**	LATITUDE **187536.436**	LONGITUDE **1018862.892**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **E. Butler**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/15/19-4/17/19**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted**	MAT. **SCH 40 PVC** TOTAL LENGTH **8.0** ft	DIA. **2-inch**	SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–8	Brown, fine to coarse SAND, some Gravel, Brick, and Concrete (FILL); moist.		0.2	Collect soil sample MW-4 (0-2) for RI list of parameters.
5			0.2	Hand cleared to 5 ft bls.
8–10	Brown, fine to coarse SAND, some Silt, little gravel; moist.		0.4	
10–15	Brown, fine to coarse SAND, little gravel and silt; moist.		0.1	
15–17	Brown, fine to coarse SAND, some Gravel; moist.		0.1	
17–24	Brown, fine to coarse SAND, little Silt; moist.		0.2	
20			0.1	
24–28	Brown, fine to medium SAND, little Silt; moist.		0.1	
25			0.1	Collect soil sample MW-4 (26-28) for RI list of parameters. Collect soil sample DUP041719 for RI list of parameters. Water observed at 28 ft bls.
28–30	Brown, fine to medium SAND, little Silt; wet.			End of soil boring at 30 ft bls.

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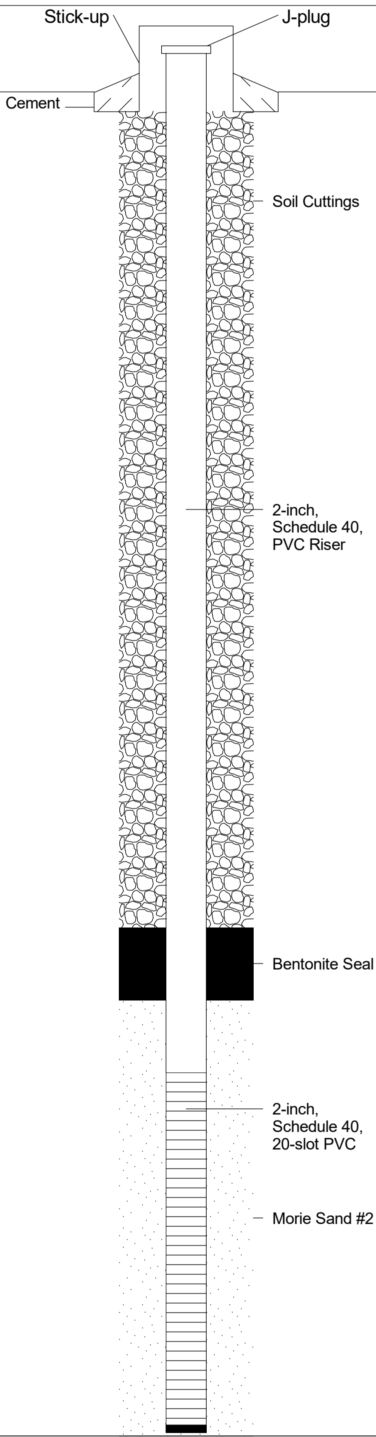
WELL CONSTRUCTION LOG

WELL NO. **MW-5**	LATITUDE **187482.798**	LONGITUDE **1018830.953**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**	
DRILLING CONTRACTOR/DRILLER **ADT /**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
2-in. / Drive Sampler	**2-inches**	**6620DT / Geoprobe**	**2" Macro-Core**	**4/12/19-4/16/19**

CASING MAT./DIA. **SCH 40 PVC / 2-inch** — SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Brown to dark brown, fine to medium SAND, some Brick, Asphalt, and Concrete (FILL); moist.	G	0.0	Collect soil sample MW-5 (0-2) for RI list of parameters.
5	Light to dark Brown, fine to medium SAND, some Asphalt and Concrete (FILL); moist.		0.0	Hand cleared to 5 ft bls.
10	Light Brown, fine to medium SAND; moist.		0.1	
15			0.0	
20			0.0	
25			0.0	
28				Collect soil sample MW-5 (28-30) for RI list of parameters.
30	Dark brown, fine to medium SAND; wet.		0.0	Water observed at 31 ft bls.
35				End of soil logging at 35 ft bls.

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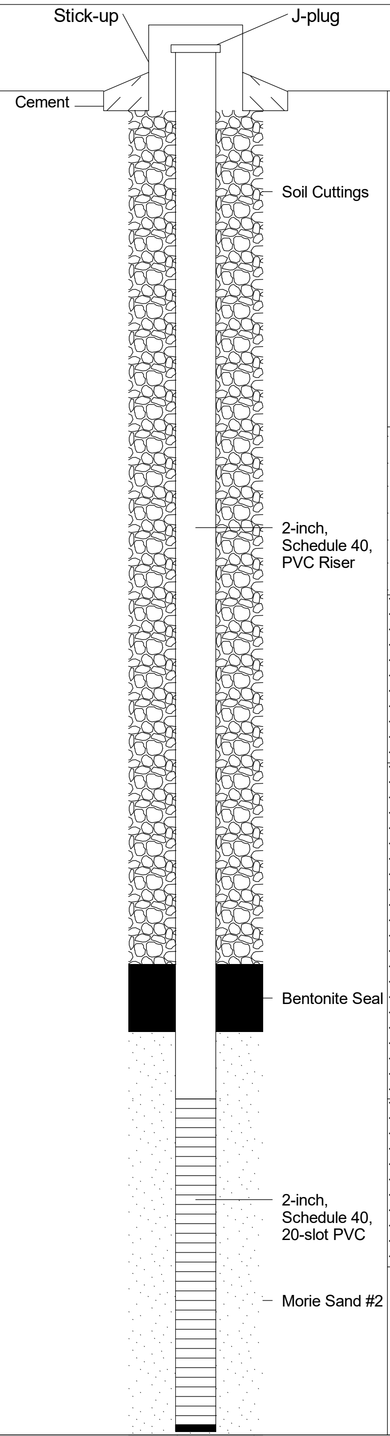
WELL CONSTRUCTION LOG

WELL NO. **MW-6**	LATITUDE **187400.609**	LONGITUDE **1018780.811**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/15/19-4/18/19**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Light to dark brown, fine to coarse SAND, some Asphalt, Brick, and Concrete (FILL), trace gravel; moist.		0.0	
5			0.0	Hand cleared to 5 ft bls.
10	Light brown, coarse SAND; moist.		8.8	
15	Brown, fine to coarse SAND; moist.		11.4	
20	Light brown, coarse to fine SAND; moist.		6.9	
25			19.0	
30	Light brown, fine to coarse SAND, trace gravel; wet.		0.0	Collect soil sample MW-6 (30-32) for RI list of parameters. Water observed at 34 ft bls.
35				End of soil logging at 35 ft bls.
40				

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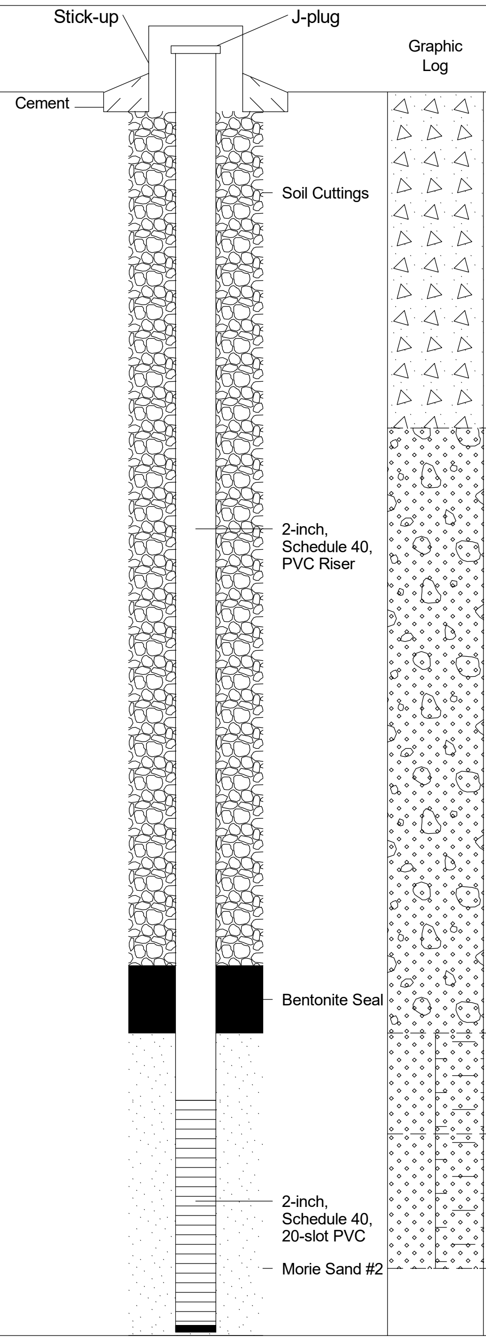
WELL CONSTRUCTION LOG

WELL NO. **MW-7**	LATITUDE **187401.853**	LONGITUDE **1018854.163**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **E. Butler**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/11/19-4/16/19**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted**	MAT. **SCH 40 PVC** TOTAL LENGTH **7.0** ft	DIA. **2-inch**	SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0	Brown, fine to coarse SAND, some Gravel, Brick, and Cocnrete (FILL); moist.		0.7	Collect soil sample MW-7 (0-2) for RI list of parameters.
5				Hand cleared to 5 ft bls.
9.5			0.2	
10	Brown, fine to coarse SAND, little Gravel; moist.			
14.5			0.2	
19.5			0.7	
24.5			0.4	
26.5			0.2	
28	Brown, fine to medium SAND, little Silt; moist.			
29.5			0.2	
30.5			0.2	Collect soil sample MW-7 (30-32) for RI list of parameters.
31	Brown, fine to medium SAND, little Silt; wet.			
32				Water observed at 32 ft bls.
37				End of soil logging at 37 ft bls.

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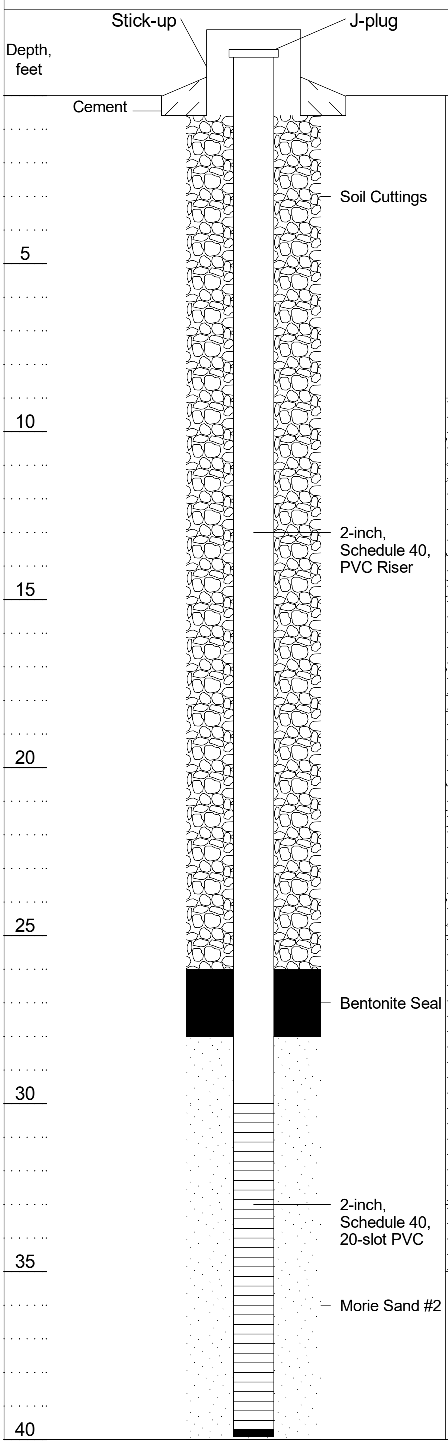
WELL CONSTRUCTION LOG

WELL NO. **MW-8**	LATITUDE **187358.266**	LONGITUDE **1018863.308**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place** **Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **E. Butler**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/11/19-4/16/19**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted**	MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft	DIA. **2-inch**	SLOT SIZE **20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, fine to coarse SAND, some Gravel and Asphalt (FILL); moist.		0.0	Collect soil sample MW-8 (0-2) for RI list of parameters.
5				0.0	Hand cleared to 5 ft bls.
9		Brown, fine to coarse SAND, little Gravel; moist.			
10				0.0	
15				0.0	
20				0.0	
25		Brown, fine to medium SAND; moist.		0.0	
30				0.0	Collect soil sample MW-8 (30-32) for RI list of parameters.
33		Brown, fine to medium SAND; wet.			Water observed at 33 ft bls.
35					End of soil logging at 35 ft bls.
40					

BORING/FEET 3002.0004Y000.GPJ ROUX.GDT 8/15/19

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SOIL BORING LOG

WELL NO. **RX-15/SV-4**	LATITUDE **187527.829**	LONGITUDE **1018747.897**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**	
DRILLING CONTRACTOR/DRILLER **ADT /**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/15/19-4/17/19**
LAND SURFACE ELEVATION **35.01(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, coarse SAND, some Gravel and Brick (FILL); moist.		0.0	Collect soil sample RX-15 (0-2) for RI list of parameters.
1		Light brown, coarse SAND; moist.	G		Hand cleared to 5 ft bls.
5		Light brown, fine to coarse SAND, some fine to medium Gravel; moist.		0.0	
10		Light brown, coarse SAND, fine Gravel; moist.		0.1	
15		Light brown, fine to coarse SAND, some fine to medium Gravel; moist.		0.1	
20				0.1	Soil vapor screen installed at 20 ft bls.
25				0.1	Collect soil sample RX-15 (24-26) (in triplicate for MS/MSD) for RI list of parameters.
27		Light brown, fine to coarse SAND, some fine to medium Gravel; wet.			Water observed at 27 ft bls.
30					End of boring at 30 ft bls.

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SOIL BORING LOG

WELL NO. RX-16/SV-11	LATITUDE 187333.802	LONGITUDE 1018783.025
PROJECT NO./NAME 3002.0004Y000 / Chestnut Commons		LOCATION 110 Dinsmore Place Brooklyn, New York
APPROVED BY J. Taylor	LOGGED BY E. Butler	
DRILLING CONTRACTOR/DRILLER ADT / R. Allegrezza		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE 2-in. / Drive Sampler	BOREHOLE DIAMETER 2-inches	DRILLING EQUIPMENT/METHOD 6620DT / Geoprobe	SAMPLING METHOD 2" Macro-Core	START-FINISH DATE 4/11/19-4/15/19
LAND SURFACE ELEVATION 39.59(FT.)	DEPTH TO WATER Not Measured	BACKFILL Soil Cuttings		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, fine to coarse SAND, some Gravel, Brick, and Concrete (FILL); moist.	G	0.0	Collect soil sample RX-16 (0-2) for RI list of parameters.
5				0.0	Hand cleared to 5 ft bls.
10				0.0	
11		Brown, fine to coarse SAND, little Gravel and Silt; moist.		0.0	
15				0.0	
20				0.0	
25				0.0	
27		Brown, fine to medium SAND; moist.			
30				0.0	Soil vapor screen installed at 30 ft bls. Collect soil sample RX-16 (30-32) for RI list of parameters.
32		Brown, fine to medium SAND; wet.			Water observed at 32 ft bls.
35					End of boring at 35 ft bls.

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SOIL BORING LOG

WELL NO. **SV-10**	LATITUDE **187407.332**	LONGITUDE **1018776.547**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / T.**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/16/19**
LAND SURFACE ELEVATION **40.41(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Brown, fine to medium SAND, some Gravel (FILL); moist.		0.0	
5–10		Brown to light brown, coarse SAND, some Brick, Concrete, and Asphalt (FILL); moist.		0.0	Hand cleared to 5 ft bls.
10–12		Light brown, coarse SAND, trace asphalt, brick, and concrete (FILL); moist.		0.4	
12–20		Light brown, coarse to fine SAND; moist.		0.1	
20–25		Light brown, coarse to fine SAND, some Gravel; moist.		3.8	Soil vapor screen installed at 25 ft bls. End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO. **SV-5**	LATITUDE **187535.724**	LONGITUDE **1018877.758**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **E. Butler**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/15/19-4/17/19**
LAND SURFACE ELEVATION **36.25(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, fine to coarse SAND, some Gravel, Brick, and Asphalt (FILL); moist.		22.9	
5				0.3	Hand cleared to 5 ft bls.
7		Brown, fine to coarse SAND, trace gravel; moist.		1.4	
10				0.1	
15				0.1	
20				0.0	
24		Brown, fine to medium SAND, little Silt; wet.		0.1	Soil vapor screen installed at 25 ft bls.
25					End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO.	LATITUDE	LONGITUDE		
SV-6	**187473.856**	**1018831.662**		
PROJECT NO./NAME: **3002.0004Y000 / Chestnut Commons**		LOCATION: **110 Dinsmore Place, Brooklyn, New York**		
APPROVED BY: **J. Taylor**	LOGGED BY: **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER: **ADT / T.**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE: **2-in. / Drive Sampler**	BOREHOLE DIAMETER: **2-inches**	DRILLING EQUIPMENT/METHOD: **6620DT / Geoprobe**	SAMPLING METHOD: **2" Macro-Core**	START-FINISH DATE: **4/12/19-4/16/19**
LAND SURFACE ELEVATION: **38.02(FT.)**	DEPTH TO WATER: **Not Measured**	BACKFILL: **Soil Cuttings**		

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5	Brown, fine to medium SAND, some Brick, Asphalt, and Concrete, trace gravel (FILL); moist.	G	0.0	
5–10	Light brown to dark brown, fine to coarse SAND, some fine to medium Gravel, Brick, Asphalt, and Concrete (FILL); moist.		0.0	Hand cleared to 5 ft bls.
10–15	Light to dark brown, fine to medium SAND, some Brick, Concrete, and Asphalt, trace gravel (FILL); moist.		0.7	
15–20	Light brown, coarse SAND, trace gravel; moist.		0.1	
20–25	Light brown, fine to medium SAND; moist.		0.1	Soil vapor screen installed at 25 ft bls. End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO. **SV-7**	LATITUDE **187455.965**	LONGITUDE **1018892.131**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / T.**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/16/19**
LAND SURFACE ELEVATION **36.74(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Light to dark brown, fine to medium SAND, some Clay, Brick, and Asphalt (FILL); moist.	G	0.1	
5–10		Light brown, fine to medium SAND, some Gravel; moist.		0.1	Hand cleared to 5 ft bls.
10–25		Light brown, fine to coarse SAND, trace gravel; moist.		0.0	
15				0.0	
20				0.1	
25					Soil vapor screen installed at 25 ft bls. End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO. **SV-9**	LATITUDE **187363.335**	LONGITUDE **1018866.492**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / T.**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/17/19**
LAND SURFACE ELEVATION **39.02(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Brown, fine to medium SAND, some medium Gravel, Brick, and Concrete (FILL); moist.		0.0	
5		Brown, fine to medium SAND, some fine to medium Gravel, Brick, Asphalt, Concrete (FILL); moist.		0.0	Hand cleared to 5 ft bls.
8		Light brown, fine SAND, trace gravel; moist.			
10		Light brown, coarse SAND, some fine to medium Gravel; moist.		0.1	
15				0.0	
20		Light brown, fine to coarse SAND; moist.		0.1	
24					Soil vapor screen installed at 25 ft bls.
25					End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO. **WC-1**	LATITUDE **187514.047**	LONGITUDE **1018778.531**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/18/19**
LAND SURFACE ELEVATION **38.68(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Dark brown, fine to medium SAND, some fine to medium Gravel, Brick, Asphalt, and Concrete (FILL); moist.	G	5.8	Collect soil sample WC-1 (0-6) for WC list of parameters.
5–10		Brown, fine to medium SAND, some Brick, Asphalt, and Gravel (FILL); moist.		0.0	Hand cleared to 5 ft bls. Collect soil sample WC-1 (6-12) for WC list of parameters.
10–15		Light to dark brown, fine to coarse SAND; moist.		5.7	Collect soil sample WC-1 (12-18) for WC list of parameters.
15–20		Light brown, fine to coarse SAND, some fine Gravel; moist.		5.0	Collect soil sample WC-1 (18-20) for RI list of parameters. End of boring at 20 ft bls.

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SOIL BORING LOG

WELL NO. **WC-2**	LATITUDE **187450.849**	LONGITUDE **1018794.054**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/10/19-4/18/19**
LAND SURFACE ELEVATION **38.48(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Dark brown, fine to medium SAND, some Gravel, trace brick and concrete (FILL); wet.	G	0.0	Collect soil sample WC-2 (0-6) for WC list of parameters.
5		Dark brown, fine to medium SAND, some Gravel; moist.		20.2	Hand cleared to 5 ft bls. Collect soil sample WC-2 (6-12) for WC list of parameters.
10		Dark brown, fine to medium SAND, some fine to medium Gravel; moist.		92.2	Collect soil sample WC-2 (12-18) for WC list of parameters.
15		Light brown, coarse SAND; moist.		12.7	Collect soil sample WC-2 (18-20) for RI list of parameters. End of boring at 20 ft bls.
20					

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SOIL BORING LOG

WELL NO. **WC-3/SV-8**	LATITUDE **187397.481**	LONGITUDE **1018802.021**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**	
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/10/19-4/18/19**
LAND SURFACE ELEVATION **39.90(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Brown, fine to medium SAND, some fine to medium Gravel, Asphalt, and Concrete (FILL); moist.	G	0.0	Collect soil sample WC-3 (0-6) for WC list of parameters.
5–10		Brown, fine to medium SAND, some Asphalt and Concrete (FILL); moist.		0.2	Hand cleared to 5 ft bls. Collect soil sample WC-3 (6-12) for WC list of parameters.
10–15		Light to dark brown, fine to coarse SAND, some Brick, Asphalt, and Concrete, trace Gravel (FILL); moist.		0.3	Collect soil sample WC-3 (12-18) for WC list of parameters.
15–20				0.0	Collect soil sample WC-3 (0-6) for RI list of parameters.
20–25		Light to dark brown, fine to coarse SAND, trace Gravel; moist.		0.0	Soil vapor screen installed at 25 ft bls. End of boring at 25 ft bls.

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SOIL BORING LOG

WELL NO. **WC-4**	LATITUDE **187354.946**	LONGITUDE **1018813.288**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**	
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA

DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/10/19-4/19/19**
LAND SURFACE ELEVATION **40.56(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0		Dark brown, fine to medium SAND, some fine to medium Gravel, Concrete, Asphalt, and Brick (FILL); moist.	G	0.0	Collect soil sample WC-4 (0-6) for WC list of parameters.
5				0.0	Hand cleared to 5 ft bls. Collect soil sample WC-4 (6-12) for WC list of parameters.
10		Light to dark brown, fine SAND, some Clay, Brick, and Concrete (FILL); moist.		0.0	Collect soil sample WC-4 (12-18) for WC list of parameters. Collect soil sample DUP041919 for WC list of parameters.
15		Light to dark brown, fine to coarse SAND, some Clay and fine to medium Gravel; moist.		0.0	Collect soil sample WC-4 (18-20) for RI list of parameters. End of boring at 20 ft bls.
20					

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SOIL BORING LOG

WELL NO.	LATITUDE	LONGITUDE		
WC-5	**187530.551**	**1018845.064**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/19/19**
LAND SURFACE ELEVATION **36.43(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5		Dark to light brown, coarse to medium SAND, some fine to medium Gravel, Asphalt, and Brick (FILL); moist.	G	9.1	Collect soil sample WC-5 (0-6) for WC list of parameters.
5–15		Light brown, coarse SAND, some medium Gravel; moist.		0.0	Hand cleared to 5 ft bls.
					Collect soil sample WC-5 (6-12) for WC list of parameters.
10				0.0	
					Collect soil sample WC-5 (12-18) for WC list of parameters.
15–20		Light brown, fine to coarse SAND; moist.		0.0	
					Collect soil sample WC-5 (18-20) for RI list of parameters.
20					End of boring at 20 ft bls.

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SOIL BORING LOG

WELL NO. **WC-6**	LATITUDE **187467.759**	LONGITUDE **1018855.243**		
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**		
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**			
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**	SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/12/19-4/19/19**
LAND SURFACE ELEVATION **37.38(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**		

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5	Dark brown, fine to medium SAND, some Gravel and Clay, some Asphalt and Concrete (FILL); moist.	G	0.0	Collect soil sample WC-6 (0-6) for WC list of parameters.
5–10	Reddish brown, fine to coarse SAND, some Clay, Asphalt, and Concrete (FILL); moist.		0.0	Hand cleared to 5 ft bls. Collect soil sample WC-6 (6-12) for WC list of parameters.
10–15	Light brown, coarse SAND; moist.		0.0	Collect soil sample WC-6 (12-18) for WC list of parameters.
15–20	Light brown, fine to coarse SAND; moist.		0.0	Collect soil sample WC-6 (18-20) for RI list of parameters. End of boring at 20 ft bls.

