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REMEDIAL INVESTIGATION WORK PLAN
FORMER GARONE BROS AUTO SERVICE CENTER SITE
352-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

by Haley & Aldrich of New York
New York, New York

for 362 Shepherd Development LLC
145 East 57th Street, 6th Floor
New York, New York 10022

File No. 0201831
October 2021

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13 October 2021
File No. 0201831

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233

Attention: Ms. Jane O'Connell

Subject: Brownfield Cleanup Program Application
Former Garone Bros Auto Service Center Site
352-362 Shepherd Avenue
Brooklyn, New York 11208 (Site)

Dear Ms. O'Connell,

Haley & Aldrich of New York, on behalf of 362 Shepherd Development LLC, is submitting for the review and approval of the New York State Department of Environmental Conservation (NYSDEC) this Remedial Investigation Work Plan (RIWP) for the Former Garone Bros Auto Service Center Site, located at 352-362 Shepherd Avenue in the East New York neighborhood of Brooklyn, NY (Site). This document is being submitted as part of 362 Shepherd Development LLC Brownfield Cleanup Program Application for the Site. This RIWP has been developed based on the NYSDEC's "Technical Guidance for Site Investigation and Remediation" (DER-10 dated May 2010).

Please do not hesitate to contact us if there are any questions regarding this submittal or any other aspects of the project.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

James M. Bellew
James M. Bellew
Senior Associate

Mari Cate Conlon
Mari C. Conlon, P.G.
Project Manager

Cc:

\\haleyaldrich.com\share\CF\Projects\0201831\Deliverables\5. NYSDEC RIWP\2021-1012-HANY-352-362 Shepherd-RIWP-F

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1. Introduction

On behalf of 362 Shepherd Development LLC (Shepherd), Haley & Aldrich of New York (Haley & Aldrich) has prepared this Remedial Investigation Work Plan (RIWP) for the Former Garone Bros Auto Service Center Site, located at 352-362 Shepherd Avenue (see Figure 1) in the East New York neighborhood of Brooklyn, NY (Site). This RIWP is being submitted as part of the Brownfield Cleanup Program (BCP) Application submitted by Shepherd and was prepared in accordance with the regulations and guidance applicable to the BCP.

The Site, identified as Block 3988 Lots 28 on the New York City tax map, is 10,000-square feet and is bounded by residential homes to the north and to the south, Shepherd Avenue followed by a residential home and a miscellaneous garage/parking area to the east, and residential apartments to the west. The Site location is shown in Figure 1. Existing Site features are shown in Figure 2. The Site is a rectangular shaped lot improved with a one-story warehouse/garage building encompassing the entire site footprint with a partial cellar. Attachment 1a of the BCP Application provides a detailed description of the site, historical use, and regulatory history, including a summary of previous site characterization activities.

The Site is currently zoned as R6A for “Residence Districts,” which allows for residential use only. The site is located in an urban area surrounded by commercial and residential properties served by municipal water.

The Site owner plans to redevelop the Site for residential purposes consistent with existing zoning text.

1.1 PURPOSE

A Phase II Subsurface Investigation (SI) was performed at the Site on the 25 and 27 August 2021 to investigate the anticipated contaminants of concern identified based on the Site’s current and former uses as part of the New York City Office of Environmental Remediation (NYCOER) E-Designation Program. The SI partially determined the nature and extent of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals contamination at the Site. Results of previous site characterization activities are summarized in Tables 1, 2 and 3. Details on previous site characterization activities are provided in Section 1.2 and Attachment 1a of the BCP Application.

The site characterization did not comprehensively delineate the extent of contamination on the Site; therefore, additional targeted soil, groundwater, and soil vapor sampling are proposed. A Remedial Investigation (RI) will be performed upon acceptance of the Site into the BCP and approval of this RIWP. Results of the additional sample analyses will be used to confirm the results of the previous site characterization activities, identify a source, and determine a course for remedial action.

2. Background

2.1 CURRENT LAND USE

The Site is currently in the process of being vacated by the existing tenant, Gils Auto Body and Hi-Tech Heating, and improved with a one-story warehouse/garage building encompassing the entire site footprint with a partial cellar located under the office area in the southeast corner of the Site.

2.2 SITE HISTORY

The Site was developed in the late 1880s with several dwellings. In the early 1900s, the Site was used as a toy animal factory and by the late 1920s, the previous Site buildings were razed and began operation as a garage. The Site continued to operate as a garage until the late 1960s/early 1970s. From the late 1970s through the present, the Site was primarily used for auto-related purposes including an auto repair shop and service center, used car sales shop, and a towing center. The Site is currently improved with a one-story warehouse/garage building encompassing the entire Site footprint and is currently occupied by Gils Auto Body and Hi-Tech Heating.

The Site is currently a rectangular-shaped lot with a one-story warehouse/garage building encompassing the entire site footprint with a partial cellar.

Historical ownership of the Site prior to 1967 was Garone Bros Auto Service Center who transferred the property in 1967 to Shepherd Avenue Garage Inc. The Site was then transferred to Bonita Garone in 2000 and again in 2021 to Bondom Corp. In July 2021, 362 Shepherd Development LLC acquired the property.

2.3 SURROUNDING LAND USE

The Site is located in an urban area of the East New York neighborhood of Brooklyn, NY bounded by residential homes to the north and to the south, Shepherd Avenue followed by a residential home and a miscellaneous garage/parking area to the east, and residential apartments to the west. One school, P.S. 345 – Patrolman Robert Bolden, is located at 111 Berriman Street, approximately 300 feet to the east of the site. No hospitals or daycare facilities are located within a 500 ft radius of the site. The properties immediately surrounding the site are zoned R6a/R5B.

2.4 SURROUNDING LAND USE HISTORY

The area surrounding the site was historically manufacturing, warehousing, and auto works from the late 1800s through present day.

2.5 PREVIOUS INVESTIGATIONS

The Phase II Site Investigation (SI), performed by Haley & Aldrich of New York on the 25 and 27 August 2021, included the following scope of work:

1. Desktop review of the dated 03 May 2021 was completed by Singer Environmental Group, LTD on behalf of the former Owner Shea Sigal;
2. Installation of six (6) soil borings across the entire project Site, and collection thirteen (13) soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installation of four (4) groundwater monitoring wells throughout the Site to establish groundwater flow and collection four (4) groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installation of five (5) soil vapor probes around the Site perimeter and collection five (5) samples for chemical analysis.

Full investigation findings are included in Appendix