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SOIL BORING LOG

WELL NO. **WC-7**	LATITUDE **187409.584**	LONGITUDE **1018867.8**
PROJECT NO./NAME **3002.0004Y000 / Chestnut Commons**		LOCATION **110 Dinsmore Place Brooklyn, New York**
APPROVED BY **J. Taylor**	LOGGED BY **L. D'Orsa**	
DRILLING CONTRACTOR/DRILLER **ADT / R. Allegrezza**		GEOGRAPHIC AREA
DRILL BIT DIAMETER/TYPE **2-in. / Drive Sampler**	BOREHOLE DIAMETER **2-inches**	DRILLING EQUIPMENT/METHOD **6620DT / Geoprobe**
SAMPLING METHOD **2" Macro-Core**	START-FINISH DATE **4/11/19-4/19/19**	
LAND SURFACE ELEVATION **38.63(FT.)**	DEPTH TO WATER **Not Measured**	BACKFILL **Soil Cuttings**

Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0-5	Dark brown, fine to medium SAND, some fine to medium Gravel, Clay, Brick, and Asphalt (FILL); moist.	G	0.0	Collect soil sample WC-7 (0-6) for WC list of parameters.
5-10	Light brown, fine to medium SAND, some fine to medium Gravel, Brick, Asphalt, and Concrete (FILL); moist.		0.0	Hand cleared to 5 ft bls. Collect soil sample WC-7 (6-12) for WC list of parameters.
10-15	Light brown, fine to coarse SAND, some fine Gravel; moist.		0.0	Collect soil sample WC-7 (12-18) (in triplicate for MS/MSD) for WC list of parameters.
15-20			0.0	Collect soil sample WC-7 (18-20) for RI list of parameters. End of boring at 20 ft bls.

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SOIL BORING LOG

WELL NO.	LATITUDE	LONGITUDE		
WC-8	187364.366	1018882.067		
PROJECT NO./NAME: 3002.0004Y000 / Chestnut Commons		LOCATION: 110 Dinsmore Place, Brooklyn, New York		
APPROVED BY: J. Taylor	LOGGED BY: L. D'Orsa			
DRILLING CONTRACTOR/DRILLER: ADT / R. Allegrezza		GEOGRAPHIC AREA		
DRILL BIT DIAMETER/TYPE: 2-in. / Drive Sampler	BOREHOLE DIAMETER: 2-inches	DRILLING EQUIPMENT/METHOD: 6620DT / Geoprobe	SAMPLING METHOD: 2" Macro-Core	START-FINISH DATE: 4/12/19-4/19/19
LAND SURFACE ELEVATION: 39.26(FT.)	DEPTH TO WATER: Not Measured	BACKFILL: Soil Cuttings		

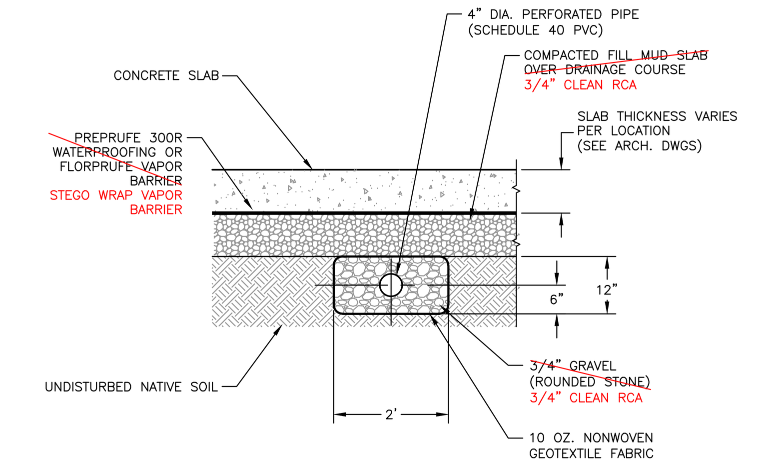
Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
0–5	Dark brown, fine to medium SAND, some Clay, Gravel, Brick, Asphalt, and Concrete (FILL); moist.	G	0.0	Collect soil sample WC-8 (0-6) for WC list of parameters.
5–10	Dark to light brown, fine to coarse SAND, some fine Gravel, Asphalt, Concrete, and Brick (FILL); moist.		0.0	Hand cleared to 5 ft bls. Collect soil sample WC-8 (6-12) for WC list of parameters.
10–15	Light brown, coarse SAND, some fine Gravel, Brick, and Asphalt (FILL); moist.		0.0	Collect soil sample WC-8 (12-18) for WC list of parameters. Collect soil sample DUP041919 for WC list of parameters.
15–20	Light brown, fine to coarse SAND; moist.		0.0	Collect soil sample WC-8 (18-20) for RI list of parameters. End of boring at 20 ft bls.

APPENDIX D

SSDS As-Built and Component Manual

SITE PLAN

SCALE: 1" = 10'

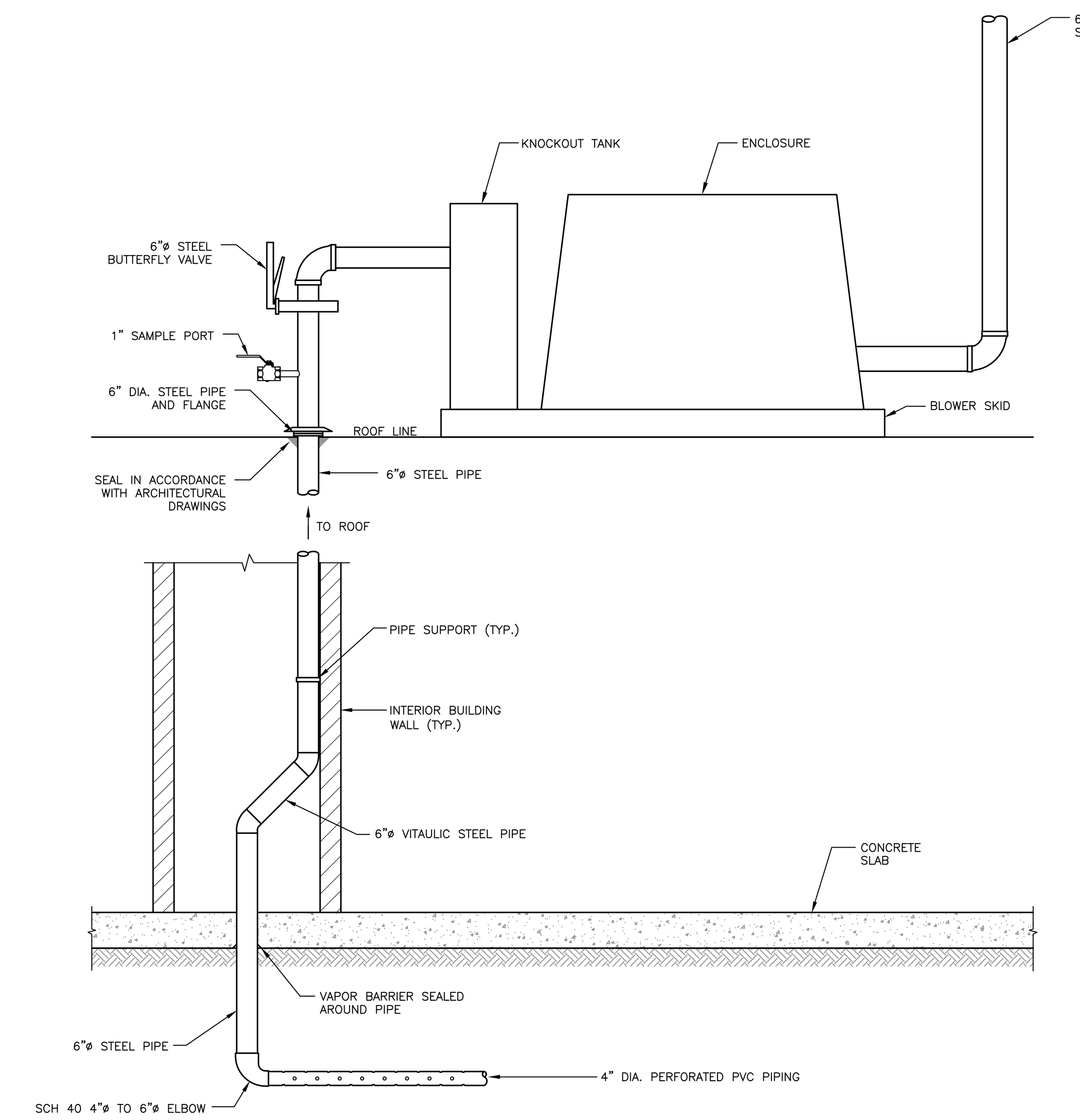


1 SUB-SLAB DEPRESSURIZATION SYSTEM PIPE DETAIL

SCALE: NOT TO SCALE

SUB-SLAB DEPRESSURIZATION SYSTEM NOTES

1. CONTRACTOR SHALL COORDINATE WITH PLUMBING, MECHANICAL, CIVIL AND ELECTRICAL CONTRACTORS FOR ALL UTILITY CROSSINGS.
2. THE PERFORATED PIPE MAY BE ROUTED AROUND OR UNDERNEATH ANY UTILITY LINES (SEWER, WATER, GAS), AS REQUIRED AND AS APPROVED BY THE ENGINEER.
3. THE SURFACES TO BE LINED WITH GEOTEXTILE SHALL BE FREE OF ALL ROCKS, STONES, SHARP OBJECTS OR CONSTRUCTION DEBRIS OF ANY KIND.
4. INSTALL GEOTEXTILE NONWOVEN FABRIC DIRECTLY ON FILL. MATERIAL OVERLAPS SHALL BE A MINIMUM OF 12" THE OVERLAPPED SEAMS WILL BE SEALED WITH TAPE.
5. ALL PENETRATIONS THROUGH THE SLAB ON GRADE (SOG) SHALL BE SEALED USING A SILICONE BASED WATERPROOF SEALANT OR EQUIVALENT.

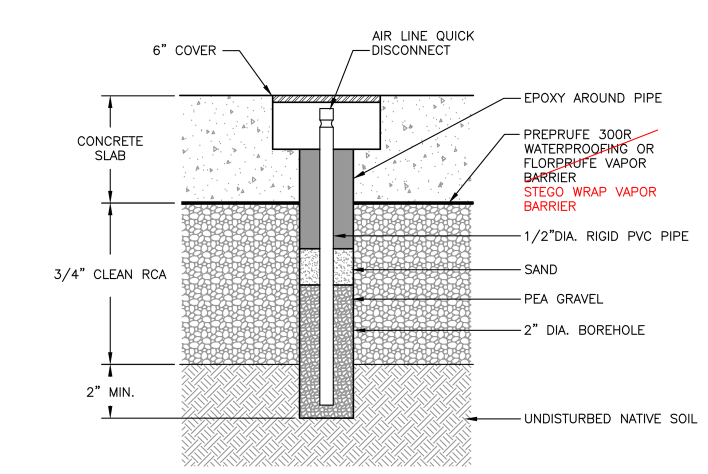


2 BLOWER DETAIL (NOT YET COMPLETED)

SCALE: NOT TO SCALE

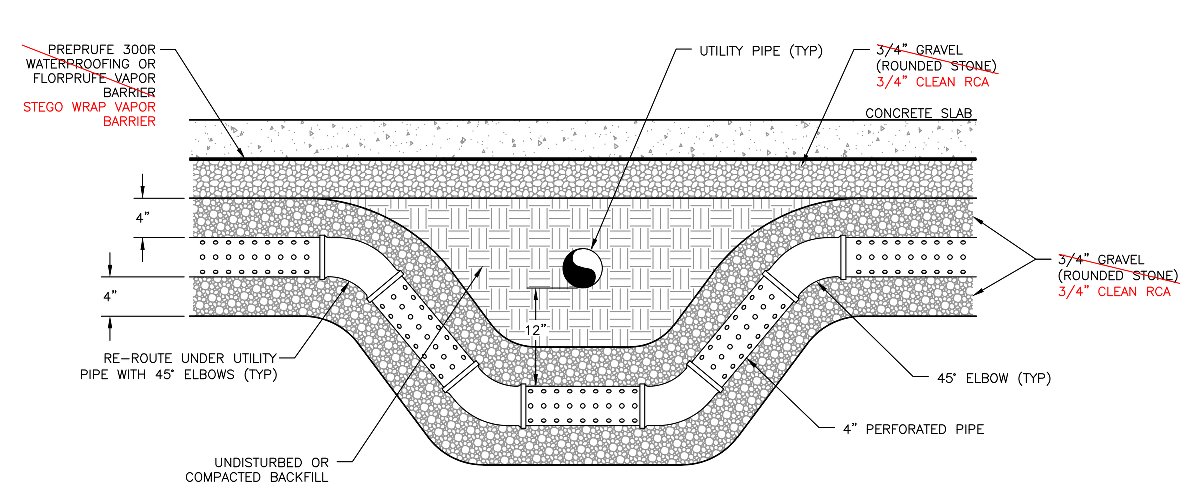
BLOWER DETAIL NOTES

1. **BLOWER INSTALLATION ANTICIPATED TO BE COMPLETED IN SEPTEMBER 2021.**
2. PROVIDE ELECTRICAL/CONTROL CONDUIT TO BLOWER. COORDINATE WITH ELECTRICAL CONTRACTOR.
3. ELECTRICAL CONDUIT SHALL BE SIZED APPROPRIATELY IN ACCORDANCE WITH THE ELECTRICAL DESIGNER.
4. THE BLOWER SHALL BE PROVIDED WITH A NOISE REDUCING ENCLOSURE.
5. THE BLOWER SKID SHALL INCLUDE ENCLOSURE, KNOCKOUT TANK (WITH HIGH LEVEL ALARM), VACUUM RELIEF VALVE, GAUGES, AND INTERCONNECTING PIPING/FITTINGS.
6. PROVIDE ALARM LIGHT INDICATING SYSTEM SHUT DOWN IN MANAGER'S OFFICE. SPECIFIC LOCATION TO BE COORDINATED AND CONFIRMED WITH THE CONTRACTOR AND ROUX ASSOCIATES.
7. TREATMENT OF BLOWER DISCHARGE WITH CARBON WILL BE EVALUATED AT SYSTEM START-UP AND ON A PERIODIC BASIS IF NEEDED.
8. PROVIDE ALL NECESSARY PIPE SUPPORTS.
9. THE BLOWER DISCHARGE SHALL BE A MINIMUM OF 10 FEET FROM HVAC AIR INLETS AND PROPERTY LINE.
10. THE BLOWER SHALL BE A 7.5 HP, AMETEK ROTRON MODEL: ~~DR858AY72W~~ EN858BA72WL OR APPROVED EQUAL.



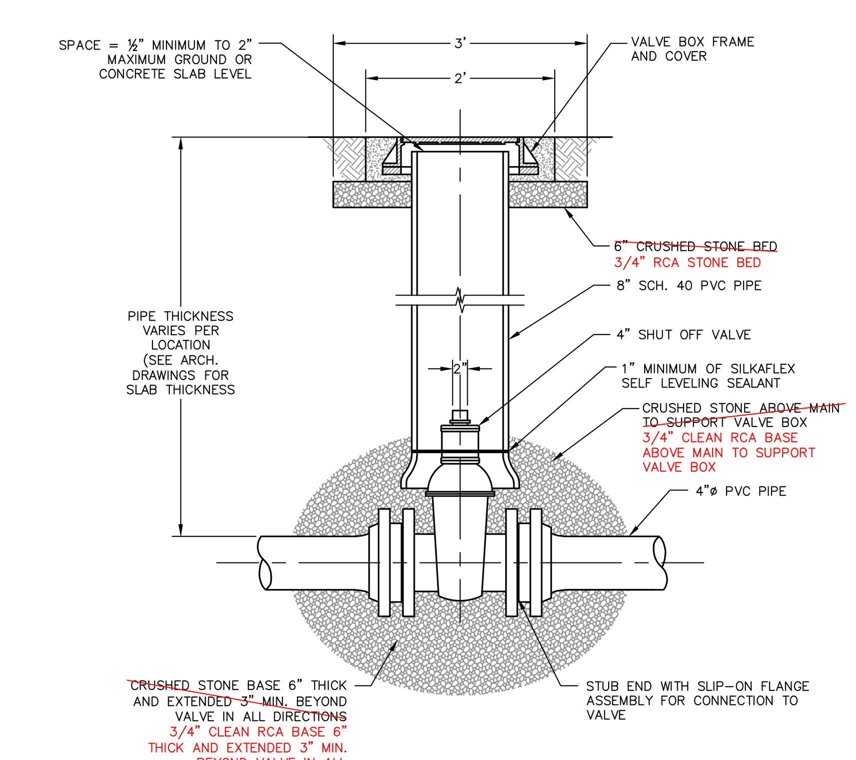
3 SUB-SLAB VAPOR MONITORING POINT DETAIL (NOT YET COMPLETED)

SCALE: 1" = 4"



4 TYPICAL UTILITY PIPE CROSSING

SCALE: NOT TO SCALE



5 TYPICAL UNDERGROUND VALVE DETAIL

SCALE: NOT TO SCALE

NOTE: BLOWER AND RISER INSTALLATION ANTICIPATED TO BE COMPLETED IN SEPTEMBER 2021.

NO.	DATE	REVISION DESCRIPTION	INIT.
1	09MAR20	REVISE SSDS PIPING	D.E.K.

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DESIGNED BY: A.F.	CHECKED BY: B.P.M.
DRAWING SCALE: AS SHOWN	PLOT SCALE: 1:1
DRAWING DATE: 23JUL20	PRINT TYPE: B&W
OFFICE: NY	PAPER SIZE: ARCH D
PROJECT NO.: 3002.0004Y000	
DRAWING FILE: 3002.0004Y133.01.DWG	

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Roux Environmental Engineering and Geology, D.P.C.
209 SHAFTER STREET ISLANDIA NEW YORK 11749
(631) 232-2600

PROJECT NAME:
CHESTNUT COMMONS
BLOCK 4142, LOT 34, BROOKLYN, NEW YORK

PROJECT FOR:
MHANY MANAGEMENT, INC URBAN BUILDERS COLLABORATIVE

TITLE:
AS-BUILT OF SUB-SLAB DEPRESSURIZATION SYSTEM

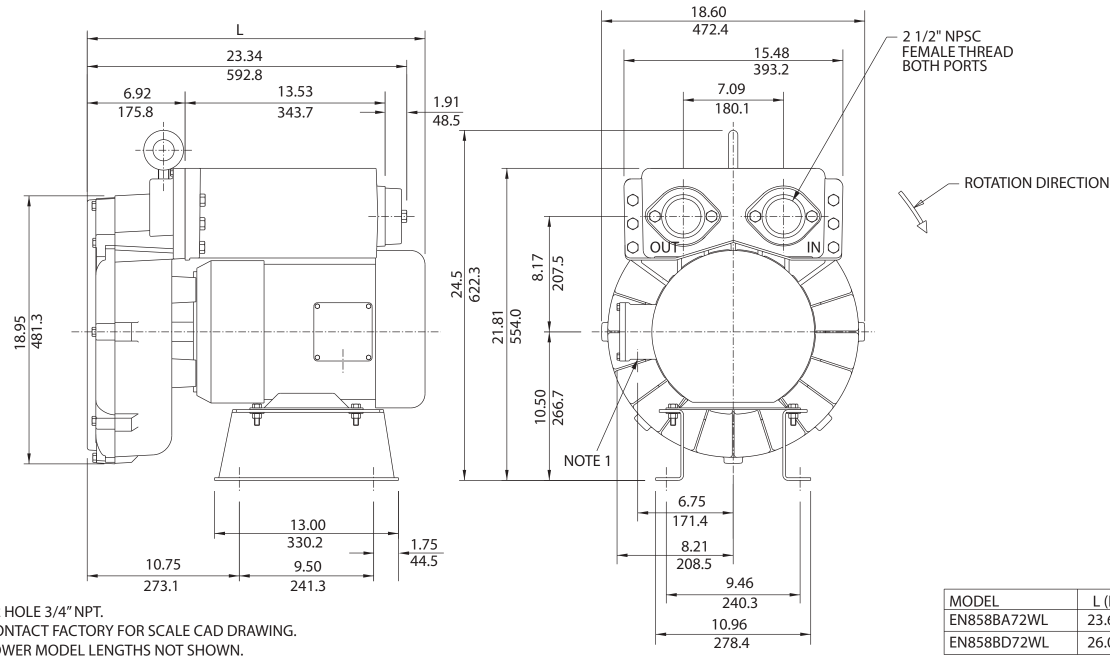
DRAWING NO.
1
DRAWING 1 OF 1

Environmental / Chemical Processing Blowers

ROTRON®

EN 858 & CP 858

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



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

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

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

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

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

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

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

Environmental / Chemical Processing Blowers

EN 858 & CP 858

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

ROTRON®

FEATURES

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

MOTOR OPTIONS

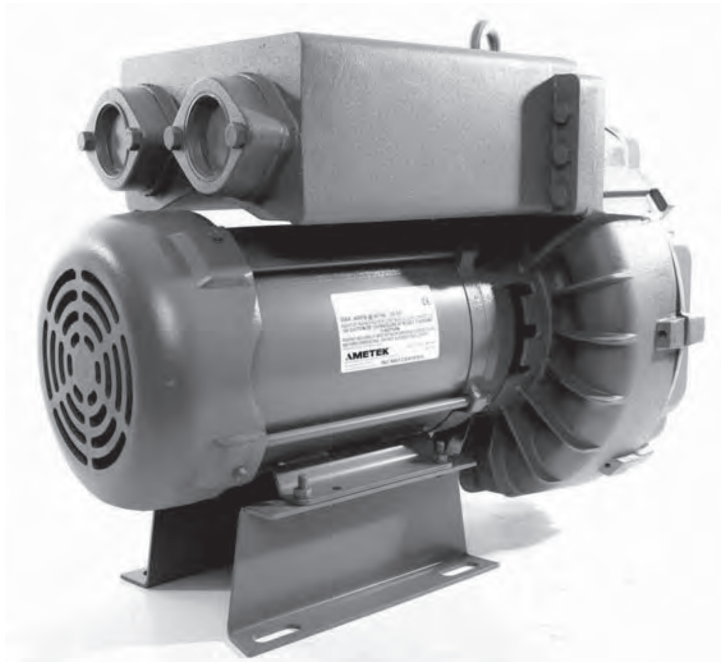
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

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

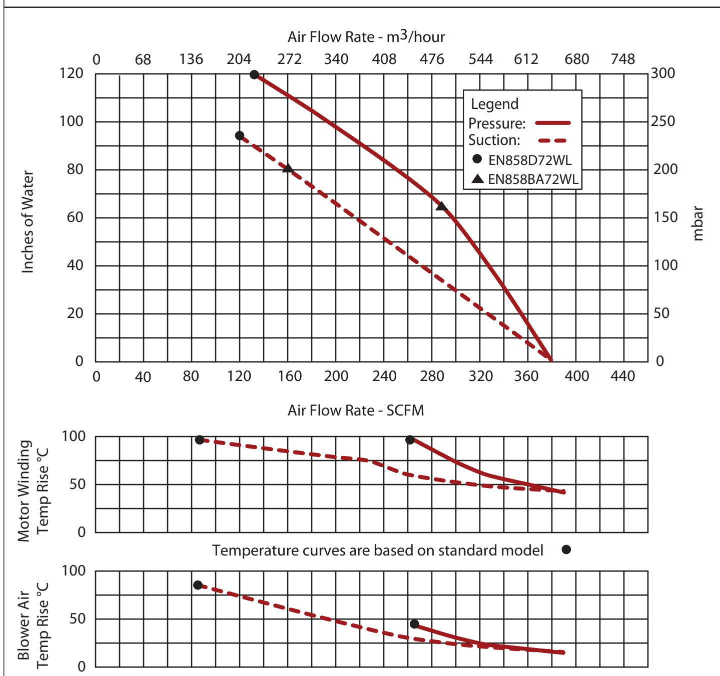
ACCESSORIES

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

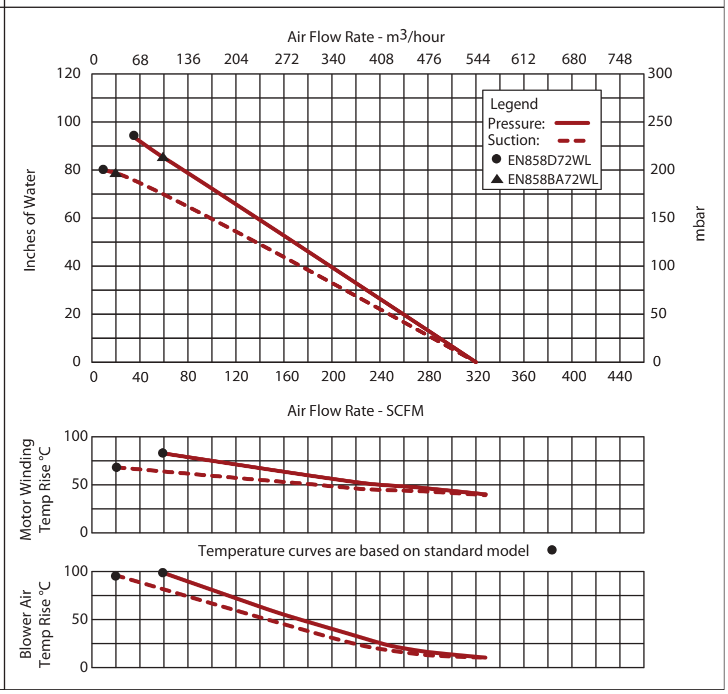


Blower Performance at Standard Conditions

60 Hz



50 Hz

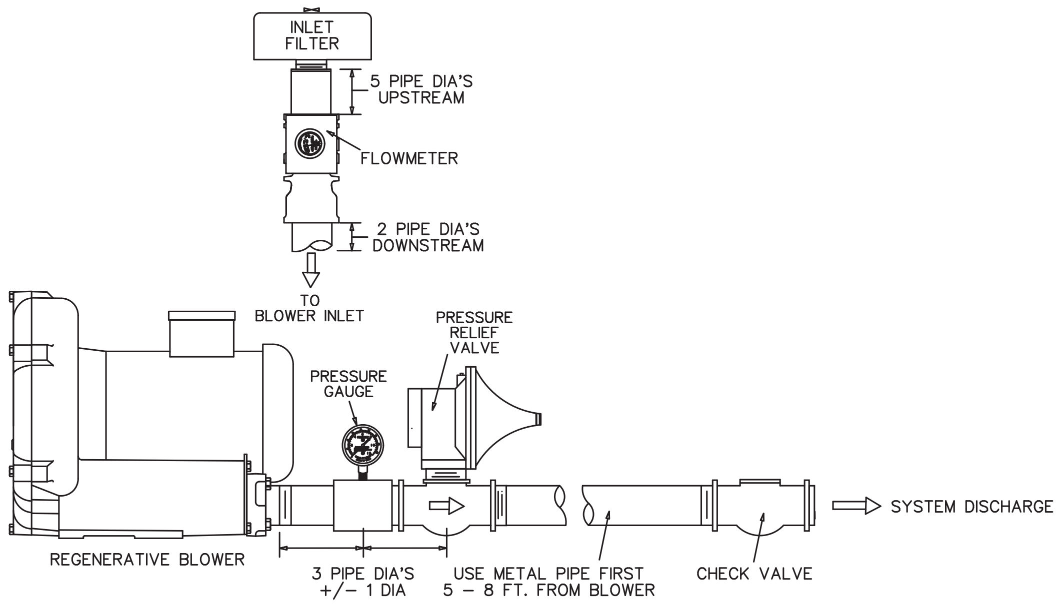


Pressure or vacuum guages should be located in the delivery line, oriented as shown. Assure that the guage is approximately three pipe diameters from the blower delivery flange and that the relief valve is located at the same spacing from the guage. 90° elbows should be located at least five pipe diameters from the blower delivery flange. Elbows, taps, tees, valves, or other restrictions to air flow should not be located between the blower delivery flange and accessories described above.

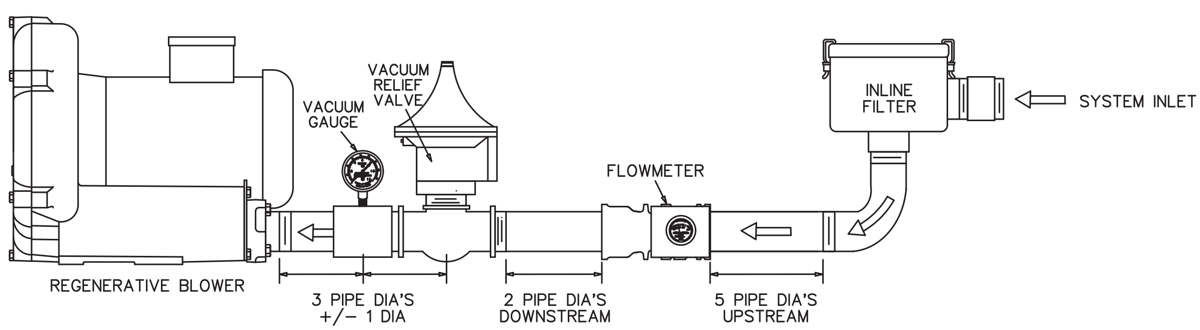
Failure to observe these precautions can result in false readings of guages and failure of the relief mechanism to protect the blower from overload.

In order to avoid overheating or distortion of PVC pipe, the first five to eight feet from the blower delivery flange on pressure systems should be metal.

Typical Pressure System



Typical Vacuum System



ROTRON®

FEATURES

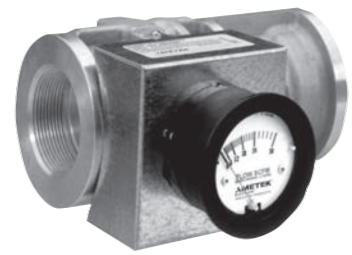
- Direct reading in SCFM
- Low pressure drop (2-4" typical) across the flow meter
- Non-clogging, low impedance air stream
- Light weight aluminum
- No moving parts
- Large easy-to-read dial
- Accurate within 2% at standard conditions
- Good repeatability
- Available in 2", 3" and 4" sizes
- Factory conÿgured for quick installation
- .048" Allen key supplied for gauge adjustment

OPTIONS

- Corrosion-resistant version with Chem-Tough ™ or in stainless steel
- FDA-approved Food Tough™ surface conversion

BENEFITS

- OPTIMIZE SYSTEM EFFICIENCY
  Measuring the correct air ˜ow can assist you in ÿne-tuning to your system’s optimal efficiency.
- BALANCE MULTI-PIPING SYSTEMS
  When evacuating CFM from more than one pipe, di˝erent run lengths or end system impedance can cause one pipe to handle more CFM than the other. With an accurate CFM reading, piping can be balanced by bleeding air in/out or by creating an extra impedance.
- DETECT CHANNELING OR PLUGGING
  For systems in which channeling or plugging can occur, a change in the CFM measured can help indicate the unseen changes in your system.



		Part/Model Number					
		FM20C030Q	FM20C045Q	FM20C065Q	FM20C125Q	FM20C175Q	FM20C225Q
Specification	Units	550599	550600	550601	550602	550603	550604
Flow Rate	CFM	6-30	9-45	13-65	25-125	35-175	45-225
	m3/hr	10-50	15-77	22-111	43-213	60-300	77-383
Threads B	-	2-11.5	2-11.5	2-11.5	2-11.5	2-11.5	2-11.5
Dimension C	Inches	7.18	7.18	7.18	7.18	7.18	7.18
	mm	182.4	182.4	182.4	182.4	182.4	182.4
Dimension D	Inches	7.0	7.0	7.0	5.8	5.8	5.8
	mm	177.8	177.8	177.8	147.3	147.3	147.3
Dimension E	Inches	2.0	2.0	2.0	2.0	2.0	2.0
	mm	50.8	50.8	50.8	50.8	50.8	50.8
Dimension F	Inches	3.75	3.75	3.75	3.75	3.75	3.75
	mm	95.3	95.3	95.3	95.3	95.3	95.3

		Part/Model Number					
		FM30C250Q	FM30C350Q	FM30C475Q	FM40C450Q	FM40C600Q	FM40C850Q
Specification	Units	550605	550606	550607	550608	550609	550610
Flow Rate	CFM	50-250	70-350	95-475	90-450	120-600	170-850
	m3/hr	85-425	119-595	162-808	153-795	204-1020	289-1445
Threads B	-	3-8	3-8	3-8	4-8	4-8	4-8
Dimension C	Inches	7.18	7.18	7.18	7.18	7.18	7.18
	mm	182.4	182.4	182.4	182.4	182.4	182.4
Dimension D	Inches	7.0	7.0	7.0	5.8	5.8	5.8
	mm	177.8	177.8	177.8	147.3	147.3	147.3
Dimension E	Inches	2.0	2.0	2.0	2.0	2.0	2.0
	mm	50.8	50.8	50.8	50.8	50.8	50.8
Dimension F	Inches	3.75	3.75	3.75	3.75	3.75	3.75
	mm	95.3	95.3	95.3	95.3	95.3	95.3

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USA: +1 215-256-6601 - Europe: +49 7703 930909 - Asia: +86 21 5763 1258
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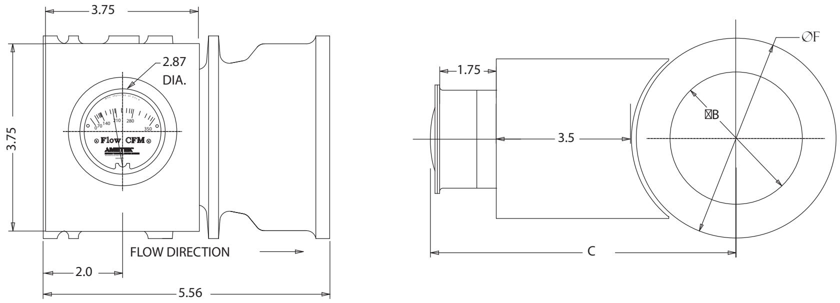
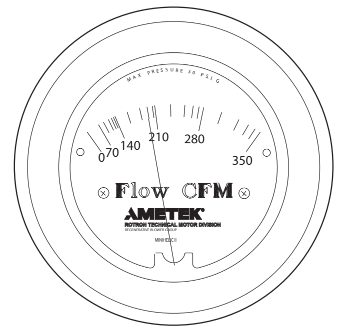
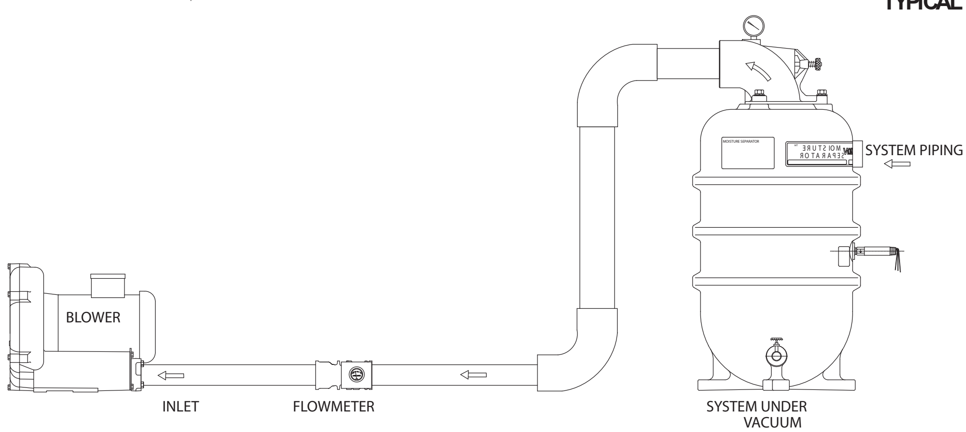
www.ametekdfs.com

TYPICAL FLOW METER ARRANGEMENT





TYPICAL GAUGE FACE



HIGH TEMPERATURE/PRESSURE CORRECTION

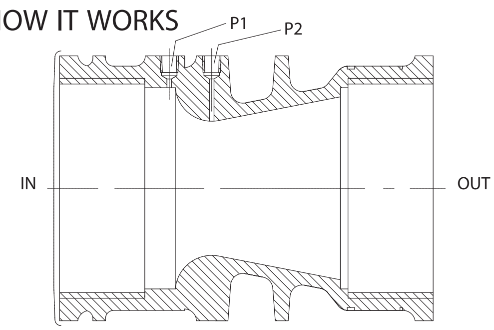
$$SCFM_2 = \frac{SCFM_1}{\sqrt{\left(\frac{14.7}{Pf_2}\right) \times \left(\frac{530}{Tf_2 + 460}\right)}}$$

Pf_2 = Absolute Pressure in

PSIA Tf_2 = Temperature in °F

- Use on inlet to limit need to correct for high pressure or elevated outlet temperature
- Standard model limits = 140°F and 30 PSIG

HOW IT WORKS



ROTRON'S ˜ flow meter is a venturi style design. After air enters the inlet, the pressure is measured in the P1 tap. The second tap, P2, measures the pressure at the throat. The differential between P1 and P2 registers across a special calibrated CFM gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

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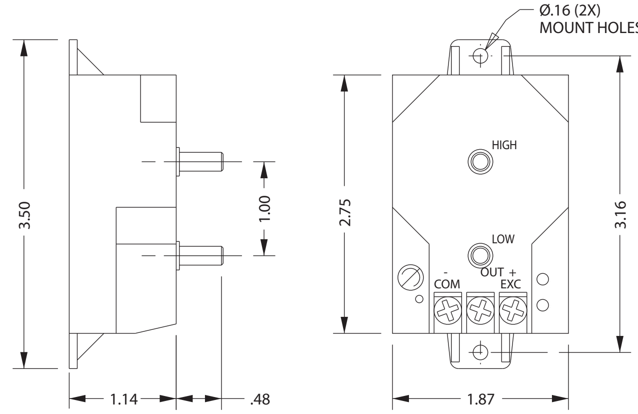
Remote air flow rate monitoring and system automation control can now be achieved through the use of 4-20 mA output signals. Our 4-20 mA analog outputs are proportional to system flow rates and can be used with PLC controlled operations to monitor system performance. Those same outputs provide digital displays for direct readings in SCFM when paired with our LCD Digital Readout option. Combined with our Variable Frequency Drives, you can now achieve a completely automated system capable of adjusting blower performance to meet changing system demands. Maintaining your system at peak performance gives your company the competitive edge needed in today's marketplace.

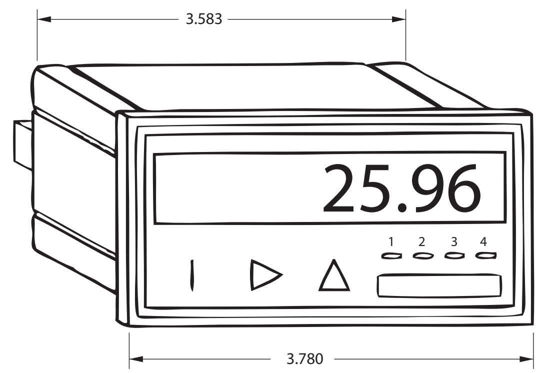
DIFFERENTIAL PRESSURE TRANSMITTER

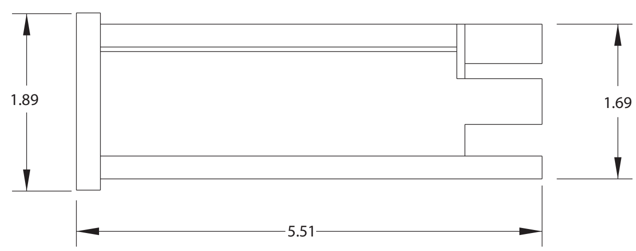
4-20 mA signal output control signals provide flow rate monitoring capabilities from remote locations
NEMA 1R-raintight enclosure orotects the integrated DC power supply and rugged differential pressure transducer
Suitable for remote mounting up to 10' form flow meter
Weight: 3 oz.
Signal Output: 4-20 mA, DC[1]
Hi/Lo pressure fittings feature snap lock action to unsure trouble-free connections[2]
System includes standard flowmeter for on-site readings and troubleshooting
Operating temperature: 0^{O}F to 150^{O}F
Drawing available



LCD DIGITAL READOUT OPTIONS

Factory configured to display direct readings in SCFM to a remote location up to 50' from signal output[1] NEMA 4, IP65 enclosure ready for panel mount instlation power supply and rugged differential pressure transducer
Suitable for remote mounting up to 10' form flow meter installation
Power input: 120 VAC, 50/60Hz AC, Field configurable to 240VAC
Display: 5 digit, 7 segment, .5" high LED w/3.3Hz update rate
Operating temperature: 10^{O}C to 40^{O}C
Weight: 1lb., 14oz.





Drawing available

Note 1: 4-20 mA output control wiring to be customer supplies. Shielded, 2 conductor cables, 22 AWG is recommemeded for runs up to 100'. For longer runs contact factory

Note 2: Use 5/16" OD stiff wall tubing-connect "Lo" on flowmeter to "Lo" on 4-20 mA enclosure, "Hi" on flowmeter to "Hi" on 4-20 mA enclosure. Tubing must be equal in length. (Maximum length is 1o feet)

DIFFERENTIAL PRESSURE TRANSMITTER

FM20S030Q	FM20S045Q	FM20S065Q	FM20S125Q	FM20S175Q	FM20S225Q	FM30S250Q	FM30S350Q	FM30S475Q	FM40S450Q	FM40S600Q	FM40S850Q
550838	550839	550840	550841	550842	550843	550844	550845	550846	550847	550848	550849

LCD DISPLAY

FM20L030Q	FM20L045Q	FM20L065Q	FM20L125Q	FM20L175Q	FM20L225Q	FM30L250Q	FM30L350Q	FM30L475Q	FM40L450Q	FM40L600Q	FM40L850Q
550860	550861	550862	550863	550864	550865	550866	550867	550868	550869	550870	550871

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APPENDIX E

Quality Assurance Project Plan/ Field Sampling Plan

Quality Assurance Project Plan/ Field Sampling Plan

Chestnut Commons
NYSDEC BCP #C244236
3629 Atlantic Avenue
Brooklyn, New York

August 3, 2020

Prepared for:

Chestnut Commons Apartments LLC
334-336 East 110th Street
New York, New York 10029

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

3002.0004Y134/CV

Table of Contents

Tables

Attachment

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Chestnut Commons Apartments LLC, has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measures that will be taken to ensure that the data generated during performance of the Site Management Plan (SMP) for the Chestnut Commons Atlantic Avenue Site (Site), located in Brooklyn, are of quality sufficient to meet project-specific data quality objectives (DQOs). The Site is comprised of Block 4412 Lot 34 of the New York City Tax Map and bounded by Dinsmore Street to the north, South Conduit Avenue to the south, Chestnut Street to the east, and a New York City School Construction Authority (NYCSCA) public school (currently under construction) to the west. This QAPP/FSP also includes field sampling procedures.

Chestnut Commons Apartments LLC is a Volunteer in the Brownfield Cleanup Program (BCP). SMP activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP (Site #C244236). This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guide, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

The Remedial Action (RA) was designed to reduce onsite contamination through excavation and off-site disposal of contaminant source areas. A Conditional Track 1 remedy was achieved for the Site based on the excavation and offsite disposal of soils exceeding NYSDEC Unrestricted Use SCOs (UUSCOs); however, since a short-term engineering control (sub-slab depressurization system [SSDS]) is needed to address soil vapor intrusion, an environmental easement and SMP are required. A Track 1 cleanup can only be achieved if the mitigation system or other required action is no longer needed within 5 years of the date of the Certificate of Completion. In the event that Track 1 unrestricted use is not achieved, including achievement of soil vapor remedial objectives, the remedy will achieve a Track 2 residential cleanup.

1.1 Purpose

The QAPP/FSP describes in detail the quality assurance/quality control (QA/QC) and field sampling methods to be used during soil vapor sampling tasks performed during the SMP phase.

This QAPP/FSP was prepared in accordance with the NYSDEC's DER-10 and provides guidelines and procedures to be followed by field personnel during performance of sampling during the RAWP implementation. Information contained in this QAPP/FSP relates to:

- sampling objectives (Section 2);
- project organization (Section 3);
- sample media, sampling locations, analytical suites, sampling frequencies, and analytical laboratory (Section 4);
- field sampling procedures (Section 5);
- sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- site control procedures and decontamination (Section 7).

2. Sampling Objectives

The objective of the sampling program is designed to meet the DQOs set forth in DER-10. Specifically, analytical parameter selected for each sample, as described in Section 4, is comprehensive, and is intended to meet the objective of analyzing onsite sub-slab soil vapor and indoor air samples to evaluate the potential for vapor intrusion inside of the building currently being developed at the Site. Soil vapor sampling results will be used to determine if conditions at the Site warrant discontinuing the SSDS thus completing the Track 1 remedy chosen for the Site.

Sampling procedures are discussed in Section 5 of this QAPP/FSP. A discussion of the DQOs and quality assurance/quality control is provided in Section 6.

3. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below. Professional profiles for the team are provided in Attachment 1.

Project Principal

Jessica Taylor, P.G. of Roux, will serve as Project Principal. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the investigation.

Remedial Engineer

The Remedial Engineer for this project will be Brian Morrissey, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the RI and future remedial program for the Site. The Remedial Engineer will certify in the Remedial Investigation Report (RIR) that the investigation activities were observed by qualified environmental professionals under her supervision as well as any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RI.

Project Manager

Levi Curnutte of Roux will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

The Field Team Leader is TBD. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

Laboratory analysis will be completed by Eurofins TestAmerica Laboratories of Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory 10391. The Laboratory Project Manager is Melissa Haas. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Project Principal and Project Manager. Relevant laboratory SOPs are provided in Attachment 2.

Quality Assurance Officer

David Kaiser, P.E. of Roux, will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure that the data collection is conducted in accordance with the FSP and QAPP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO reports to the Project Manager and makes independent recommendations to the Field Team Leader.

4. Sample Media, Locations, Analytical Suites, and Frequency

The media to be sampled during the SMP activities include sub-slab vapor and indoor air. A discussion of the sampling schedule is provided below, while the assumed number of field samples to be collected, including quality control (QC) samples, is shown in Tables 1 and 2. Specifics regarding the collection of samples at each location and for each task are provided in Section 5 of this QAPP/FSP.

4.1 Sub-slab Vapor and Indoor Air Sampling

The sub-slab vapor and indoor air samples to be collected are described in detail in the SMP. The proposed samples to be collected and sampling frequency are also summarized in the following table:

Sampling Location	Analytical Parameter	Schedule
Sub-slab Vapor Monitoring Points (2)	**TO-15**	**Quarterly**
Indoor Air (1)	**TO-15**	**Quarterly**

All sub-slab vapor samples will be collected in accordance with the October 2006 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance) and June 2015 USEPA Soil Vapor Guidance. SSDS sub-slab vapor monitoring points were previously installed during building construction and construction details are included on the as-built drawing in Appendix D. The locations of the sub-slab vapor monitoring points and indoor air samples are included on Figure 5 of the SMP. All samples will be analyzed for VOCs using USEPA Method TO-15.

5. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during sub-slab vapor sampling activities during the SMP phase. The sample locations are discussed in the SMP. Additional details regarding sampling procedures and protocols are described in Roux's relevant Standard Operating Procedures (SOPs), which are provided in Attachment 3.

When sub-slab vapor and indoor air samples are collected, the following actions/conditions will be documented to aid in the interpretation of the sampling results:

- Current photographs of the sample locations and surrounding areas;
- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., windows/doors closed) will be reported; and
- Any pertinent observations such as floor stains or odors will be recorded.

5.1 Sub-Slab Vapor Samples

Prior to the collection of the first sub-slab vapor samples collection event using the previously installed SSDS sub-slab vapor monitoring points, the monitoring points will be purged of approximately two volumes using a vacuum pump set at a rate of 0.2 liters per minute. A tracer gas (i.e., helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location in order to test the monitoring point seal and verify that ambient air is not being drawn into the sample in accordance with the procedures outlined in the NYSDOH Guidance. Following purging and verification with the tracer gas, tubing will be used to connect the monitoring point access point to the pre-cleaned (batch-certified) laboratory supplied six-liter summa canister. All soil vapor samples will be collected using the canisters with regulators calibrated to collect samples over an 8-hour period and submitted for laboratory analysis under chain of custody procedures for analysis using USEPA Method TO-15 for VOCs.

5.2 Indoor Air Samples

One indoor air sample will be collected after SSDS start-up and before the building is occupied and then concurrently with the sub-slab vapor sampling to characterize exposures to air within the building. These samples will be collected in summa canisters over an 8-hour interval and analyzed for VOCs using USEPA Method TO-15 for VOCs. These canisters will be placed in a location based on the building cellar floor plan, spaces of high occupancy, and with bias to the areas of the Site with the highest detections of contamination. The sample location will be chosen to provide representative background results based on Site conditions at the time of sampling and placed four to five feet above the ground in the normal breathing zone.

6. Sample Handling and Analysis

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and QA/QC.

6.1 Field Sample Handling

A discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed, can be found in Section 4 of this QAPP/FSP. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 3.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis as described in Roux's SOP for Sample Handling included in Attachment 3.

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

6.3 Sample Shipment

Laboratory analysis will be completed by Eurofins TestAmerica Laboratories of Burlington, Vermont, NYSDOH ELAP-certified laboratory 10391. Sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

- Ensure that all summa canister labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
- Ensure all summa canisters are firmly packed in packaging material.

- Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.
- Separate chain of custody forms. Seal proper copies within a large Ziploc® bag. Retain copies of all forms.
- Secure each box using custody seals.
- Relinquish to overnight delivery service or laboratory courier as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for “NEXT A.M.” delivery).

6.4 Quality Assurance / Quality Control

Joshua Cope of Roux will review the analytical data for QA/QC and prepare the DUSR in accordance with NYSDEC standards. The professional profile for Joshua Cope is provided in Attachment 1.

The primary DQO of the soil vapor and indoor air sampling program, therefore, is that data be accurate and precise, and hence representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples, and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Sampling canisters will be batch-certified clean by the laboratory before use in the field.

Table 1 lists the requirements for field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 2 lists the number/type of field and QA/QC samples that will be collected. Table 3 lists the preservation, holding times and sample container information.

All Method TO-15 analyses for VOCs will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC’s website (http://www.dec.ny.gov/chemical/62440.html). A Data Usability Report will be prepared meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated for the RI.

7. Site Control Procedures

Site control procedures, including decontamination and waste handling and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the Site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP). The HASP is included as Appendix I to the RIR/RAWP.

7.1 Decontamination

In an attempt to avoid the spread of contamination, all sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. The laboratory will supply pre-cleaned (batch-certified) laboratory supplied six-liter summa canister for sampling. Althought not anticipated, detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs for the Decontamination of Field Equipment located in Attachment 3.

7.2 Waste Handling and Disposal

Contaminated waste is not anticipated to be generated during sub-slab vapor and indoor air sampling activities. Sampling canisters used during sampling will be returned to the laboratory.

TABLES

1. Field and Laboratory QC Summary
2. Site Management Plan Sampling Summary
3. Preservation, Holding Times, and Sample Containers

Table 1. Field and Laboratory QC Summary

QC Check Type	Minimum Frequency	Use
Field QC		
Duplicate	1 per matrix per 20 samples or SDG*	Precision
Laboratory QC		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

Notes:

* SDG - Sample Delivery Group - Assumes a single extraction or preparation

Table 2. Site Management Plan Sampling Summary

Sample Medium	Target Analytes	Maximum No. of Field Samples	Duplicates[1]	Maximum No. of Samples
Sub-slab Vapor and Indoor Air Samples	TO-15 VOCs	60	20	80

Totals are estimated based on scope of work as written; two sub-slab vapor samples per quarter for up to five years, one indoor air sample performed during the first year of operation, and one indoor air sample per quarter for up to four years thereafter.

[1] Based on 1 per 20 samples or 1 per Sample Delivery Group (3 days max)

VOCs - Volatile Organic Compounds

Table 3. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation	Holding Time
TO-15	Air	6 liter Summa Canister	None	14 days from date of sample collection

ATTACHMENTS

1. Professional Profiles
2. NYSDEC PFAS Guidance
3. Roux 's Standard Operating Procedures

ATTACHMENT 1

Professional Profiles

ROUX

PROFESSIONAL PROFILE

Jessica L. Taylor, P.G.
Principal Hydrogeologist

TECHNICAL SPECIALTIES

Project Management and Field Management for large-scale soil excavation and remediation projects, including site assessment, remediation implementation, and construction activities. Coordination and management of large-scale demolition and renovation support. Performance of sampling and direction of field sampling teams for the following media: soil, groundwater, surface water, soil vapor, sludge, and sediment. Excavation sampling and oversight and waste tracking.

EXPERIENCE SUMMARY

Fourteen years of experience: Senior, Project and Staff Hydrogeologist, Roux Environmental Engineering and Geology, D.P.C., Islandia, New York; Staff Hydrogeologist and Intern at GSC|Kleinfelder.

CREDENTIALS

B.S. Geology, Binghamton University, 2005
Professional Geologist, New York, 2017
OSHA 40-Hour HAZWOPER Training, 2005
OSHA 10-Hour Construction Safety Training, 2008
NJDEP UST Subsurface Evaluator Certification, 2009

KEY PROJECTS

- Senior Project Manager for a large ongoing redevelopment project in Brooklyn, New York. Project includes coordination and oversight of *in situ* waste characterization sampling, excavation, and proper disposal of soil. Coordination of pre-demolition asbestos and hazardous materials surveys. Construction management and support for excavation of 600,000 tons of soil; environmental support for demolition and relocating of an active nine-acre 100-year old rail yard. Responsible for implementing and managing remediation work at several NYSDEC spill sites within the project footprint, including *in situ* chemical oxidation, UST removal, and soil excavation. Agency support for NYSDEC, NYCDEP, NYCOER, MTA (LIRR/NYCT), and ESDC. The project will encompass 336,000 square feet of office space, 6.4 million square feet of residential space, an 18,000 seat sports and entertainment venue – the Barclays Center (home of the Nets professional basketball team) – 247,000 square feet of retail space, a 165,000 square-foot hotel, and over 8 acres of intricately designed publicly accessible open space.

- Senior Project Manager for two parcels in Queens as part of NYSDEC Brownfield Cleanup Program. This project included due-diligence environmental assessment and investigation, development of NYSDEC-approved Remedial Investigation Work Plans, and future remediation during construction of two mixed-use, affordable housing developments. Also required coordination with NYCHPD and NYCDEP to meet regulatory requirements for funding.

- Senior Project Manager for the environmental management of asbestos remediation during the renovation of Nassau Coliseum. Responsible for coordinating inspections and delineation of ACM, preparing budgetary estimates, and bid support for full abatement. Also includes management of decommissioning and replacement of existing emergency generator UST.

- Project Manager for redevelopment of four properties in Brooklyn, with NYCOER to address NYCDEP "E" designations. Coordination with NYCOER to implement remedial investigation and develop RAP as part of the NYC VCP.

- Project Manager for commercial redevelopment site in the Bronx, including *in situ* waste characterization, management and coordination of excavation, community air monitoring, and development of NYCDEP-approved RAP.

- Project Manager for petroleum spill closure at active retail gasoline service station in Brooklyn, NY. Included remedial investigation and coordination with NYSDEC for spill closure.

- Project Manager for design, implementation, and reporting of *in situ* waste characterization for the largest retail developer in the world as part of new construction at a premier shopping center on Long Island.

- Client liaison and full-time onsite construction manager at redevelopment site in Rego Park, New York. Collection of 500 *in situ* waste characterization soil samples, oversight of 250,000 cubic yards of soil excavation and remediation, development of post-remediation sampling plan, organization of waste manifests and hazardous waste documents to ensure proper disposal. Coordination of daily site activities with multiple construction contractors and other involved parties on behalf of client. Oversight and confirmatory soil sampling for on-site treatment of 75,000 cubic yards of hazardous lead contaminated soil.

- Field Manager for *in situ* soil characterization as part of RAP implementation for a one-acre brownfield site containing chlorinated solvents, heavy metals and petroleum compounds in soil, soil vapor and groundwater over one city block in Manhattan, New York. This project is part of the NYSDEC BCP.

- Project and Field Manager for multiple Phase I and Phase II ESAs of retail gasoline stations in New York and New Jersey. This includes drilling and sampling oversight and health and safety management, as well as writing Phase II ESA reports for over 40 sites.

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ROUX

PROFESSIONAL PROFILE

Brian P. Morrissey, P.E., BCEE
Principal Engineer

TECHNICAL SPECIALTIES

Development, design and implementation of soil and groundwater remediation systems.

Optimization of ongoing remedial operations.

Cold eye design review and evaluation of process safety.

Management, support, and oversight of large inter-disciplinary teams for site remediation.

Preparation of feasibility studies, engineer's reports, design drawings, specifications, contract documents, permit applications, cost estimates, operations and maintenance plans and construction management for the following:

- Industrial and sanitary wastewater treatment systems
- *In situ* groundwater remedial technologies
- Sub-slab depressurization systems
- Floating product recovery systems
- Ground water pumping and treatment facilities
- Water supply, treatment, and distribution
- Underground storage tank (UST) systems
- Containment systems
- Air sparging, soil vapor extraction and vapor collection and treatment systems
- Building decontamination and decommissioning
- Landfill cap design and permitting
- Hazardous waste soils removal, transportation, and disposal

EXPERIENCE SUMMARY

More than 30 years of experience working in many areas of the environmental industry under a variety of regulatory programs such as Federal and State Superfund, SPDES, SEQRA, New Jersey ECRA/ISRA, NYSDEC Voluntary Cleanup, Petroleum and Chemical Bulk Storage, and NYC Brownfields.

Principal Engineer and Office Manager at Roux; Senior Engineer and Senior Project Manager at ERM

CREDENTIALS

B.E., Civil Engineering, Cooper Union, 1980

M.S., Civil and Environmental Engineering, NYU Tandon School of Engineering (former Polytechnic), 1985

Professional Engineer: New York (1986), New Jersey (2003), and Virginia (2010)

OSHA 40-hour Health and Safety Training

ExxonMobil Loss Prevention System certified

NYCOER Gold Certified Professional

Board Certified Environmental Engineer (BCEE) of the American Academy of Environmental Engineers and Scientists (AAEES) - Specialty Certification in Hazardous Waste Management, 1995

PROFESSIONAL AFFILIATIONS

Water Environment Federation

KEY PROJECTS

- Project Manager for the design of wastewater treatment plant (WWTP) upgrades at three (3) separate facilities under the program to protect New York City's watershed. The work included preparing conceptual upgrade plans, facility plans, detailed cost estimates, design drawings and specifications, startup plans, O&M plans, and oversight of construction. Design at one facility included replacement of secondary treatment components and the addition of recirculating sand filters, microfiltration units, emergency generator and telemetry systems.
- Principal Engineer and P.E. of Record for the design and construction of a storm drainage and sanitary sewer project located adjacent to a former petroleum terminal in Brooklyn, New York. Worked on several design modifications to obtain NYCDEP approvals. Work included construction of 1,600 linear feet of RCP storm sewer and 1,000 feet of ductile iron sanitary sewer. Construction required vibration monitoring during sheeting and operation and maintenance of a temporary dewatering treatment system.
- Project Engineer for environmental audits at more than 20 commercial and manufacturing facilities to evaluate compliance with federal, state, and local air, wastewater, and hazardous waste regulations. Audits addressed regulatory areas including RCRA, SARA, CWA, CAA, TSCA, and OSHA.
- Principal Engineer for conducting detailed evaluation of problematic groundwater treatment system in Rensselaer, New York. Primary constituents of concern include heavy metals, chlorinated solvents, and BTEX compounds. Developed performance testing program, diagnosed causes of problems and presented several recommendations for upgrading systems and improving personnel health and safety. Prepared engineering report with key recommendations that included modifying equipment layout, injecting iron deposition and calcium scale control agents into water stream, and upgrading the system instrumentation and controls.
- Principal Engineer and Project Manager for the remediation and monitoring of over 100 vehicle fueling sites in New York City with UST petroleum releases. The remediation systems at the various sites include multi-phase extraction, soil vapor extraction, air sparging, groundwater recovery and treatment, and product-only recovery systems. Priorities on this multi-year contract included expediting remedial progress, increasing the effectiveness of operating systems, achieving NFA status, and reducing NYC's overall program costs. Work included conducting soil vapor studies at 9 sites to assess vapor intrusion concerns. Also implemented *in situ* injections at 14 sites to cost-effectively achieve site closure. The *in situ* injections used chemical oxidation and bioremediation products including sodium percarbonate, oxygen generating compounds, hydrogen peroxide, petroleum-degrading bacteria, and nutrient/enzyme complexes.

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- Senior Manager for remedial design and construction oversight at federal Superfund site in Elmira, New York. The 33-acre site included several areas of concern where soil/groundwater were contaminated by several types of hazardous wastes. Managed preparation of design submittals to EPA Region II in accordance with CERCLA guidelines. The soil-sediment remediation design included requirements for materials handling, dewatering and disposal. PCB wastes were segregated and disposed of at TSCA-permitted facility. The design required stabilization of wastes and installation of a RCRA cap. Groundwater remediation system includes 12 recovery wells, filtration and two air strippers.
- Project Manager for upgrading industrial process wastewater treatment system at medical products manufacturing facility in Hancock, New York. The upgraded system removes VOCs and metals, including lead, zinc, and copper, from highly variable waste streams generated by the manufacture of surgical instruments. Prepared design documents for automated system that allows for expected future increase in plant manufacturing capabilities.
- Principal Engineer for design upgrades and expansion of the groundwater depression and separate phase product recovery systems at former petroleum refinery in Brooklyn, NY. Site encompasses one of the nation's largest petroleum releases (18 million gallons). Key components included installation of 10 remote dual-pump free-phase product recovery wells, and modifications to groundwater treatment facilities to optimize performance and system runtime. Redesigned building with new mezzanine and equipment layout to improve flow of the process treatment train.
- Senior Manager for remediation of industrial airport site in Millville, New Jersey under ECRA/ISRA programs. Managed planning, detailed design and permitting activities required to replace 1,000-gpm public supply well impacted by chlorinated solvent plume. Also managed final design of the 200-gpm groundwater recovery, treatment and recharge system that includes ultraviolet light/hydrogen peroxide system controlled by PLCs. This project won the annual Honor Award granted by AAEES.
- Design Manager for evaluation and upgrade of industrial wastewater treatment system for golf shaft manufacturer in Connecticut in accordance with CT DEEP requirements. Options evaluated included assessment of source reduction opportunities, flow segregation, and additional treatment equipment. Inspected the construction and coordinated start-up and testing of the upgraded system which included new tanks, piping, chemical metering pumps, mixers, a continuous flow sludge thickener; and enhanced instrumentation and controls.
- Project Manager for the planning and design of irrigation system using treated wastewater in the Catskills area. Conducted study on acceptable uses of wastewater treated by tertiary methods in accordance with federal and New York State guidance.
- Project Manager for evaluation of wellhead treatment alternative for 1,100-gpm public water supply well in Mineola, NY. Conducted well efficiency tests and investigated existing conditions and future requirements. Prepared design of activated carbon treatment system including building modifications and requirements for well development and replacement of the well pump and controls.
- Design Manager for groundwater recovery and treatment system at a former manufactured gas plant (MGP) in Atlantic Highlands, New Jersey. Developed specification to implement directional drilling under state highway to expand recovery system to capture off-site contamination. System design included PLC-based control software that significantly reduced on-site staffing needs. Also managed construction phase, negotiated/reduced change orders and worked with subcontractors to meet tight regulatory schedule for system start-up. System removes cyanide, metals, VOCs, and free-phase product.
- Senior Engineer for preparing and certifying Spill Prevention Control and Countermeasure (SPCC) Plans for 25 U.S. Postal Service facilities.
- Principal Engineer for the design of modifications to an active sub-slab depressurization system (SSDS) to mitigate chlorinated solvent soil vapor contamination beneath an existing occupied shopping mall in the Bronx, New York. Worked on the coordination and troubleshooting of construction issues. Managed the system testing and start-up and provided recommendations to improve system operation.
- Project Manager for planning, permitting, design and construction oversight of 12,000-foot sewer system for the collection of sanitary and industrial wastewater in Melville, New York. Sewer design included route selection, sizing of gravity sewers, provisions for utility crossings, solar-powered flow meters, grease interceptor, pump station for one branch line, and proper abandonment of leaching facilities. Project included design of two 20,000-gallon underground storage tanks and a tanker truck fill area with secondary containment. Final phase of the project implemented an industrial waste pretreatment system utilizing pH adjustment, filtration, and a bioreactor tank. This project provided a safe and reliable wastewater disposal system and eliminated a costly 40,000-gallon per day hold and haul system.
- Principal Engineer for development of innovative approach for remediation and reuse of federal Superfund site in Plaistow, New Hampshire. Prepared cost estimates for approaches aimed at reducing project costs by utilizing alternate treatment technologies and maximizing efficiency of existing system. Phased approach for site includes hot spot soil removal, enhancements of existing remedial system, implementing air sparging with SVE and follow with polishing step of in situ bioremediation. This alternative plan will achieve environmental restoration of site and is tailored to anticipated re-development of land.

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Levi Curnutte
Project Scientist

Technical Specialties:
Project Management and Field Management of Phase II environmental site assessments/investigations, remedial implementations, and soil excavation/redevelopment projects. New York State Brownfields Cleanup Program (BCP); New York City Office of Environmental Remediation (NYCOER) E-Designation and Voluntary Cleanup Programs; New York State Spills Program. Additional technical skills include waterproofing, vapor barrier, sub-slab depressurization system (SSDS) installation inspections along with soil, groundwater, and soil vapor sampling.

Experience Summary:
Four years' experience; Project and Staff Scientist at Roux Environmental Engineering and Geology, D.P.C., Islandia, NY.

Credentials:
B.S. Marine Science, Coastal Carolina University, 2011
M.S. Environmental Studies, College of Charleston, 2013
OSHA 40-hour HAZWOPER Training
OSHA 10-hour Construction Safety Training
NYCOER Gold Certified Professional
ExxonMobil Loss Prevention System-certified
MTA LIRR Roadway Worker Protection Training

Publications:
Climate Change and Bemisia tabaci (Hemiptera: Aleyrodidae): Impacts of Temperature and Carbon Dioxide on Life History. Curnutte, L., Simmons, A. M., and S. Abd-Rabou. Ann. Ent. Soc. Amer. 107(5): 933-943. 2014.

Key Projects:
- Project Manager providing support for all soil and groundwater disturbances during development of Cornell NYCTech campus located on Roosevelt Island, NY, NY. Management tasks include Agency support for NYCDEP and NYSDEC, community action monitoring plan (CAMP), soil characterization for reuse and disposal, SWPPP implementation, UST removal following NYSDEC regulations, asbestos abatement coordination, and preparation of a NYCDEP Remedial Closure Report.
- Project Manager for former Manufactured Gas Plant (MGP) site in Brooklyn, New York. Under NYSDEC regulation, responsibilities include coordination of monitoring of recovery wells known to be former and current producers of coal tar (DNAPL) and DNAPL recovery and disposal.
- Project Manager for an 85-acre commercial site, Staten Island Mall, within the NYCOER Voluntary Cleanup Program (VCP) undergoing a 500K sq. ft. mall expansion. Project involved the construction an adjacent building to the existing mall and a new above grade parking structure. Manager for remedial action work plan implementation and production of multiple Remedial Action Reports leading to one NYCOER Notice of Satisfaction for the client to date.
- Field Investigation Manager for previously abandoned oil-water separator delineating residual contamination at a NYSDEC-regulated 175-acre former petroleum refinery and terminal in Brooklyn, New York. Responsibilities included the oversight of all field tasks, site management, property owner and tenant coordination, and investigation report.
- Project Manager and Field Manager for the largest ongoing redevelopment project in New York City, including the relocation of a nine-acre 100-year old active rail yard. Project includes management of sites with NYCDEP "E" designation and the implementation of *in situ* soil characterization sampling, soil disposal, and NYSDEC spill remediation at multiple sites within project footprint. Achieved an NYCOER Notice of Satisfaction for one property within the OER VCP. The project will encompass 336,000 sq. ft. of office space, 6.4 million sq. ft. of residential space, an 18,000 seat sports and entertainment venue - the Barclays Center (home of the Nets professional basketball team) - 247,000 sq. ft. of retail space, a 165,000 square-foot hotel, and over 8 acres of intricately designed publicly accessible open space.
- Field Manager at 149 Kent Avenue, a NYSDEC BCP Site, implementing a RAWP requiring extensive remediation of chlorinated VOC-impacted soil and groundwater to accommodate development of a mix-used building and underground parking garage. Primary contaminants of concern were PCE and TCE. Project responsibilities include a 12-month oversight period involving zero-valent iron injections (ZVI) for a permeable reactive barrier (PRB), installation of sub-slab depressurization system (SSDS), Grace® waterproofing inspections, groundwater monitoring/sampling, CAMP, coordination and tracking of hazardous and non-hazardous waste, and providing contractor work zone health and safety recommendations/oversight in accordance with OSHA guidance. Involved in submissions of the Periodic, Annual, and Final Engineering Reports submitted to NYSDEC leading to Certificate of Completion. Project received the NYC Brownfield Partnership's 2017 Big Apple Brownfield Award for Innovation.
- Field Manager of subset of field operations for a large scale, high profile investigation of 500 residential and sensitive-use properties located throughout Los Angeles County. As a result of lengthy aerial depositions of emissions originating from a former battery recycling facility in Vernon, CA, soil was analyzed *in-situ* for lead contamination on a real-time basis through the use of X-ray fluorescence (XRF) instruments. Helped coordinate and perform the rapid assessment of soils by multiple teams while under heavy scrutiny by the press, regulators, and home owners.

David E. Kaiser, P.E.
Senior Engineer

TECHNICAL SPECIALTIES
Engineering services including development and review of design drawings, implementation of design, development of technical specifications, review of construction submittals, development of SWPPPs, field management and site safety of various heavy construction projects, and civil/remediation engineering construction management. Designs have included stormwater drainage systems, NYCDEP sewer system, NYCDOB/DOT sidewalk project, and remedial system design. Additional services including budget management, permitting, project coordination, project scheduling, development of bid packages and cost estimating.

Field management and construction oversight of heavy equipment construction including sewer construction, drainage construction, crane lift activities and remedial construction activities. Environmental site assessments focusing on soil, soil vapor, groundwater and excavation dewatering investigations.

EXPERIENCE SUMMARY
Twelve years of experience: Project Engineer with Roux Environmental Engineering & Geology, D.P.C.; Design Engineer with Bohler Engineering.

CREDENTIALS
B.E. Civil Engineering, Hofstra University, 2006
Fundamentals of Engineering E.I.T. Certification, 2006
Professional Engineer (NY), 2017
OSHA 40-Hour HAZWOPER Training, 2008
OSHA 30-Hour Construction Safety Training, 2011
OSHA 10-Hour Construction Safety Training, 2018
OSHA 8-Hour Hazardous Waste Refresher Training, 2017
LPS 8-Hour Training Certification, 2008
First Aid and CPR Certified, 2016
DOT Hazardous Materials Awareness Training, 2017
NYSDEC Erosion and Sediment Control Training, 2016
Transportation Worker Identification Credential (TWIC)

KEY PROJECTS
- Land Development Site Plan Preparation – Design Engineer for the design and development of residential, commercial and industrial site plan packages for Suffolk County, Nassau County and New York City Boroughs. Site plan packages for the various municipalities within Suffolk County, Nassau County and New York City included components such as: zoning analysis, site removals plan, site design and construction documents, water and sewer system design (detention and retention systems), site grading and drainage plans, and lighting analysis and design.
- Suffolk County Drywell Closure – Senior Engineer for the planning and coordination of closing existing drywell structures serving as sanitary and industrial retention basins for an industrial facility. The project consisted of developing a sampling plan for the site, coordinating sampling and inspection of existing sanitary and industrial drywells in accordance with Suffolk County Department of Health Services Article 12, SOP No. 9-95 Pumpout and Soil Cleanup Criteria. Following the sampling event, a summary of results was prepared and sent to the SCDHS for review. Due to exceedances that were present within the septic tanks, a remedial action work plan was developed to identify the required steps for successful closure which included coordinating the SCDHS field inspection, extraction of contaminated liquids and solids, and proper disposal of the waste.
- Property Drainage System Design and Construction – Project Engineer for the design and development of a new on-site stormwater treatment system located at a former petroleum terminal in Brooklyn, NY. Design included drainage improvements and modifications for the former petroleum terminal to support ongoing remediation activities that were being conducted to facilitate the future closure of an existing in-ground oil/water separator and removal of associated piping, and to support the anticipated long-term remedy for, and potential future redevelopment of, the subject property. The proposed drainage modifications included the installation of new drainage structures, Contech treatment structures and conveyance piping to collect and treat stormwater runoff within the property, and bypass the existing in-ground oil/water separator, prior to discharging the stormwater via an existing SPDES outfall.
- Oil/Water Separator Closure – Project Engineer for engineering support and review for the closure of an existing in-ground oil/water separator at a former petroleum terminal in Brooklyn, NY. The closure and abandonment of the oil/water separator was deemed the long-term remedy as approved by the NYSDEC. The oil/water separator was originally constructed in the early 1900s and has served the property by providing stormwater runoff treatment. The closure project includes the following tasks: dewatering and treatment of separator water; excavation of existing sludge in separator; dewatering and drying/stabilization of the sludge removed; power washing of interior; backfill and compaction of clean fill inside separator; removal of all existing above grade structures including catwalks, guardrails and piping; proper shipping and disposal of sludge contents; installation of a final cover system consisting of a geosynthetic clay liner (GCL) and filter fabric barrier; and final site grading.
- Utility Tunnel Extension – Project Engineer for construction management of a utility tunnel extension and modification project. The project consisted of installation of a precast concrete stairway access to an existing utility tunnel, installation of a structural slab to span the tunnel extension, installation of a new base slab, installation of cast-in-place concrete walls and top slab, installation of sidewalks and relocation of all existing system piping and conduits. The work was performed in accordance with the requirements of the New York City Department of Buildings (NYCDOB) and the New York City Department of Transportation (NYCDOT).

- Treatment System Building Upgrades – Project Engineer for the review and implementation of engineering drawings for a metals removal system upgrade to an existing 450-gpm groundwater treatment system. The upgrades consisted of: relocating and reinstalling the existing oil/water separator tank on a steel spacer via crane; lifting and installing the existing 10,000 gallon equalization tank to be repurposed as a filter backwash solids removal tank; lifting and installing prefabricated concrete pads with a subbase of Geogrid BX1200 and 6" of aggregate size number 57 (as per NYCDDC Highway Specifications and ASTM C33) compacted to 95% Standard Proctor, under proposed tank locations; locating a new 20,000 gallon equalization/aeration tank on the new pad; installing of new blower motor and enclosure; and installing of new piping and appurtenances.
- Recovery Well Construction – Staff Engineer for the construction of aspects of a dual-phase free-phase petroleum product (free-product) and groundwater recovery well at a former petroleum terminal in Brooklyn, NY. Groundwater extracted from the recovery well would be conveyed through 4-inch diameter high density polyethylene standard dimension ratio 11 (HDPE SDR 11) piping and connected to an existing 6-inch HPDE SDR 11 force main piping network that transports the groundwater to an existing on-site groundwater treatment system. Any free-product recovered would be sent to an existing 2,000 gallon above ground storage tank (AST) via 1-inch double wall product piping. Electrical and signal conduits were routed to an existing well house where the system control components were housed.
- Treatment System Building Roof Rehabilitation and Platform Installation – Project/Staff Engineer for providing engineering design, review and construction management of the rehabilitation of a roof and installation of an internal platform in an existing remediation groundwater treatment system building located at a former petroleum terminal in Brooklyn, NY. The roof rehabilitation project included the replacement of approximately 1,200 square feet of stainless steel decking, insulation and waterproofing. The project also included the construction of three new skylights and access ladders. The platform installation project included the installation of new steel members and fiberglass reinforced polymer (FRP) molded grating within the existing remediation groundwater treatment to provide a working platform for on-site technicians. The new steel members were bolted to existing infrastructure to limit on-site welding and the platform was installed with tubular steel handrails. Responsibilities included: ensuring that the development of the plans and technical specifications were in accordance with the New York City Construction Codes, New York State Building Standards and Codes, various ASTM standards, American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", and Steel Structures Painting Council (SSPC) Publications.
- NYCDEP Private Storm and Sanitary Sewer System – Project/Staff Engineer for the design and development of a New York City Department of Environmental Protection (NYCDEP) Private Storm and Sanitary Sewer System located at a former petroleum terminal in Brooklyn, NY. The sewer system comprised of over 2,600 LF of sewer in Greenpoint Brooklyn over two phases of construction. During the duration of this project responsibilities included: develop/revise NYCDEP sewer design plans and construction notes, address NYCDEP comments and markups, develop Bill of Materials, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDEP and NYCDOT specifications and requirements, develop/revise NYCDOT Builder's Pavement Plan (BPP), develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, review subcontractor submittals and cut sheets, address NYCDEP punch list items, management/oversight/coordination of subcontractor construction activities.
- NYCDOB/NYCDOT Sidewalk Installation – Project/Staff Engineer for the design, development, and installation of over 4,000 linear feet of new sidewalks over various phases located at a former petroleum terminal in Brooklyn, NY. The design, development, and installation of these sidewalks were in accordance with the New York City Department of Buildings and New York City Department of Transportation specifications and details of construction. During the duration of these projects my major responsibilities included: develop/revise NYCDOT Builder's Pavement Plans, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDOB and NYCDOT specifications and requirements, develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, ensure proper installation and testing of sidewalks in accordance with NYCDOB and NYCDOT, management/oversight/coordination of subcontractor construction activities.
- Sub Slab Depressurization System – Staff Engineer for the design and construction of two sub slab depressurization systems (SSDS) located within the footprint of a petroleum remediation site where a new building was proposed to be built. These projects were part of an Interim Remedial Measure (IRM) Action Plan as approved by the NYSDEC to provide a preventative proactive measure to address potential soil vapor issues. The SSDSs were designed to operate passively; however, header piping was installed to allow for the installation of the necessary equipment if an active system was required. The SSDSs consisted of ¾-inch gravel with 4-inch diameter polyvinyl chloride (PVC) schedule 40 well screen used as soil gas collection piping and 6-inch diameter solid PVC used as the header piping. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric were installed between the venting layer and the floor slab.

All penetrations through the floor slab were sealed using a silicone based waterproof sealant. The scope of work included, excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings, valves and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone based waterproof sealant.

- Remediation System Signal Network Utility Expansion Oversight and Management – Staff Engineer and Field Manager for the completion of a signal communication network expansion as part of a petroleum remediation system. My responsibilities included oversight of a subcontractor while installing level sensors within the product pull boxes to improve the safety of the system operations by continuously monitoring the underground product piping network for potential leaks, and programming, testing and verification of operation of sensors. The scope of work also included the installation of signal and control wiring from recovery well houses to subsurface vaults through existing conduit located beneath New York City streets located in Greenpoint Brooklyn. The signal expansion was part of an effort to integrate the sensor/components within the vaults with the existing remediation system's programmable logic controllers (PLCs). The scope of work also included: development of programming to integrate input infrastructure to existing PLCs, development of human machine interface (HMI) screens to allow for remote viewing at the system control buildings, and installation of power supplies and other apparatuses as required for the operation of the new infrastructure. My responsibilities for this work included: subcontractor management, submittal and cut sheet review, scheduling management, 3rd party coordination, and construction meetings.
- New York City Transit Plan Submission – Staff Engineer for researching, preparing and submitting New York City Transit (NYCT) Plans for various sites to seek approval for drilling and other subsurface activities in proximity to NYC Subways. The scope of work included visiting the Microfilm Room at the NYCT Office to obtain copies of the as-built plans, roof plans, profiles, sections, and alignments adjacent to the properties that our clients were proposing to perform subsurface work. Using these plans, develop proposed boring location plans and cross section plans, overlaying the NYCT plans to determine the proposed distance to adjacent NYCT structures. Ensured that these plans had the most up to date NYCT construction notes since these drawing became part of the projects' contract drawings. Submitted the plans and fees to the NYCT and coordinated with the NYCT inspectors assigned to each project ensuring that all requirements and questions were satisfied. Procured the associated NYCT approvals and distributed to the client so that they may proceed.
- Stormwater Pollution Prevention Plan (SWPPP) Reports – Staff Engineer for preparing and submitting Stormwater Pollution Prevention Plans (SWPPP) for various residential and commercial development sites in New York City and Long Island. The scope of work included preparation of SWPPP Reports in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) regulations at the time including the 'General Permit for Stormwater Discharges from Construction Activity' and the 'New York State Stormwater Management Design Manual'. Preparation of the SWPPP Reports included: summarizing the site history and project description, soil geology, potential pollutants, erosion and sediment control practices, inspection and maintenance procedures, water quantity and water quality control plans, construction sequence scheduling, and the Notice of Intent (NOI) for each project as required by the NYSDEC.
- Former Petroleum Storage Wetland and Canal Remediation Site – Staff Engineer for daily construction oversight of subcontractors as a field manager and implementation of the site-specific health and safety plan as a Community Air Monitoring Program manager. The scope of work included conducting an on-site Community Air Monitoring Program monitoring for airborne dust and VOCs that were potentially generated by remedial and construction work activities. Stopping work and implementing best engineering/control practices if action levels were exceeded. Recording and providing QA/QC analysis of on-site weather and air monitoring data, as well as ensuring the proper operation of all instruments/monitors on a daily basis. Inspections were conducted of three on-site aboveground API concrete oil/water separators. Stormwater Pollution Prevention Plan (SWPPP) inspections were performed, ensuring compliance with NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity and daily reports were generated which would comprehensively document daily work activities and CAMP data and exceedances.

ROUX

PROFESSIONAL PROFILE

Josh Cope

Senior Scientist

TECHNICAL SPECIALTIES

Fuel oil forensics and age dating, USEPA Superfund, OPA, and NJDEP environmental regulations, Site Assessment and Contractor Oversight, GC/MS Operator, Data Validation, Technical Report preparation and review, Field Chemistry: field screening, HAZCATTING, groundwater and soil sampling, Hazardous Waste Transportation and Disposal

EXPERIENCE SUMMARY

25 years experience; Senior Scientist with Roux Associates, Inc.; Senior Chemist, Project Manager with Tetra Tech, Inc.; Owner of Geodyne Engineering Consultants, Inc.; Quality Assurance Officer, GC/MS Operator, Twenty First Century Environmental, Inc.; Project Manager, Field Technician, Resource Applications, Inc.

CREDENTIALS

B.A., 1991, Chemistry, Haverford College
OSHA 40-Hour Health and Safety Training
Level A Personal Protective Equipment Training
DOT and IATA Hazardous Material Shipping Training
New Jersey Transit (NJT) – Roadway Worker / On Track Protection

FEDERAL PROGRAMS – CLIENT: USEPA

KEY PROJECTS

- Provide technical and project management support to USEPA Removal and Remedial Branches in Regions 2, 3, 4 on Superfund and OPA projects.
- Manage and perform phase I and II site assessments, remedial investigations, removal action oversight, prepare health and safety plans, monitor site health and safety, support USEPA enforcement actions, implementation of Facility Response Plan (FRP) program, emergency response, biowatch exercises, criminal investigation support, contractor oversight, cost tracking, documentation, daily reporting, prepare after action reports, data validation, waste management, and attend public meetings
- Sites include: UST, AST, and pipeline leaks, lead smelter sites, wood treatment facilities, coal to gas plants, dry cleaners, junk yards, federal facilities, unpermitted landfills, drum burial, flood and hurricane clean up, oil refinery inspections, farmland, and historic industrial sites.
- Contaminants include: TCE, PCE, MTBE, BTEX, oil, gasoline, PCP, PAHs, mercury, lead, arsenic, ammonia, acids, bases, pesticides, PCBs, asbestos, and unknowns.
- Participated in the largest USEPA sponsored interagency response emergency response exercise, Liberty Radex, in Philadelphia. Acted as planner prior to the exercise and master controller during the exercise.
- Interface with state and local regulators on sites in Pennsylvania, Delaware, New Jersey, Maryland, Virginia, West Virginia, and Mississippi.

STATE PROGRAMS – CLIENTS: BUSINESSES AND INDIVIDUALS IN NEW JERSEY

- Provide a wide array of environmental services to homeowners, land developers, insurance companies, gas stations, and small industrial companies in New Jersey.
- Manage and/or perform ISRA reporting, phase I and II site assessments, third party investigations, subsurface evaluation, UST removal, air emissions permitting preparation, soil, groundwater, and vapor intrusion investigations, NPDES compliance.
- Manage remedial investigation, design, and execution for LUSTs, and farmland development.
- Manage reporting, deed restriction preparation, CEAs, remedial action permits, and response action outcome preparation (RAO).
- Evaluate environmental costs for insurance claims and litigation cases.
- Prepare and present justification for fine reduction to state regulators for private client.
- Meet with clients, prepare proposals, and negotiate contracts.

DATA VALIDATION/LABORATORY EXPERIENCE

- Perform level 3 and 4 data validation of analytical data packages in accordance with USEPA National Functional Guidelines.
- Quality assurance officer and GC/MS operator for New Jersey certified laboratory.
- Performed analysis of volatile and semi-volatile organics.
- Preformed maintenance and repair of analytical instruments.
- Performed method development and trouble shooting of analytical issues.
- Set up and operated mobile laboratory for organic and inorganic analyses on Superfund site assessments.
- Performed field screening of contaminants using test kits, XRF, radiation meters, and various types of air monitoring equipment.

WASTE MANAGEMENT

- Waste Management Specialist for oil pipeline client in Michigan for largest inland oil spill in United States during August 2010 through October 2011.
- Responsible for compliance, cost tracking, cost estimation, waste tracking and reporting, oil recovery calculation and reporting, contractor oversight.
- Prepared Waste Transportation and Disposal Plans and responses to regulator comments.

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- Prepared waste profiles, negotiated waste removal protocols with USEPA and MDEQ to streamline process of waste handling to realize savings through greater efficiency and lowering sampling requirements.
- Located disposal facilities, negotiated disposal rates.
- Performed cost benefit analysis of various soil dewatering agents and procedures and proposed methods and protocols to client, USEPA, and MDEQ.
- Performed some oversight of removal actions along river.
- Supported submerged oil assessment of river.

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ATTACHMENT 2

NYSDEC PFAS Guidance

Title: Determination of VOCs in Ambient Air EPA Compendium Methods TO15, & TO3

Approval Signatures:

Don Dawicki Laboratory Director	Bill Desjardins Department Supervisor
Luke Orchard Quality Assurance Manager	Mathew Kirk Operations Mgr./EHS Coordinator

Facility Distribution No. Electronic **Distributed To: Facility Intranet**

The controlled copy of this SOP is the PDF copy of the SOP that is posted to the laboratory's SOP Directory. Printed copies of this SOP or electronic copies of this SOP distributed outside the facility are considered uncontrolled.

1.0 Scope and Application

This SOP describes the laboratory procedure for the analysis of polar and non-polar volatile organic compounds (VOCs) in ambient and non-ambient air. The procedure is applicable to those VOCs that have been evaluated by the laboratory for their consistent performance in meeting the control criteria put forth in Compendium Method TO-15. While the compendium method is specifically written for the analysis of ambient air samples collected in leak-free passivated stainless steel canisters, it may be applied to the analysis of samples that have employed the use of other collection devices such as Tedlar bags, and are from sources other than ambient air such as soil gas, landfill gas, gas cleaning apparatuses and stack emissions.
This procedure may be also be used to report a variety of carbon ranges, constituent groups like TVOC (total volatile organic compounds), or as unresolved complex mixtures (e.g. Total Hydrocarbons).

1.1 Analytes, Matrix(s), and Reporting Limits

The target compound list and reporting limits for each compound are provided in Table 1A and Table 1B.

2.0 Summary of Method

An aliquot of sample is pulled from the canister through a solid multi sorbent bed trap which reduces the water content of the sample. The sample is thermally desorbed and the VOCs are carried onto a GC column coupled to a mass spectrometer. Compounds are identified by comparison of the mass spectra for individual peaks in the total ion chromatogram to the fragmentation patterns of ions corresponding to VOCs including the intensity of primary and secondary ions as well as the patterns of stored spectra acquired under similar conditions. The concentration of the target compound is calculated by internal standard technique using the average response factor or slope and intercept of that compound as determined by the initial calibration.

This procedure is based on EPA Compendium Method TO-15 "Determination of Volatile Organic Compounds in Ambient Air using Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry", US EPA, January, 1999 and Method TO-3 "Method for the Determination of Volatile Organic Compounds In Ambient Air Using Cryogenic Pre Concentration Techniques and Gas Chromatography with Flame Ionization and Electron Capture Detection", USEPA, April 1984.

If the laboratory has modified the method, a list of these modifications may be found in Section 16.0.

3.0 Definitions

A list of terms and definitions are provided in Appendix A.

4.0 Interferences

Contamination may occur if canisters or other equipment is not properly cleaned before use. The laboratory procedures for canister and flow controller cleaning are provided in SOP BR-AT-011.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

The analytical system contains zones with elevated or depressed temperatures that are capable of causing injury upon direct contact. The analyst needs to be aware of the locations of those zones, and allow them to return to room temperature prior to maintenance activities or take measures to avoid contact with hot and/or cold surfaces. There are areas of high voltage in the analytical system. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

Liquid nitrogen (LN_2) is used for cryogenic purposes. In addition to avoiding contact with LN_2 cooled surfaces, analysts must be aware of the potential for oxygen depletion in a confined space in the event of an unexpected large release of the product. Users should evacuate a confined space in which large amounts of LN_2 have been released.

Sample canisters are occasionally pressurized for cleaning or sample dilution purposes. Lab systems are designed to ensure that the cans are not pressurized above 40 psi. Eye protection must be worn when cans are pressurized in the event of a canister failure.

5.2 Primary Materials Used

There are no materials used in this method which have a serious or significant hazard rating

NOTE: This list does not include all materials used in the method. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

6.0 <u>Equipment and Supplies</u>

Catalog numbers listed in this SOP are subject to change at the discretion of the vendor. Analysts are cautioned to be sure equipment meets the specification of this SOP.

6.1 Sampling Equipment

- 6L and 1L SUMMA® Canisters: Leak-Free, Passivated Stainless Steel, with Swagelok DSS4 Valves, or equivalent. Maximum rated pressure 40 psig.
- 6L SUMMA® Canisters: Silicon lined-Leak-Free, Passivated Stainless Steel, with Swagelok DSS4 valves or equivalent. Maximum rated pressure 40 psig.
- Flow Controllers: Restek Catalog #24239 or equivalent.
- Flow Controller Orifice: Various sizes ranging from 0.008” to 0.060”, Restek or equivalent.
- Flow Controller Vacuum Gauges: Capable of measuring vacuum to an absolute vacuum of -30” of HG, and pressure up to 30 psi, Grainger Catalog #5WZ37 or equivalent
- Rain Guard: Stainless Steel Tubing ¼”, 10ft. Grainger or Equivalent. Cut 8” and bend into a J shape using a pipe bender.
- Stainless Steel Pre-Filter (7 um): Swagelok Catalog# SS-4F-T7-7 or equivalent
- Teflon Tape: Home Depot Brand or equivalent.

6.2 Analytical System

- Mass Spectrometer: Agilent 5973, 5975 MSD or equivalent.
- Gas Chromatograph: Agilent 6890, 7890, or equivalent.
- VOC Autosampler: Entech 7016CA or equivalent.
- Cryogenic Concentrator: Equipped with an electronic mass flow controller that maintains a constant flow for carrier gas and sample over a range of 0-200 cc/min. Entech 7100A, 7200, or equivalent.
- Low Pressure Liquid Nitrogen: Air Gas or equivalent.
- Glass Bead Cryotrap: Capable of effectively removing water while trapping polar and non-polar compounds. Entech catalog# 01-04-11320.
- TENAX Sorbent Trap: Capable of removing CO2 and trapping the polar and non-polar compounds. Entech catalog # 01-04-11330.Primary Column: Fused silica capillary column (60 m x 0.32 mm x 1.8 µm), Restek RTX-624 or equivalent.
- Data System: PC software for Entech instrumentation. Hewlett-Packard ChemStation data acquisition software, TestAmerica Chrom and TestAmerica LIMS (TALS).
- NIST Mass Spectral Library and Search Program, 2014 release or newer

6.3 Cleaning System

- Canister Cleaner Module and Software: Capable of filling canisters with humidified air and evacuating canisters to 50 mtorr, Entech Model 3100A or equivalent.
- Vacuum Pump: Capable of evacuating sample canisters to full vacuum. Vacuubrand or equivalent.
- Cleaning Manifold: Equipped with stainless steel and Teflon transfer lines and connections for cleaning up to twelve canisters simultaneously.
- Heating Belts: Individual thermal-stated heating belts used to heat canisters to 100ºC during the manifolds cleaning cycles. Entech or equivalent.
- Cleaning oven: Capable of cleaning 6 Summa Cans simultaneously at a temperature of 100ºC. Entech or equivalent.
- Flow Controller Cleaning Manifold: Capable of flushing hot Nitrogen through 24 flow controllers simultaneously for cleaning.

6.4 Miscellaneous Supplies

- Mass Flow Controller, NIST Traceable: Capable of flow rate of 70 mL/min, McMillan Company 80SD or equivalent. Use for the preparation of calibration and working standards.
- Syringes: Gas tight with a Luer-Lok tip, assorted sizes ranging from 1.0 mL to 1.0 L, SGE or equivalent.
- Digital Pressure Gauges, NIST Traceable: Capable of measuring pressure in the range of -30" Hg to 100 psi, Dwyer Models DPGA-12 and 67100 or equivalent
- Digital Flow Meter, NIST Traceable: Alltech or equivalent.
- Nitrogen Gas

7.0 Reagents and Standards

7.1 Reagents

Nitrogen- Gas off bulk Liquid Nitrogen tank. Air Gas or equivalent vendor

7.2 Standards

Purchase the following stock standard mixtures from commercial vendors:

- Mixed Gas Stock Standard: - Commercially prepared standard that includes internal standard and tune standard compounds: Bromofluorobenzene, Bromochloromethane, 1,4-Difluorobenzene, and Chlorobenzene-d5, at a concentration of 100 ppbv each. Spectra Gas or equivalent.
- Calibration Stock Standard: - Commercially prepared custom gaseous stock standard used by all network facilities that includes all target analytes at a concentration of 1.0 ppmv. Spectra Gases or equivalent.
- Calibration Ethanol Neat Material. >99.5 %
- ICV / LCS Stock Standard: - Custom made gaseous stock standard prepared from a different lot(s) of the source material(s) used to manufacture the calibration stock standard. The ICV/LCS stock standard includes all target analytes at a concentration of 1.0 ppmv. Spectra Gases.
- ICV/LCS Ethanol Neat material. >99.5% from a source other than the calibration source.

Prepare calibration and working standards mixtures by diluting a known volume of the stock standard with ultra pure zero air to a specified volume into a humidified summa canister. The summa canister is humidified by adding 100ul of VOA free reagent water. The volume of the standard added to the canister is calculated using the set flow rate of 70mL/min using a mass flow meter multiplied by the time of the standard addition, plus the inclusion of the 25ml volume for the tubing connecting the mass flow meter to the summa canister. The formulations for standard preparation are provided in Appendix B along with recommended expiration dates and storage conditions.

Each stock standard is assigned a 1 year expiration date from manufacture and recertified annually. See BR-QA-002 for details on the recertification process. The ethanol neat material is assigned the expiration date given by the manufacturer.

Note: When entering the concentrations of source standards in TALS, use the Requested concentration of source standards only if reported concentration is within +/-5% of the requested concentration. If it is not, use the reported concentration in the TALS reagent module.

If a new standard can not be received prior to the expiration of the standard presently in use, the lab will notify the QA manager. The QA manager will perform a control chart review (see SOP BR-QA-013). If the standard is determined to be acceptable, the lab may assign a new expiration date of not more than 30 days from the date of the last data point in the control chart review. When the new standard ID is created in TALS, the COA and the Control Chart verifying the standards stability will be attached to the reagent ID.

8.0 Sample Collection, Preservation, Shipment and Storage

The laboratory does not perform sample collection so these procedures are not included in this SOP. Sampling requirements may be found in the published reference method.

Matrix	Sample Container	Minimum Sample Size	Preservation	Holding Time	Reference
Air	1L or 6L Passivated Summa Canister*	1L	NA	30 days from collection	EPA TO-15

*1 liter Tedlar bags are only provided upon client request, however clients are discouraged from using Tedlar bags due to the shortened holding time of 72 hours from collection.

All samples should be collected in passivated stainless steel canisters that have been certified clean prior to sampling. The laboratory will provide certified clean canisters to the client upon request. The procedures for clean canister certification are provided in Laboratory SOP BR-AT-011.

The laboratory can also provide flow controllers set to the appropriate flow rate for the sampling time required by the client.

The laboratory ships air canisters in custom made boxes. The boxes are equipped with custom-made foam inserts to hold the pre-set flow-controllers. The shipping materials are designed to prevent damage of equipment to and from the sampling site. The laboratory checks the equipment to ensure it is in proper working order before shipment to the client and additional checks are performed on return of the equipment to the laboratory. Sampling instructions are provided with each sampling kit. The sampling crew is advised to handle the sampling equipment using the instructions provided by the laboratory to ensure optimum performance.

The laboratory’s sample acceptance policy for air samples in canisters requires that the sampling crew record the ID of the flow controller used for sample collection on the tag attached to each canister, but the association may also be recorded on the Field Test Data Sheet or a COC. With this information the laboratory can review the history of use of the FC as needed to troubleshoot potential equipment problems. Without the association, the history of use of the FC is unknown. The laboratory strongly recommends that field samplers be instructed to provide this information for each sampling event.

The return pressure of each canister should be between -10” Hg to -1”Hg, except for “grab” samples or samples with a collection rate of 100 or 200 mL/min, which must have a pressure greater than or equal to -10” Hg. The residual vacuum criteria ensure that the sample was collected over the time period the flow controller was calibrated for.

9.0 Quality Control

9.1 Sample QC

The following quality control samples are prepared with each batch of samples.

QC Item	Frequency	Acceptance Criteria
Method Blank (MB)	1 in 20 or fewer samples	See Table 3
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	See Table 3
Internal Standard (ISTD)	Every Sample	See Table 3
Laboratory Control Sample Duplicate (LCSD)	Client request or if insufficient sample for Sample Duplicate	See Table 3
Sample Duplicate (SD)	1 in 20 or fewer samples	See Table 3
Trip Blank (TB)	Client Request	See Table 3

NOTE: The compendium reference method does not require the analysis of a laboratory control sample (LCS) or provide criteria for the evaluation of an LCS. The laboratory performs an LCS at the above mentioned frequency as an evaluation of percent recovery in a blank matrix. The laboratory uses statistically derived control limits for the LCS.

Unless otherwise specified by the client during project initiation, the LCSD will be used to measure precision only. The LCS will be used for evaluations for percent recovery and to determine if corrective action is necessary.

9.2 Instrument QC

The following instrument QC is performed:

QC Item	Frequency	Acceptance Criteria
Tune Standard (BFB)	Each Analytical Window	See Section 10.0
Initial Calibration (ICAL)	Initially; when ICV or CCV fail	See Section 10.0
Initial Calibration Verification (ICV)	Once, after each ICAL	See Section 10.0
RT Window Establishment	Once per ICAL	See Section 10.0
Relative Retention Time (RRT)	With each sample	See Section 10.0
Continuing Calibration Verification (CCV)	Daily, after each BFB	See Section 10.0

10.0 Procedure

10.1 Support Equipment Calibration

Verify the calibration of the mass flow controller used to prepare standards, the calibration of the digital flow meter used to set and check the flow rates of the FC(s) used for sample collection, the calibration of the digital pressure gauges used to check return canister pressure, and the calibration of the stop watch used to measure standard addition time is current to the year. Immediately notify the QA department if the calibration is not current and wait for further instruction. Equipment whose calibration has expired may not be used without documented approval from the QA department.

NOTE: The QA department schedules the annual calibrations of the support equipment and maintains all Certificates of Calibration. The flow controllers are checked against a NIST traceable standard. This check is performed by the manufacturer of the equipment, when possible, or by an approved vendor that provides certification service.

10.2 Instrument Calibration

10.2.1 Tune Standard

Analyze a tune standard (BFB) prior at the beginning of each analytical window. The tune standard is a commercially prepared mixed gas stock standard that includes bromofluorobenzene (BFB) at a concentration of 100 ppbv.

To analyze the tune standard:

1) Establish the instrument operating conditions specified in Section 10.4.1.

2) Attach the mixed gas stock standard to the Entech concentrator by attaching the cylinder to the line dedicated for introduction of the internal standard (ISTD). The concentrator directly injects 20 mL of the 100 ppbv stock standard onto the instrument to yield an on column concentration of 10 ppbv.

3) Acquire the data and evaluate the results against the acceptance criteria given in Table 2. Criteria must be met prior to further analysis. The official start time of the 24 hour analytical window is the injection time of a passing tune standard. All samples must be injected within 24 hours of that time.

NOTE: The data processing system averages three scans (apex scan, scan prior, and scan following) and performs background subtraction of the single scan prior to the elution of BFB.

10.2.2 Initial Calibration (ICAL)

The instrument must be calibrated with a minimum of five calibration standards for each target analyte at concentrations that span the working range of the method.

The laboratory routinely analyzes 8 standards at the recommended concentrations of 0.035, 0.20, 0.50, 5.0, 10.0, 15.0, 20 and 40 ppbv, except for Ethanol. For Ethanol, a 6 point curve is analyzed at the following concentrations: 5, 10, 15, 20, 40, and 100 ppbv. Even though eight calibration standards are routinely analyzed not every calibration standard is used for each analyte. Each analyte has been assigned to an analyte group that includes a calibration range of at least five standards. The analyte group associations for each target analyte are provided in Table 1A and Table 1B. The calibration range for each analyte group is as follows:

- Group A: This analyte group is associated with a seven point calibration curve. The calibration range is 0.20 to 40 ppbv with the 0.035 ppbv standard excluded. The limit of quantitation (LOQ) for this group of analytes is 0.20 ppbv

- Group B: This analyte group is associated with a six point calibration curve. The calibration range is 0.50 to 40 ppbv with the 0.04 and 0.20ppbv standards excluded. The limit of quantitation (LOQ) for this group of analytes is 0.50 ppbv.

- Group C: This analyte group is associated with a five point calibration curve. The calibration range is 5.0 to 40 ppbv with the 0.04, 0.20, and 0.50ppbv standards excluded. The limit of quantitation (LOQ) for this group of analytes is 5.0 ppbv.

- Group D: This analyte group is an eight point calibration curve. The calibration range is 0.04 to 40 ppbv. The limit of quantitation (LOQ) for this group of analytes is 0.04 ppbv.

- Group E: (Ethanol): This analyte has a six point calibration curve. The calibration range is 5 to 100 ppbv. The limit of quantitation (LOQ) for this analyte is 5 ppbv.

Prepare the calibration standards using the formulations provided in Appendix B.

Analyze the standards in a sequence from lowest to highest concentration using the instructions provided in Section 10.4.2.

The data processing system calculates a relative response factor (RRF), for each analyte and isomer pair using the assigned internal standard. The internal standard associations for each target analyte are provided in Table 1A and 1B. The data processing system also calculates a mean relative response factor, relative standard deviation (RSD), relative retention time (RRT) and the mean RRT.

The following criteria must be met for a calibration to be considered acceptable:

- The RSD for each target analyte must be <30% with at most 2 exceptions up to a limit of 40%.

If linear regression is used the R2 must be greater than 0.996

- The area response for the primary quantitation ion for the internal standard for each ICAL standard must be within 40% of the mean area response over the calibration range for each internal standard.

- The RRT for each target compound at each calibration level must be within 0.06 RRT units of the mean RRT for the compound. The retention time shift for each of the internal standards at each calibration level must be within 20 seconds of the mean retention time over the initial calibration range for each internal standard.

If these criteria are not met inspect the system for problems and perform corrective action. Recommended corrective actions are provided in Section 10.2.5 and in Table 3.

Repeat initial calibration whenever instrument operating conditions are changed, a new column is installed, when significant instrument maintenance has been performed, and when the result of the CCV indicate the calibration is no longer valid.

10.2.3 Second Source Calibration Verification (ICV)

Immediately following an acceptable initial calibration verify the accuracy of the calibration by the analysis of the second source calibration verification standard (ICV).

Prepare the ICV following the formulation provided in Appendix B.

Analyze the ICV following the instructions provided in Section 10.4.2.

The percent recovery (%R) for each target analyte must be within 70-130%. If criteria are not met, perform corrective action. Recommended corrective actions are provided in Table 3. If corrective action is not successful, remake your standards and recalibrate.

If after successful analysis of the ICV, time remains in the 24-hour analytical window, QC and field samples may be analyzed without analysis of a continuing calibration verification check standard. If time does not remain in the analytical window, a new analytical sequence must be initiated with a Tune Standard followed by daily calibration (CCV).

10.2.4 Continuing Calibration Verification (CCV)

Analyze the CCV immediately after the tune standard unless the analytical window includes ICAL, in which case, a CCV is not required.

Prepare the CCV standard using the formulation given in Appendix B. The recommended concentration of the CCV for each target analyte is 10.0 ppbv.

Analyze the CCV following the instructions provided in Section 10.4.2. The data system calculates a response factor for each analyte and calculates the percent difference (%D) of the RRF relative to the mean RRF in the most recent initial calibration.

- The %D for each target analyte must be within ±30%. If the above criteria are not met, repeat the analysis of the CCV once. If the second CCV meets criteria, continue with the analytical sequence. If it fails, evaluate the data to determine if one of the following conditions is met. If these conditions are not met corrective action must be taken. Guidance for troubleshooting is provided in Section 10.2.5. After corrective action the analytical sequence may be continued only if two immediate, consecutive CCVs at different concentrations are within acceptance criteria. If these two CCVs do not meet the criteria, recalibration is required prior to further analysis.
- DoD QSM 5.1 requires that the closing CCV recover within ±30%. EPA Methods TO-14 and TO-15 do not include a closing CCV requirement, but they do have an opening CCV with a +/- 30% limit. If these criteria are not met, immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails or if two consecutive CCVs cannot be run, perform corrective action(s) until a passing CCV is attained, and then reanalyze all associated samples since last acceptable CCV. If necessary, perform a new initial calibration and then reanalyze all associated samples since the last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative.

Note: Per DoD QSM5.1, if samples cannot be re-analyzed, the data MUST be qualified with a Q flag and an explanation must be provided in the case narrative. With client permission, closing CCV criteria of 50% can be utilized.

- If the CCV criteria are exceeded high, indicating a high bias, and the associated samples have non-detects for those analytes, the analytical data may be considered usable. In the absence of instructions otherwise, proceed with analysis.

- If the CCV criteria are exceeded low, indicating a low bias, analytical results may be reported if those results exceed the project's regulatory decision level. In other words, if the analytical results are sufficiently high to counter the low bias, results may be reported. Consult with the project manager to determine if the exception is allowable for each project.

10.2.5 Troubleshooting

Check the following items in case of calibration failures:

- Loss of sensitivity or unstable ISTD recoveries are usually the result of a leak. Check the union between the GC column and Entech transfer line.

- Loss of sensitivity for individual compounds may be a result of either an active site in a transfer line or a bad trap. Troubleshoot and perform maintenance as necessary.

- Poor chromatography usually requires GC column maintenance, perform as necessary.

- Carryover is usually caused by excessive amounts of analyte introduced to the system. Analyze blanks until the system is cleaned or replace the traps and transfer lines if necessary.

Refer to corporate policy CA-Q-S-005 for additional information of procedures to establish and troubleshoot initial calibration curves.

10.3 Sample Preparation

10.3.1 Post Sampling Canister Pressure Check Procedure

The post-sampling canister pressure check is performed at the time of sample login by sample management staff so that any problems found are quickly identified and communicated to the client.

Refer to the current version of SOP BR-SM-001 for the procedure to take and record the post sampling canister pressure check.

10.3.2 Sample Screening

At the laboratory's discretion unknown samples may be screened prior to initial analysis to determine if the sample requires dilution. Unless otherwise requested by the client the laboratory does not provide screen data with the data package report even when primary dilutions are performed based on the results of the screen analysis.

To prepare a sample for screen analysis, connect the sample canister to the autosampler connected to screening instrument and analyze 20 mL of sample. Acquire and evaluate the results. If the results of screen analysis indicate that a target compound is above its upper range of calibration, calculate a recommended dilution factor (DF) by dividing the concentration of analyte found by 30. Record the recommended DF on the screen worksheet.

NOTE: Samples are screened on a GC/MS instrument that is programmed with the operating conditions given in Section 10.4.1 of this SOP. The calibration is checked weekly with a single point calibration standard at a concentration of 10 ppbv for all target analytes. The calibration is checked more frequently when the results of instrument analysis do not correlate well with the results of the screen analysis.

10.3.3 Sample Dilutions & Pressure Adjustment

Field samples should be diluted prior to initial analysis when the screen results indicate that the concentrations are above calibration range or when the laboratory has sufficient knowledge of the sample (history) to know that the sample will require dilution. Field samples must be reanalyzed at a dilution when the concentration of target compounds in initial analysis exceed of the upper range of calibration.

When the return negative pressure of a canister is greater than -10"Hg, make-up gas may be added to provide sufficient volume of make-up gas in order to have an adequate sample volume for analysis. The addition of make-up gas is considered a canister dilution. Some concentrators are able to pull full sample volume even if the residual vacuum is lower than -10"Hg so make-up air may not be necessary.

For samples analyzed for constituent groups (e.g. TVOC as Toluene), ranges, and or unresolved complex mixtures (Total Hydrocarbons), samples must be diluted such that the maximum peak height of any sample constituent under consideration does not exceed the equivalent peak height generated by highest calibration level standard. For evaluation it may be useful to graphically overlay sample chromatograms with that of the high point calibration standard.

To dilute the sample:

1) Attach the sample canister to the nitrogen gas line equipped with a pressure gauge that reads negative pressure in ("Hg) and positive pressure in (psig).

2) Ensure the valve of the nitrogen gas line is closed then open the valve of the sample canister. Record the negative pressure reading in the Canister Dilution Worksheet or on the canister's tag.

3) Slowly open the valve of the nitrogen gas line and fill the canister until canister pressure gauge reads -10"Hg. Do not open the valve to such an extent that the nitrogen gas line pressure drops below 15 psig and do not allow the nitrogen gas line to reach equilibrium otherwise you will contaminate the nitrogen gas line.

4) When the desired pressure is achieved, close the canister valve and the valve on the nitrogen gas line; wait 15 seconds. The pressure should not exceed 40 psig.

5) Open the canister valve and record the final pressure reading in psig.

6) Close the canister valve and remove the valve from the zero air line.

7) Record the initial and final pressure readings in the TALS canister dilution tracking module. If the final pressure is below ambient, the "HG reading must be converted to psig by dividing the value by 2 prior to entry into the TALS worksheet.

When the return pressure of a canister is positive, the pressure must be adjusted to near ambient (0"Hg) prior to analysis. To adjust the pressure to ambient, vent the canister to ambient in a fume hood by opening the canister value for ~4-5 seconds, close the valve. For higher pressure canisters, open the valve and listen for a release of air then close the valve when the sound recedes.

If a trip blank is provided, pressurize the trip blank canister to 10 psig. The pressurization of the trip blank is not considered a dilution.

10.3.4 QC Sample Preparation

To prepare the method blank (MB): Fill a clean canister that has never been used to collect environmental samples and has never left the laboratory to 20 psig with nitrogen gas. Continue to use this canister as the MB until the pressure of the canister reaches 0 psig, at which time, recharge with nitrogen gas to 20 psig and reuse.

To prepare the LCS: Follow the instructions provided in Appendix B for preparation of the working ICV/LCS standard. If an LCSD is requested, analyze the LCSD from the same canister as the LCS.

10.4 Sample Analysis

10.4.1 Instrument Operating Conditions

Optimize the GC and MS conditions for compound separation and sensitivity.

The recommended operating conditions are as follows:

Thermal Desorb:	Initial Trap #1 Temperature: -110ºC Desorb Temperature from Trap #1 to #2: 0 ºC Total Volume Transfer by Mass Flow Controller: 40 mL Initial Trap #2 Temperature: -15 ºC Desorb Temperature from Trap #2 to #3: 200ºC Transfer time 3.5 minutes Initial Trap #3 Temperature: -165 ºC Injection Trap #3 Temperature: 70ºC Injection Time: 1.5 minutes Trap #3 Temperature after Injection: -165 ºC

Carrier Gas:	Helium, Ultra High Purity
Cryogenic Focusing Gas:	Liquid Nitrogen
Flow Rate:	~1.5 mL/min
Temperature Program:	Initial Temperature: 40ºC Initial Hold Time: 4 minutes Ramp1 Rate: 20ºC/min. to 200ºC. Ramp 2 Rate: 40ºC/min. to 220ºC Final Temperature: 220ºC Final Hold Time: 6.5 minutes
Electron Energy:	70 electron volts
Mass Range:	35-265 amu
Scan Time:	≥1 scan per second

These operating conditions may be changed but once the operating conditions are established for initial calibration the same conditions must be used until a new calibration is performed.

10.4.2 Daily Instrument Maintenance

Prior to analysis initiate the flushing sequence using the Entech software. Then initiate the bake program using the Entech software.

10.4.3 Bi-Weekly Instrument Maintenance

At a minimum frequency of once every two weeks, perform an autosampler leak check. Cap all autosampler ports and initiate the leak check program using the Entech software. Record this check in the instrument maintenance log.

10.4.4 Analytical Sequence

An example analytical sequence that includes initial calibration (ICAL) is provided below. When ICAL is not performed, the sequence begins with the tune standard and is followed by the CCV, LCS, LCSD, and method blank. If sufficient time remains in the 24 hours analytical window after initial calibration, QC and field samples may be analyzed without the CCV and the ICV will serve as the LCS for the sequence. The MB, LCS and LSCD must be analyzed at a frequency of every 20 samples or with each analytical sequence whichever is more frequent.

1. Tune Standard (BFB)
2. ICAL
3. ICV
4. CCV
5. LCS (repeat every 20 samples)
6. LCSD (when requested)
7. MB (repeat every 20 samples)
8. Field Samples (including trip blanks)

Attach the canisters to the autosampler inlet in the order of the analytical sequence then initiate the analytical sequence. The autosampler introduces 200 mL of sample volume from each canister to the instrument system and adds 20 mL of the mixed gas standard to each sample.

Acquire the data and evaluate the results to confirm qualitative identification and quantification.

11.0 <u>Calculations / Data Reduction</u>

11.1 Qualitative Identification

The data processing system tentatively identifies target analytes by comparing the retention time of the peaks to the window set around the continuing calibration standard, and searches in that area for the primary ion and up to two secondary ions characteristic of the target analyte.

All tentative identifications made by the computer are reviewed and either accepted or rejected by the primary analyst. The identification made by the system is accepted when the following criteria are met:

- The target analyte is identified by comparison of its background subtracted mass spectrum to a reference spectrum in the NIST14 database. In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and their relative abundances should agree within 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10-50%. Some ions, particularly the molecular ion, are of special importance if a tentative identification is to be made, and should be evaluated even if they are below 10% relative abundance.

- The GC retention time for the target analyte should be within 0.06 RRT units of the daily standard.

Identification requires expert judgment when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components. When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. If the data system does not properly integrate a peak, perform manual integration. All manual integration must be performed and documented in accordance with corporate SOP CA-Q-S-002*Manual Integration*.

11.2 Quantification of Target Analytes

After a compound has been identified, the data system quantifies the on-column concentration of the target compound based on the integrated abundance of the characteristic ion from the EICP. If there is matrix interference with the primary ion, a secondary ion may be used for quantification by calculating a mean RF factor for that ion and using that ion to quantify the analyte in the sample. When secondary ion calculations are required, include this information in the non-conformance report and project narrative.

Samples analyzed for constituent groups, ranges, and or unresolved complex mixtures are quantified as follows;

11.2.1 TVOC as Toluene
An internal standard type quantification response factor is generated using the RIC peak response measured for Toluene and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all RIC chromatographic sample response with the exception of those peak responses associated with internal standards. The results are reported as 'TVOC (as Toluene)'.

Retention Time Range: Propene to Naphthalene

11.2.2 GRO as Octane
An internal standard type quantification response factor is generated using the RIC peak response measured for Octane and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all RIC chromatographic sample response with the exception of those peak responses associated with internal standards that eluted within the retention time range as defined by the elution of 2-Methyl-Butane through Decane (C5-C10). The results are reported as 'GRO (as Octane).

Retention Time Range: 2-Methyl-Butane to n-Decane

11.2.3 Unresolved Complex mixtures

An internal standard type quantification response factor is generated using the RIC peak response measured for the un-resolved complex mixture (i.e. the gasoline envelope) and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all similarly chromatographing RIC sample response with the exception of those peak responses associated with internal standards. The results are reported using the name of the unresolved complex mixture used in the calibration (e.g. Total Hydrocarbons).

Retention Time Range: Propene to Naphthalene

Final results are calculated in TALS.

11.3 Calculations

Analytical results are calculated as follows:

- **Dilution Factor**

$$DF = \frac{V_2}{V_1} x \frac{V_4}{V_3}$$

Where:
V_1 = Pre-Dilution Canister Volume

V_2 = Post-Dilution Canister Volume
V_3 = Sample Amount (mL)
V_4 = Base Sample Amount (200 mL)

Relative Response Factor (RRF)

$$RRF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)}$$

Where:
A_x = Area of the quantitation ion of the analyte
A_{is} = Area of the quantitation ion of the internal standard
C_x = Concentration of analyte in concentration units (ppbv)
C_{is} = Concentration of internal standard in concentration units (ppbv)

- **Percent Relative Standard Deviation (%RSD)**

$$\%RSD = \frac{SD}{Mean} x100$$

Where:
SD = Standard deviation individual response factors
Mean = Average of five response factors

- **Sample Concentration**

$$C_x = \frac{(A_x)(C_{IS})}{(A_{IS})(\overline{RRF})}(DF)$$

Where:
C_x = Compound concentration (ppbv)
C_{IS} = Concentration of associated internal standard (ppbv)
A_{IS} = Area of quantitation ion for associated internal standard
A_x = Area of quantitation ion for compound
DF = Dilution Factor
Mean RRF = Average Relative Response Factor from initial calibration.

- **Unit Conversion from ppbv to ugm3**

$$\text{Analytical Result (ug/m3)} = \text{Result(ppbv)} \times \left(\frac{mw}{24.45}\right)$$

Where:
mw = molecular Weight

Example:
Benzene Result = 56 ppbv

Benzene mw = 78.108

$$\text{Analytical Result (ug/m3)} = 56\ \text{ppbv} \times \left(\frac{78.108}{24.45}\right)$$

Result(ug/m3) = 178.9 ug/m3 reported as 180 ug/m3

- **Percent Recovery (%R)**

$$\%R = \frac{C_s}{C_n} \times 100\%$$

Where:
C_s = Concentration of the spiked sample (ppbv)
C_n = Nominal concentration of spike added (ppbv)

- **Precision (%RPD)**

$$RPD = \frac{|C_1 - C_2|}{\left(\frac{C_1 + C_2}{2}\right)} \times 100$$

Where:
C_1 = Measured concentration of the first sample aliquot
C_2 = Measured concentration of the second sample aliquot

Formula of Standard Addition:

Volume (mL) = (FR x T) + 25 mL

Where:
FR = flow rate in mL/min
T= time in minutes

Example FR = 70ml/min
Time = 10.69 minutes
Volume = 25+ (70 x 10.69) = 773 mL

Total Volume of diluted standard

Volume (mL) = CV x P

Where:
CV = canister volume in mL
P = pressure in Bar (14.7psi per Bar)

Example: CV = 6185 mL
P= 2.5 Bar

Volume = 15462 mL

11.4 Data Review

11.4.1 Primary Review (Performed by Primary Analyst)

Upload the data files to TALS. Enter batch editor information and add the standards and reagents to the TALS batch. Review the results against acceptance criteria. If acceptance criteria are not met, make arrangements to perform corrective action.
Check the results of samples analyzed immediately after high concentration samples for signs of carry-over. Reanalyze the sample if carry over is suspected.

Dilute and reanalyze samples whose results exceed the calibration range. The diluted analysis should result in a determination within the upper half of the calibration curve.

Set results to primary, secondary, acceptable or rejected as appropriate.

Verify corrective action was taken for all results not within acceptance criteria. If corrective action is not taken or was unsuccessful, record all instances where criteria are not met with a nonconformance memo (NCM). Be sure to provide explanation of your decision making in the internal comment section of the NCM. The internal comment section should list the reason the NCM is suspected, which action (if any) was taken and why and the outcome of the action taken.

Review project documents such as the Project Plan (PP), Project Memo or any other document/process used to communicate project requirements to ensure those project requirements were met. If project requirements were not met, immediately notify the project manager (PM) to determine an appropriate course of action.

Set the batch to 1st level review.

Record your review on the data review checklist.

11.4.2 Secondary Review (Performed by Peer Reviewer)

Review the project documents such as the Project Plan (PP), Project Memo or any other document/process used to communicate project requirements and verify project requirements were met. If project requirements were not met, immediately notify the project manager (PM) to determine an appropriate course of action.

Review records (these records include but are not limited to the Pre-Shipment Clean Canister Certification Report, Flow Controller Set Flow Rate and Leak Check Record, Field Test Data Sheets, and the Air Canister Return Pressure Check Record) associated with release and return of air sampling equipment to ensure all anomalies are properly recorded. Compare any problems noted in these documents with the analytical results and record any findings in the narrative note program or otherwise communicate your findings to the PM for inclusion in the project narrative.

Review the TALS batch editor to verify information is complete. Review the batch to verify that the procedures in this SOP were followed. If discrepancy is found, resolve the discrepancy and verify any modifications to the SOP are were approved and are properly documented.

Spot-check 15% of samples in the batch to verify quantitative and qualitative identification. If the samples are being analyzed under DoD methods 100% of data must be checked during secondary review.

If manual integrations were performed:

- Review each manual integration to verify that the integration is consistent and compliant with the requirements specified in corporate SOP CA-Q-S-002.

- Check to ensure an appropriate technical reason code is provided for each manual integration. Acceptable technical reason codes are provided in corporate SOP CA-Q-S-002.

- Generate a “before” and “after” chromatogram for every manual integration performed on an instrument performance check standard (Tune, ICAL, ICV, CCV), QC sample (MB, LCS) and for any manual integration performed on any surrogate or internal standard in any field sample, if not already performed automatically by the software..
- Generate the Manual Integration Summary Report if not automatically generated by the software. Document your review of manual integrations on the summary report and obtain any review signatures of integrations performed during secondary review as required.

  If the reviewer disagrees with the integration performed by the primary analyst, the secondary data reviewer should not change the integration. Instead, he/she should consult with the primary analyst that performed the integration and both the reviewer and the primary analyst should agree the integration should be changed. If consensus between the primary analyst and the peer reviewer cannot be achieved; both should consult with the Technical Manager or department management for resolution. Any changes to the integration should be performed by the primary analyst. If it is necessary for the secondary reviewer to perform the manual integration because the primary analyst is out of the office; the integration made by the peer reviewer must be reviewed by another peer reviewer or by department management to verify the integration was performed and documented in compliance to SOP CA-Q-S-002. If the original analyst that performed the integration is out of the office, the data reviewer may consult with the Department Manager (DM), Department Supervisor (DS) or the Technical Manager (TM) to verify the change he/she thinks is needed is warranted and should be made.

Verify that the performance criteria for the QC items listed in Table 1A or 1B were met. If the results do not fall within the established limits verify that corrective actions were performed. If corrective action was not performed; verify the reason is provided and that the situation is properly documented with an NCM. Set samples to 2nd level review.

Run the QC checker and fix any problems found. Run and review the deliverable. Fix any problems found. When complete set the method chain to lab complete and forward any paperwork to report/project management.

Record second level review on the data review checklist.

11.4.3 TO15 Poor Performing analytes

NOTE: Statistically derived limits will be no wider than 50-150%R for poor performing compounds.

Compounds with a high boiling point which is beyond the range of typical gas compounds

- Dodecane
- 1,2,4-Trichlorobenzene
- Hexachlorobutadiene
- Naphthalene
- 1,2,3-Trichlorobenzene

The following compounds change how they act on the traps depending on the humidity of the standard

- 3-chloro-1-propene
- Bromoform

The following compounds are very polar and are linked to the water in the standard. Since we remove most of the water during the trapping process, a little change can produce a big result. For example removing 95% of the water instead of 94% of the water will have a negligible affect on non-polar compounds, but a 20% difference for polar compounds.

- Ethanol (made from neat material and is not part of the standard TO-15 calibration gas mix due to high reactivity
- Ethyl ether
- Acrolein
- Acetone
- Isopropyl alcohol
- 2-butanone
- Tetrahydrofuran
- 2-hexanone

11.5 Data Reporting

Report analytical results above the reporting limit (RL) as the value found. Report analytical results less than the RL, to the adjusted RL with a "U" data qualifier. If the data is to be reported to the method detection limit (MDL) the analytical results between the RL and the MDL are reported with an "estimated" footnote. Adjust the RL and MDL for sample dilution/concentration. The unadjusted RL for each target analyte is provided in Table 1A and 1B. For Method TO3 the laboratory does not report values below the reporting limit.

Data reporting and creation of the data deliverable is performed by TALS using the formatters set by the project manager during project initiation.

Electronic and hardcopy data are maintained as described in laboratory SOP BR-QA-014 Laboratory Records.

12.0 <u>Method Performance</u>

12.1 Method Detection Limit Study (MDL)

Perform a method detection limit (MDL) study at initial method set-up following the procedures specified in laboratory SOP BR-QA-005,

12.2 Demonstration of Capabilities (DOC)

Perform a method demonstration of capability at initial set-up and when there is a significant change in instrumentation or procedure.

Each analyst that performs the analytical procedure must complete an initial demonstration of capability (IDOC) prior to independent analysis of client samples. Each analyst must demonstrate on-going proficiency (ODOC) annually thereafter. DOC procedures are further described in the laboratory's quality system manual (QAM) and in the laboratory SOP for employee training.

12.3 Training Requirements

Any employee that performs any portion of the procedure described in this SOP must have documentation in their employee training file that they have read this version of this SOP.

Instrument analysts, prior to independent analysis of client samples, must also have documentation of demonstration of initial proficiency (IDOC) and annual on-going proficiency (ODOC) in their employee training files.

13.0 <u>Pollution Control</u>

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.0 <u>Waste Management</u>

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to BR-EH-001 *Hazardous Waste*.

The following waste streams are produced when this method is carried out:

- None

15.0 References / Cross-References

- EPA Compendium Method TO-15, "Determination of Volatile Organic Compounds in Ambient Air using Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry", US EPA, January, 1999.
- USEPA Compendium Method TO-3 “Method for the Determination of Volatile Organic Compounds In Ambient Air Using Cryogenic Pre Concentration Techniques and Gas Chromatography with Flame Ionization and Electron Capture Detection”, USEPA, April 1984
- New Jersey Department of Environmental Protection Site Remediation Program Vapor Intrusion Technical Guidance, Version 3.1, March 2013.
- Laboratory SOP BR-QA-005, Procedures for the Determination of Limits of Detection (LOD), Limits of Quantitation (LOQ) and Reporting Limits (RL).
- Laboratory SOP BR-QA-011 Employee Training
- Laboratory SOP BR-EH-001 Hazardous Waste
- Laboratory SOP BR-QA-014 Laboratory Records
- Laboratory SOP BR-SM-001 Sample Management
- Laboratory SOP BR-AT-011 Canister Cleaning
- Laboratory Quality Assurance Manual (QAM)
- Corporate SOP CA-Q-S-002 *Manual Integration Practices*

16.0 Method Modifications

- This SOP utilizes and alternative detector (mass spectrometer) vs that of a FID and/or ECD as listed in the published method.
- This SOP describes a method where an aliquot of a whole air sample collected in a passivated stainless steel canister is cryogenically trapped and concentrated prior to injection into the MS detector equipped GC.
- This Method SOP utilizes an RTX-624 capillary column (60M x 0.32 mm ID x 0.18um).
- Additional quality control aspects are employed in the use of this method based on the alternative detector type, specifically, the detector tune is verified at the beginning of each period of analysis prior to the acquisition on any standard, blank, QC sample or field sample.
- This Method SOP does not utilize sub ambient column oven temperature programming.
- Sample traps consist of a multi bed system employing Tenax and glass beads (see manufactures system description: Entech Model 7100 Sample pre Concentrator).
- Sampling apparatus consists of passivated stainless steel canister specifically design for the collection of ambient air samples for volatile analysis
- Nafion dryers are not used. The analytical pre-concentration system employs a moisture control system consisting of multi sorbent bed traps.
- System calibration is verified every 24 hour within which samples are analyzed. System linearity is not verified every 4-6 hours as described.
- Published Method requires weekly multi-point calibration be performed. Laboratory performs multi-point calibrations as necessary see section 10.2
- System linearity is determined through multi point calibration utilizing average response factors and internal standard technique quantification (see Section 10).

17.0 Attachments

- Table 1A: Target Compound List, RL, Internal Standard and Ion Assignments for TO15
- Table 1B: Target Compound List, RL, Internal Standard and Ion Assignments for TO3
- Table 2: Ion Abundance Criteria (BFB)
- Table 3: QC Summary & Recommended Corrective Action
- Table 4: LCS Control Limits
- Appendix A: Terms and Definitions
- Appendix B: Standard Preparation Tables
- Appendix C: DoD QSM LCS and MS/MSD Limits

18.0 Revision History

Revision 13.0:

- Title Page: Updated copyright date and signatories.
- Added note to section 7.2 regarding requested vs. reported concentration of standards
- Section 10.2.2 added statement "**If linear regression is used the R2 must be greater than 0.996**"
- Added section 11.4.3 regarding poor performing compounds.
- Table 4: updated control limits based on historical data from 1/28/2018 through 1/28/2019.
- Section 11.5: added note regarding reporting between MDL and RL.
- Table 3: updated wording to match section 10.2.2 for ISTD criteria.

Previous revisions are retained by the QA department.

Table 1A: Routine Compound List, Reporting Limit, Internal Standard and Ion Assignments

Analyte	CAS No.	6L RL (ppbv)	1L RL (ppbv)	Quantifier Mass	Qualifier Mass	Qualifier Mass	ISTD Group	Analyte Group
Dichlorodifluoromethane	75-71-8	0.5	5	85	87		1	B
Freon-22	75-45-6	0.5	5	51	67	69	1	B
1,2-Dichlorotetrafluoroethane	76-14-2	0.2	2	85	135	87	1	A
Chloromethane	74-87-3	0.5	5	50	52		1	B
n-Butane	106-97-8	0.5	5	43	41	58	1	B
Vinyl Chloride	75-01-4	0.035	0.40	62	64		1	D
1,3-Butadiene	106-99-0	0.035	5	54			1	D
Bromomethane	74-83-9	0.2	2	94	96		1	A
Chloroethane	75-00-3	0.5	5	64	66		1	B
Isopentane	78-78-4	0.2	2	43	57	56	1	A
Bromoethene (Vinyl Bromide)	593-60-2	0.2	2	106	108	81	1	A
Trichlorofluoromethane	75-69-4	0.2	2	101	103		1	A
Pentane	109-66-0	0.5	5	43	57	72	1	B
EthylEther	60-29-7	0.2	2	59	45	74	1	A
Acrolein	107-02-8	5	50	56	55	37	1	C
Freon TF	76-13-1	0.2	2	101	151	103	1	A
1,1-Dichloroethene	75-35-4	0.035	2	96	61	63	1	A
Acetone	67-64-1	5	50	43	58		1	C
Isopropyl Alcohol	67-63-0	5	50	45	43		1	C
Carbon Disulfide	75-15-0	0.5	5	76			1	B
3-Chloropropene (Allyl Chloride)	107-05-1	0.5	5	41	76		1	B
Acetonitrile	75-05-8	5	50	41	40	39	1	C
Methylene Chloride	75-09-2	0.5	5	49	84	86	1	B
tert-Butyl Alcohol	75-65-0	5	50	59	41	43	1	C
Methyl tert-Butyl Ether	1634-04-4	0.5	5	73	43		1	B
trans-1,2-Dichloroethene	156-60-5	0.2	2	61	96		1	A
n-Hexane	110-54-3	0.5	5	57	86		1	B
1,1-Dichloroethane	75-34-3	0.035	2	63	65	83	1	A
Methyl Ethyl Ketone	78-93-3	0.5	5	72	43		1	B
cis-1,2-Dichloroethene	156-59-2	0.035	2	96	98		1	A
Tetrahydrofuran	109-99-9	5	50	42	72		2	C
Chloroform	67-66-3	0.2	2	83	85		1	A
1,1,1-Trichloroethane	71-55-6	0.2	2	97	99	61	2	A
Cyclohexane	110-82-7	0.2	2	84	56		2	A
Carbon Tetrachloride	56-23-5	0.035	2	117	119		2	D
2,2,4-Trimethylpentane	540-84-1	0.2	2	57	41	43	2	A
1,2-Dichloroethene (total)	540-59-0	0.2	2	61	96		1	A
Benzene	71-43-2	0.2	2	78	77		2	A
1,2-Dichloroethane	107-06-2	0.2	2	62	98		2	A
n-Heptane	142-82-5	0.2	2	43	71		2	A
Trichloroethene	79-01-6	0.035	0.40	95	130	132	2	D
Methyl Methacrylate	80-62-6	0.5	5	69	41	39	2	B

Analyte	CAS No.	6L RL (ppbv)	1L RL (ppbv)	Quantifier Mass	Qualifier Mass	Qualifier Mass	ISTD Group	Analyte Group
1,2-Dichloropropane	78-87-5	0.2	2	63	41		2	A
1,4-Dioxane	123-91-1	5	50	88	58		2	C
Dibromomethane	74-95-3	0.2	2	174	93	172	2	A
Bromodichloromethane	75-27-4	0.2	2	83	85		2	A
cis-1,3-Dichloropropene	10061-01-5	0.2	2	75	110		2	A
Methyl Isobutyl Ketone	108-10-1	0.5	5	43	58		2	B
n-Octane	111-65-9	0.2	2	43	57	114	2	A
Toluene	108-88-3	0.2	2	92	91		3	A
trans-1,3-Dichloropropene	10061-02-6	0.2	2	75	110		2	A
1,1,2-Trichloroethane	79-00-5	0.2	2	83	97	85	3	A
Tetrachloroethene	127-18-4	0.035	0.40	166	168	129	3	D
Methyl Butyl Ketone	591-78-6	0.5	5	43	58		3	B
Dibromochloromethane	124-48-1	0.2	2	129	127		3	A
1,2-Dibromoethane	106-93-4	0.2	2	107	109		3	A
Nonane	111-84-2	0.2	2	57	71	128	3	A
Chlorobenzene	108-90-7	0.2	2	112	77	114	3	A
Ethylbenzene	100-41-4	0.2	2	91	106		3	A
Xylene (m,p)	1330-20-7	0.5	5	106	91		3	A
Xylene (o)	95-47-6	0.2	2	106	91		3	A
Styrene	100-42-5	0.2	2	104	78		3	A
Bromoform	75-25-2	0.2	2	173	175	171	3	A
Cumene	98-82-8	0.2	2	105	120	77	3	A
1,1,2,2-Tetrachloroethane	79-34-5	0.2	2	83	131	85	3	A
Xylene (total)	1330-20-7	0.2	2	106	91		3	A
n-Decane	124-18-5	0.5	5	57	71	142	3	B
n-Propylbenzene	103-65-1	0.2	2	91	120	92	3	A
1,2,3-Trichoropropane	96-18-4	0.5	5	75	110	112	3	B
4-Ethyltoluene	622-96-8	0.2	2	105	120		3	A
1,3,5-Trimethylbenzene	108-67-8	0.2	2	105	120		3	A
2-Chlorotoluene	95-49-8	0.2	2	91	63		3	A
tert-Butylbenzene	98-06-6	0.2	2	119	91	134	3	A
1,2,4-Trimethylbenzene	95-63-6	0.2	2	105	120		3	A
sec-Butylbenzene	135-98-8	0.2	2	105	134	91	3	A
4-Isopropyltoluene	99-87-6	0.2	2	119	134	91	3	A
1,3-Dichlorobenzene	541-73-1	0.2	2	146	111	148	3	A
1,4-Dichlorobenzene	106-46-7	0.2	2	146	111	148	3	A
n-Undecane	1120-21-4	5	50	57	71	156	3	C
Benzyl Chloride	100-44-7	0.2	2	91	126	65	3	A
n-Butylbenzene	104-51-8	0.2	2	91	134	92	3	A
1,2-Dichlorobenzene	95-50-1	0.2	2	146	111	148	3	A
n-Dodecane	112-40-3	5	50	57	71	170	3	C
1,2,4-Trichlorobenzene	120-82-1	0.5	5	180	182		3	B

Analyte	CAS No.	6L RL (ppbv)	1L RL (ppbv)	Quantifier Mass	Qualifier Mass	Qualifier Mass	ISTD Group	Analyte Group
1,3-Hexachlorobutadiene	87-68-3	0.2	2	225	223		3	A
Naphthalene	91-20-3	0.5	5	128			3	B
1,2,3-Trichlorobenzene	87-61-6	0.2	2	180	182	145	3	A
Propylene	115-07-1	5	50	41	42	39	1	C
Vinyl Acetate	108-05-4	5	50	43	86		1	C
Ethyl Acetate	141-78-6	5	50	43	74		1	C
Ethanol	64-17-5	5	50	46	45		1	E
Bromochloromethane	74-97-5	NA	NA	128	49	130	1	NA
1,4-Difluorobenzene	540-36-3	NA	NA	114			2	NA
Chlorobenzene-d5	3114-55-4	NA	NA	117			3	NA

Table 1B: TO-3 Analyte List, Reporting Limit, Internal Standard and Ion Assignments

Analyte	CAS No.	RL (ppbv)	Qualifier Ion	Qualifier Ion	Qualifier Ion	ISTD Group
n-Octane	111-65-9	0.2	43	57	114	2
Toluene	108-88-3	0.2	92	91		3
TVOC as Toluene	NA	11				NA
GRO as Octane	NA	14				NA
Total Hydrocarbons	NA	76 ug/m3				NA
Internal Standards						
Bromochloromethane	74-97-5	NA	128	49	130	1
1,4-Difluorobenzene	540-36-3	NA	114			2
Chlorobenzene-d5	3114-55-4	NA	117			3

Table 2: Tune Standard Criteria

Mass	Ion Abundance Criteria
50	8.0 to 40.0 percent of mass 95
75	30.0 to 66.0 percent of mass 95
95	Base Peak, 100 percent relative abundance
96	5.0 to 9.0 percent of mass 95
173	Less than 2.0 percent of mass 174
174	50.0 to 120.0 percent of mass 95
175	4.0 to 9.0 percent of mass 174
176	93.0 to 101.0 percent of mass 174
177	5.0 to 9.0 percent of mass 176

Table 3: TO15 QC Summary & Recommended Corrective Action (Routine and DoD)

QC Check	Frequency	Acceptance Critera	Recommended Corrective Action
Tune Standard	Prior to calibration and every 24 hours	See Table 2	Correct Problem. Reanalyze. No samples may be analyzed without a valid tune.
ICAL	Prior to sample analysis and when CCV fails	RSD for each analyte ≤ 30% with 2 exceptions up to 40%	Correct problem and repeat calibration
ICV	Once after each ICAL	%R for all analytes within 70-130	Correct Problem. Reanalyze, re-make, re-verify & re-analyze. If that fails, re-make all standards and repeat calibration.
Retention Time Window	Once per ICAL	NA	NA
RRT	With each sample	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct Problem. Repeat ICAL
CCV	Daily before sample analysis after tune standard	%D ≤ 30	Correct Problem. Reanalyze once. If that fails, see section 10.2.5 for instruction.
Closing CCV	At the end of the analytical sequence, within 24 hours of opening tune acquisition.	%D ≤ 30	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails or if two consecutive CCVs cannot be run, perform corrective action(s) until a passing CCV is attained, and then reanalyze all associated samples since last acceptable CCV. If necessary, perform a new initial calibration and then reanalyze all associated samples since the last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative. With client permission, closing CCV criteria of 50% can be utilized.
LCS	Each batch or every 20 samples, whichever is sooner.	**Routine**: %R for all analytes by statistically generated limits. See Table 4. **DoD**: %R for all analytes by QSM 5.1 limits, see Appendix C.	Reanalyze LCS or re-prep and reanalyze LCS and all associated samples if sufficient sample volume is available. If corrective action not successful, initiate nonconformance report and qualify sample results.
LCSD	Per Client Request or when there is insufficient volume for a sample duplicate	RPD ≤ 25	Reanalyze LCSD or re-prep and reanalyze LCSD and all associated samples if sufficient sample volume is available. If corrective action is not successful, initiate nonconformance report and qualify sample results.
Method Blank	Each batch or every 20 samples, whichever is sooner.	No analytes detected above RL	Reanalyze along with associated samples, unless detects for same compounds found in blank are greater than 10X the concentration found in the blank.
Internal Standard	All standards, field and QC samples	+/- 40% of the mean response over the calibration range. See sec. 10.2.2 RT +/- 0.33 min (20 seconds) from last acceptable calibration.	Inspect system for malfunction. Reanalyze samples. Qualify data.
Sample Duplicate	One per batch of 20 samples or fewer	RPD ≤ 25 when one or both results are greater than five times the RL.	Consult with PM. Reanalyze or qualify data.

Table 4: In-house LCS limits**

Analyte	In-House Lower Limits %R	In-House Upper Limits %R	RPD
1,1,1-Trichloroethane	72	127	25%
1,1,2,2-Tetrachloroethane	74	126	25%
1,1,2-Trichloro-1,2,2-trifluoroethane	70	121	25%
1,1,2-Trichloroethane	75	126	25%
1,1-Dichloroethane	66	130	25%
1,1-Dichloroethene	68	120	25%
1,2,3-Trichlorobenzene	*50	*150	25%
1,2,3-Trichloropropane	71	125	25%
1,2,4-Trichlorobenzene	*50	*150	25%
1,2,4-Trimethylbenzene	71	129	25%
1,2-Dichloro-1,1,2,2-tetrafluoroethane	71	141	25%
1,2-Dichlorobenzene	68	129	25%
1,2-Dichloroethane	68	135	25%
1,2-Dichloroethene, Total	73	126	25%
1,2-Dichloropropane	69	128	25%
1,3,5-Trimethylbenzene	72	126	25%
1,3-Dichlorobenzene	69	131	25%
1,4-Dichlorobenzene	67	132	25%
1,4-Dioxane	66	129	25%
2-Butanone (MEK)	72	124	25%
2-Chlorotoluene	74	126	25%
2-Hexanone	57	143	25%
2-Methyl-2-propanol	66	132	25%
2-Methylbutane	56	150	25%
3-Chloro-1-propene	*50	*150	25%
4-Ethyltoluene	75	129	25%
4-Isopropyltoluene	68	130	25%
4-Methyl-2-pentanone (MIBK)	58	144	25%
Acetone	54	154	25%
Acetonitrile	60	154	25%
Acrolein	*50	*150	25%
Acrylonitrile	65	140	25%
Alpha Methyl Styrene	71	132	25%
Benzene	73	119	25%
Benzyl chloride	60	136	25%
Bromoform	53	149	25%
Bromomethane	72	124	25%
Butadiene	58	139	25%

Analyte	In-House Lower Limits %R	In-House Upper Limits %R	RPD
Butane	53	151	25%
Carbon disulfide	71	138	25%
Carbon tetrachloride	71	133	25%
Chlorobenzene	76	119	25%
Chlorodibromomethane	73	125	25%
Chlorodifluoromethane	60	147	25%
Chloroethane	68	130	25%
Chloroform	73	124	25%
Chloromethane	56	141	25%
cis-1,2-Dichloroethene	72	121	25%
cis-1,3-Dichloropropene	74	125	25%
Cyclohexane	76	124	25%
Dibromomethane	68	126	25%
Dichlorobromomethane	75	127	25%
Dichlorodifluoromethane	61	142	25%
Dodecane	*50	*150	25%
Ethanol	*50	*150	25%
Ethyl acetate	70	131	25%
Ethyl ether	71	143	25%
Ethylbenzene	74	122	25%
Ethylene Dibromide	78	122	25%
Hexachlorobutadiene	58	130	25%
Hexane	63	138	25%
Isooctane	68	131	25%
Isopropyl alcohol	53	142	25%
Isopropylbenzene	73	123	25%
Methyl methacrylate	73	129	25%
Methyl tert-butyl ether	70	127	25%
Methylene Chloride	59	137	25%
m-Xylene & p-Xylene	76	121	25%
Naphthalene	*50	*150	25%
n-Butanol	50	156	25%
n-Butylbenzene	65	137	25%
n-Decane	68	134	25%
n-Heptane	60	142	25%
n-Nonane	70	131	25%
n-Octane	62	144	25%
N-Propylbenzene	73	127	25%
o-Xylene	73	123	25%

Analyte	In-House Lower Limits %R	In-House Upper Limits %R	RPD
Pentane	59	152	25%
Propene	*50	*150	25%
sec-Butylbenzene	70	128	25%
Styrene	74	125	25%
tert-Butylbenzene	71	125	25%
Tetrachloroethene	70	125	25%
Tetrahydrofuran	60	149	25%
Toluene	75	122	25%
trans-1,2-Dichloroethene	69	137	25%
trans-1,3-Dichloropropene	74	128	25%
Trichloroethene	73	122	25%
Trichlorofluoromethane	70	129	25%
Undecane	62	136	25%
Vinyl acetate	59	149	25%
Vinyl bromide	75	125	25%
Vinyl chloride	61	135	25%
Xylenes, Total	75	122	25%
1,1,1-Trichloroethane	72	127	25%
1,1,2,2-Tetrachloroethane	74	126	25%

*These are poor performing compounds. Limits for poor performing compounds will be no wider than 50-150%.
**The limits in this table are those in effect as of the published date of this SOP. These limits are based on historical data and are subject to change. Current in-house limits are populated in the LIMS database. Contact a laboratory representative for the most current set of limits. Limit Ref: 2019CCTO15

Appendix A: Terms and Definitions

Acceptance Criteria: Specified limits placed on characteristics of an item, process or service defined in requirement documents.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Analyte: The specific chemicals or components for which a sample is analyzed. (EPA Risk Assessment Guide for Superfund, OSHA Glossary).

Batch: Environmental samples that are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation/digestion batch is composed of one to 20 environmental samples of similar matrix, meeting the above criteria. An analytical batch is composed of prepared environmental samples (extracts, digestates and concentrates), which are analyzed together as a group.

Calibration: a set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values realized by the standards.

Calibration Curve: the graphical relationship between the known values or a series of calibration standards and their instrument response.

Calibration Standard: A substance or reference used to calibrate an instrument.

Continuing Calibration Verification (CCV): An analytical standard gas mixture containing all target analytes and internal standard compounds that is used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

Corrective Action: the action taken to eliminate the cause of an existing nonconformity, defect or other undesirable occurrence in order to prevent recurrence.

Cryogen: A refrigerant used to obtain very low temperatures in the cryogenic trap of the analytical system. A typical cryogen is liquid nitrogen (bp -195.8℃) or liquid argon (bp -185.7℃).

Demonstration of Capability (DOC): procedure to establish the ability to generate acceptable accuracy and precision.

Holding Time: the maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.

Initial Calibration: Analysis of analytical standards for a series of different specified concentrations used to define the quantitative response, linearity and dynamic range of the instrument to target analytes.

Initial Calibration Verification (ICV): An analytical standard mixture containing all target analytes and internal standard compounds that are prepared from a source independent of the source of the initial calibration standards. The purpose of the ICV is to verify that the initial calibration is in control.

Intermediate Standard: a solution made from one or more stock standards at a concentration between the stock and working standard. Intermediate standards may be certified stock standard solutions purchased from a vendor and are also known as secondary standards.

Internal Standards (IS): Non-target analytes that are similar to the target analytes but are not expected to be found in environmental media (generally, isotopically labeled target analytes are used for this purpose). IS are added to every standard, quality control sample, and field sample at a known concentration prior to analysis. IS responses are used as the basis for quantitation of target analytes.

Laboratory Control Sample (LCS) – A QC sample of known composition spiked with analytes of interest. The LCS evaluates method performance and ability to successfully recover target analytes from a clean matrix. LCS recovery is typically expressed as percent recovery and provides a measure of accuracy. A LCSD is a duplicate LCS prepared and analyzed from a separate canister to provide a measure of replicate precision.

Method Blank (MB): A canister of humidified ultra pure zero air that is treated exactly as a sample. The MBLK is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific measurement system. The MDL is a statistical estimation at a specified confidence interval of the concentration at which relative uncertainty is ±100%. The MDL represents a range where qualitative detection occurs. Quantitative results are not produced in this range.

Non-conformance: an indication, judgment, or state of not having met the requirements of the relevant specification, contract or regulation.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.

Quality Control Sample (QC): a sample used to assess the performance of all or a portion of the measurement system.

Reporting Limit (RL): the level to which data is reported for a specific test method and/or sample.

Stock Gas Mixture: A Commercially purchased concentrated gas mixture containing one or more method analytes

Appendix B: Standard Preparation Tables

The standard formulations contained in this appendix are recommended and are subject to change. If the concentration or volume of any of the stock standard changes, the standard preparation instructions must be adjusted accordingly. See laboratory SOP BR-QA-002 *Standard Preparation* for further guidance on the preparation of standard solutions.

Prepare all standards using the McMillan Company 80SD mass flow controller. Prepare the standard in zero air, demonstrated to be analyte free. Store the standard at ambient temperature. Unless otherwise specified, assign an expiration date of 30 days from date of preparation unless the parent standard expires earlier, in which case, use the earliest expiration date.

Intermediate Calibration Standard

Parent Standard	Vendor	Stock Standard Concentration (ppmv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Custom Calibration Stock Standard	Spectra Gases Custom Made	1.0	7500	37.5	200

Prepare in 15 L Summa Canister Expiration Period 3months
This standard contains all the target analytes listed in table 1.

Working Calibration Standards

Parent Standard	Calibration Standard	Parent Standard Concentration (ppbv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Cal Standard 20 ppbv	Cal Standard 0.2 ppbv	20	155	15.46	0.2
Cal Standard 20 ppbv	Cal Standard 0.5 ppbv	20	386	15.46	0.5
Intermediate Calibration Standard	Cal Standard 5 ppbv	200	386	15.46	5
Intermediate Calibration Standard	Cal Standard 10 ppbv	200	773	15.46	10
Intermediate Calibration Standard	Cal Standard 15 ppbv	200	1160	15.46	15
Intermediate Calibration Standard	Cal Standard 20 ppbv	200	1546	15.46	20
Intermediate Calibration Standard	Cal Standard 40 ppbv	200	3092	15.46	40

Prepare in 6 L Summa Canister Expiration Period 3 months
Each calibration standard contains all the analytes listed in table 1 at the above concentrations.

Intermediate ICV/LCS Standard

Parent Standard	Vendor	Stock Standard Concentration (ppmv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
ICV Stock Standard	Spectra Gases Custom Made	1.0	7500	37.5	200

Prepare in 15L Summa Canister Expiration period 3 months
This standard contains all target analytes listed in table 1.

Working ICV/LCS Standard

Parent Standard	Calibration Standard	Stock Standard Concentration (ppbv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Intermediate ICV/LCS Standard	ICV Standard 10 ppbv	200	773	15.46	10

Prepare in 6L Summa Canister Expiration period 3 months

This standard contains all target analytes listed in table 1.

Initial Calibration Levels

Calibration Level	Working Calibration Standard	Volume Analyzed (mL)	Concentration on Column (ppbv)
Calibration Level 1	Cal Standard 0.2 ppbv	40	0.04
Calibration Level 2	Cal Standard 0.2 ppbv	200	0.2
Calibration Level 3	Cal Standard 0.5 ppbv	200	0.5
Calibration Level 4	Cal Standard 5 ppbv	200	5
Calibration Level 5	Cal Standard 10 ppbv	200	10
Calibration Level 6	Cal Standard 15 ppbv	200	15
Calibration Level 7	Cal Standard 20 ppbv	200	20
Calibration Level 8	Cal Standard 40 ppbv	200	40
ICV	Intermediate ICV 10ppb	200	10

Prepare in 6L Summa Canister

Intermediate Ethanol Calibration Standard at 500ppbv/v

1) Fill a 44 ml VOA vial with VOA free water. Remove 197ul of water from the vial.
2) Add 197 ul of >99.5% Ethanol neat material
3) Cap and shake/roll vial for 1 minute
4) Inject 10ul of the prepared water/ethanol mix into a fully evacuated 15 liter summa canister
5) Pump the syringe plunger 5 times to insure complete transfer of material
6) Immediately fill the canister to 22 psig with zero air.

Calibration Level	Working Calibration Standard	Volume added (mL)	Concentration on Column (ppbv)
Calibration Level 1	Cal Standard 0.5 ppbv	124	5
Calibration Level 2	Cal Standard 5.0 ppbv	309	10
Calibration Level 3	Cal Standard 10ppbv	464	15
Calibration Level 4	Cal Standard 15 ppbv	618	20
Calibration Level 5	Cal Standard 20 ppbv	1237	40
Calibration Level 6	Cal Standard 40 ppbv	3092	100

Appendix C: DOD QSM 5.1 LCS Limits

Analytes	CAS #	Lower Limit	Upper Limit	Units
Propene	115-07-1	57	136	%
Dichlorodifluoromethane	75-71-8	59	128	%
Chlorodifluoromethane	75-45-6	59	145	%
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	63	121	%
Chloromethane	74-87-3	59	132	%
Butane	106-97-8	64	129	%
Vinyl chloride	75-01-4	64	127	%
Butadiene	106-99-0	66	134	%
Bromomethane	74-83-9	63	134	%
Chloroethane	75-00-3	63	127	%
Vinyl bromide	593-60-2	71	126	%
Trichlorofluoromethane	75-69-4	62	126	%
Ethanol	64-17-5	59	125	%
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	66	126	%
1,1-Dichloroethene	75-35-4	61	133	%
Acetone	67-64-1	58	128	%
Isopropyl alcohol	67-63-0	52	125	%
Carbon disulfide	75-15-0	57	134	%
3-Chloro-1-propene	107-05-1	71	131	%
Methylene Chloride	75-09-2	62	115	%
2-Methyl-2-propanol	75-65-0	24	150	%
Methyl tert-butyl ether	1634-04-4	66	126	%
trans-1,2-Dichloroethene	156-60-5	67	124	%
Hexane	110-54-3	63	120	%
1,1-Dichloroethane	75-34-3	68	126	%
Vinyl acetate	108-05-4	56	139	%
Ethyl acetate	141-78-6	65	128	%
2-Butanone (MEK)	78-93-3	67	130	%
cis-1,2-Dichloroethene	156-59-2	70	121	%
Chloroform	67-66-3	68	123	%
Tetrahydrofuran	109-99-9	64	123	%
1,1,1-Trichloroethane	71-55-6	68	125	%
Cyclohexane	110-82-7	70	117	%
Carbon tetrachloride	56-23-5	68	132	%
Isooctane	540-84-1	68	121	%
Benzene	71-43-2	69	119	%
1,2-Dichloroethane	107-06-2	65	128	%
n-Heptane	142-82-5	69	123	%
Trichloroethene	79-01-6	71	123	%
Methyl methacrylate	80-62-6	70	128	%
1,2-Dichloropropane	78-87-5	69	123	%
1,4-Dioxane	123-91-1	71	122	%
Dichlorobromomethane	75-27-4	72	128	%
cis-1,3-Dichloropropene	10061-01-5	70	128	%
4-Methyl-2-pentanone (MIBK)	108-10-1	67	130	%
Toluene	108-88-3	66	119	%
trans-1,3-Dichloropropene	10061-02-6	75	133	%
1,1,2-Trichloroethane	79-00-5	73	119	%
Tetrachloroethene	127-18-4	66	124	%
2-Hexanone	591-78-6	62	128	%
Chlorodibromomethane	124-48-1	70	130	%
Ethylene Dibromide	106-93-4	74	122	%

Analytes	CAS #	Lower Limit	Upper Limit	Units
Chlorobenzene	108-90-7	70	119	%
Ethylbenzene	100-41-4	70	124	%
m-Xylene & p-Xylene	179601-23-1	61	134	%
o-Xylene	95-47-6	67	125	%
Styrene	100-42-5	73	127	%
Bromoform	75-25-2	66	139	%
Isopropylbenzene	98-82-8	68	124	%
1,1,2,2-Tetrachloroethane	79-34-5	65	127	%
N-Propylbenzene	103-65-1	69	123	%
2-Chlorotoluene	95-49-8	74	130	%
tert-Butylbenzene	98-06-6	65	124	%
1,2,4-Trimethylbenzene	95-63-6	66	132	%
sec-Butylbenzene	135-98-8	68	125	%
4-Isopropyltoluene	99-87-6	67	130	%
1,3-Dichlorobenzene	541-73-1	65	130	%
1,4-Dichlorobenzene	106-46-7	60	131	%
Benzyl chloride	100-44-7	50	147	%
n-Butylbenzene	104-51-8	66	130	%
1,2-Dichlorobenzene	95-50-1	63	129	%
1,2,4-Trichlorobenzene	120-82-1	55	142	%
Hexachlorobutadiene	87-68-3	56	138	%
Naphthalene	91-20-3	57	138	%
1,2,3-Trichloropropane	96-18-4	76	124	%
Acetonitrile	75-05-8	63	132	%
Acrolein	107-02-8	62	126	%
n-Decane	124-18-5	70	118	%
n-Nonane	111-84-2	63	128	%
n-Octane	111-65-9	69	121	%
Dodecane	112-40-3	62	147	%
Undecane	1120-21-4	69	123	%
Pentane	109-66-0	63	131	%
Acrylonitrile	107-13-1	71	137	%
Alpha Methyl Styrene	98-83-9	67	128	%
n-Butanol	71-36-3	62	133	%

ATTACHMENT 3

Roux ‘s Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). Blue ice packs will not be used to transport samples being analyzed for Per- and Polyfluoroalkyl Substances (PFAS). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack; no blue packs for PFAS samples).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap," and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidance to obtain accurate and consistent samples of soil gas.

2.0 MATERIALS/EQUIPMENT

- Teflon or Nylaflow tubing, one-quarter or one-eighth inch diameter sample tubing.
- Swagelok® ¼-inch nut and ferrule sets for connecting the probe tubing to the sampling manifold, as appropriate for the collection method
- Helium leak check equipment, as dictated by Site-specific data quality objectives (DQOs), including the enclosure, helium cylinder (high purity helium), and helium detector (Dialectric MGD is preferred). The enclosure and helium detector may be provided by the driller.
- Air pump for purging and electric supply for the pump (either battery, generator, or power inverter with adapter for car battery). Must be capable of a flow of 200 milliliters per minute (mL/min) and a vacuum of 20" Hg.
- Canister, tedlar bag or syringe, as appropriate for the collection method.

3.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves and plastic sheeting will be changed after each use and discarded in an appropriate manner.

4.0. SITE-SPECIFIC CONSIDERATIONS

Prior to attempting soil gas sampling there should be an understanding of subsurface conditions at the Site. Soil gas samples should be collected in the vadose zone and generally, soil gas samples should not be collected at a depth less than above 5 feet below ground surface (bgs), unless sub-slab soil gas samples are needed. It may also not be feasible to collect soil gas from tighter grain soils with little pore volume, such as clays, and these layers should be avoided.

Soil gas sampling should not be performed until 24-hours after a significant rain event (>1/2 inch of rainfall).

5.0 PROCEDURE

5.1 System Set-up

1. Acquire all the necessary hardware and sampling equipment. Be sure to use one-quarter or one-eighth inch diameter Teflon or Nylaflow sample tubing.

2. Assemble or obtain the necessary fittings and vacuum gauge to create a soil gas probe and sampling manifold (vacuum gauge and valving). This manifold must be clean, free of oils, and flushed free of VOCs prior to use. If appropriate, be sure to place the helium leak check enclosure over the probe, and push the sample tubing through the hole in the cap before attaching the sampling manifold.

3. Adjust the purge system evacuation pump sampling rate to achieve the desired flow rate of 200 mL/min. This should be performed at the outlet of the vacuum pump prior to purging, either by using a suitable flow meter, or determining the amount of time required to fill a 1-liter Tedlar bag.

5.2 Shut-In Test

Prior to purging or sampling, a shut-in test should be conducted to check for leaks in the above-ground sampling system.

1. Assemble the above-ground valves, lines and fittings downstream from the top of the probe.

2. Evacuate the system to a minimum measured vacuum of about 100 inches of water using the purge pump.

3. Observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, adjust the above-ground sampling system until the vacuum is maintained.

5.3 System Leak Checking and Purging

Perform a leak check of the sample manifold system by:

1. Make sure the gas probe valve is off and the sample valves are closed.

2. Open the purge valve and start the purge pump. Verify that the flow is set to 200 mL/min until a vacuum of approximately 15” Hg is achieved.

3. Turn off the purge pump and observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, the leaks must be fixed prior to sampling.

4. Record the leak check date and time on the field notebook.

5.4 Purge Volume Test (Mobile Laboratory Only)

The purpose of the purge volume test is to ensure that stagnant air is removed from the sampling system and to ensure that samples are representative of subsurface conditions. The test well should be located where soil gas concentrations are anticipated to be elevated, if possible.

Perform a purge test of the test well by:

1. Purge the well one purge volume and collect a sample.

2. Have the mobile laboratory analyze the sample for target compounds. Sample procedures are explained in Section 5.6, below.

3. Purge an additional two purge volumes (for a total of 3 purge volumes), collect a sample and submit to the mobile laboratory for analysis.

   a. One purge volume is equal to the sum of the following volumes:

      - The internal volume of tubing;

      - The void space of the sand pack around the probe tip;

      - The void space of the dry bentonite in the annular space.

4. Repeat for a purge of 10 total purge volumes.

5. The site purge volume will be chosen based on the sample with the highest concentration of target compounds from the purge test. All of other sample locations will utilize this purge volume (either one, three, or ten).

5.5 Helium Leak Check (as dictated by DQOs)

The helium leak check procedure is accomplished by:

1. Start the flow of helium under the leak check enclosure. Position the tube so the helium is directed at the interface of the probe and the ground. Let the helium fill the enclosure for a couple of minutes.

2. Turn the helium leak detector on and make sure that the detector is not reading any helium before proceeding.

3. Verify that the helium concentration inside the leak check enclosure is >10% by placing the probe of the helium detector into the hole where the sample tubing comes out or under the enclosure wall. It is not necessary to verify that the helium concentration is 100% as this is bad for the detector.

4. Purging is carried out by pulling soil gas through the system at a rate of 200 mL/min for a time period sufficient to achieve three purge volumes, equal to the sum of the internal volume of the in-ground annular space, sample line, and sampling manifold system.

   Note: When calculating the purge volume, be sure to take into account the inside diameter and length of the sample tubing, as well as the probe outside diameter and retract distance for the annular space for temporary probes. If during the purge (or sampling) the vacuum exceeds 7 "Hg, then reduce the pump flow rate. The system vacuum must stay below this level at all times.

5. To start the soil gas probe purge, open the gas probe valve and close the sample valve at the same time, and start timing. Verify that the flow rate is still 200 mL/min.

6. During the last 5 minutes of the purge (or the entire purge time if less than 5 minutes), attach a Tedlar bag to the purge pump exhaust and open the bag's valve.

7. At the end of the purge time, close the purge valve, close the valve to the Tedlar bag, and turn off the pump.

8. Attach the Tedlar bag to the helium detector and open the valve. If a helium reading of greater than or equal to 5% of the helium concentration inside the leak check enclosure is observed, then the probe leak check has failed and corrective action should be taken.

9. Record the purge date, time, purge rate, leak check result, and purge volume on the field sampling log.

10. Immediately move on to the sampling phase. Little to no delay should occur between purging and sampling.

5.6 Sample Collection

'Clean' sampling protocols must be followed when handling and collecting samples. This requires care in the shipping, storage, and use of sampling equipment. Sharpie markers should not be used for labeling or note-taking during sampling.

1. Attach the canister, tedlar bag or syringe to the sample tubing.

2. Before taking the sample, confirm that the sampling system valves are set as follows: the purge valve is confirmed to be closed, gas probe valve is open, and the sample valve is open.

3. After sampling for the appropriate amount of time, close the sample valve and the canister/tedlar bag valve. Remove the sample container from the sampling manifold.

4. Record the sampling date, time, canister identification (ID), flow controller ID, and any other observation pertinent to the sampling event on the field sampling log. The temperature and barometric pressure should be recorded.

5. Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).

6. Disassemble the sampling system.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner, and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

APPENDIX F

Site Management Forms

Site Inspection Checklist, 110 Dinsmore Place, Brooklyn, New York

Date: ______________________

Completed By: ______________________

Description	Status: Ok	Status: Action Req.	Status: N/A	Actions Taken / Comments
<u>General Site Conditions</u>				
1 Inspect general site conditions.				
<u>Sub-Slab Depressurization System Blower</u>				
A. Aboveground Piping on Roof				
1 Inspect aboveground piping for cracks, leaks and support issues.				
2 Inspect vacuum/pressure gauges and flowmeters for proper operation.				
B. Electrical				
1 Check that the electrical control panel is closed/secured.				
C. Blower Enclosure				
1 Inspect condition of exhaust fan, thermostat and louver.				
D. Knock-out Tank				
1 Check condition of vacuum filter.				
2 Check dilution valve for noises or leaks.				
3 Check for presence of water in knockout tank.				
E. Vapor Phase Carbon Units (If Installed)				
1 Inspect and check pressure gauges.				
2 Check for any leaks on piping, fittings, etc.				
<u>Institutional Controls</u>				
1 Confirm that the site usage is in compliance with the institutional controls.				
<u>Site Records</u>				
1 Inspect site records and confirm that they are up to date (e.g., Site Inspection Checklists and Sub-Slab Depressurization System Operations Logs, sampling logs, etc.)				

SSDS Operations and Maintenance Log, 110 Dinsmore Place, Brooklyn, New York

INSPECTION ITEM DESCRIPTION	Yes	Action Req.	Comments/ Actions Taken
Is the system operating normally?	___	___	___
Are any warning lights on? (Please list those that are on)	___	___	___
If there is an alarm condition, was it fixed and the system restarted?	___	___	___
Is the blower enclosure in good condition?	___	___	___
Is the vacuum filter in good condition?	___	___	___
Does the knock-out tank need to be drained? (Record amount drained)	___	___	___
Are aboveground piping free of cracks, leaks, and support issues?	___	___	___
Are vacuum/pressure gauges at blower operating properly?	___	___	___
Are interior piping free of cracks, leaks, and support issues?	___	___	___
List maintenance activities that were performed or other comments about the system:			

Source of Reading	Units	Values	Comments
Blower Run Time	Hours		
Vacuum at Aboveground Piping (at roof line)	Inches of Water		
MP-1	Inches of Water		
MP-2	Inches of Water		
Knock-Out Tank Vacuum	Inches of Water		
Blower Inlet Vacuum	Inches of Water		
Blower Discharge Pressure	Inches of Water		
Blower Effluent PID Reading	PPMV		
VPGAC Unit Effluent PID Reading (If Applicable)	PPMV		

Form Completed By: ______________________ Signature: __________ Date & Time: ______________________

SDSS Non-Routine Maintenance Form, 110 Dinsmore Place, Brooklyn, New York

DATE	DESCRIPTION OF WORK DONE	CAUSE (Use as many lines as required to define the problem)	Completed By

Soil Vapor Sampling Form

Date: ______________ **Time:** ______________

Weather : ____

Temperature: ______________ Humidity: ______________

Wind Magnitude: ______________ Wind Direction: ______________

Barometric Pressure: ______________ Precipitation: ______________

Sampling Team: ____

Sampling Location: ____________________________

Site Condition (i.e. any adjacent questionable facilities, vent pipes, tanks, etc. and what type of basements are present)

____

____

____

Prior to commencing the sampling activity, remove the brass cap from the end of the sample tubing and fit a new brass hose barb fitting onto the sample tubing.

Calibrate the Helium detection meter

Utility Clearance Completed: ______________

Sampling Depth: ______________ feet below land surface (If ambient air sample, elevate can to approx. 3 ft - 5 ft above land surface)

Sealed with bentonite: ______________

Apparent Moisture Content: ______________

Purge Rate: ______________ Must be less than 0.2 L/min (200 mL/min)

Purge Time: ______________

Helium Rate at enclosure: ______________

Helium Rate from sample tubing: ______________ Is this rate <10% of the rate at the enclosure **Yes / No**

If the Helium readings have a greater ratio than 10% the seals should be rechecked and the tracer gas should be reapplied.

Once the tracer gas screening procedures are completed and no short-circuiting is determined to be present at the location the soil vapor sample can be collected in a lab certified clean summa canister at a rate less than 0.2 L/min.

Is the Summa Canister Certified Clean and within the proper holding time ? Yes

Starting Pressure: ______________ in. of Hg

Starting Time: ______________

Ending Time: ______________

Ending Pressure: ______________ in. of Hg

Summa Canister Identification #: ______________

Flow Regulator ID # ______________

Sample ID # ______________

Time ______________

Analysis ____

Laboratory ____

ROUX

SVE and SDSS System Non-Routine Maintenance Form, Equity One, Garden City, New York

DATE	DESCRIPTION OF WORK DONE	CAUSE (Use as many lines as required to define the problem)	Completed By

APPENDIX G

Remedial System Optimization Table of Contents

APPENDIX [x]

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR [Site Name]

TABLE OF CONTENTS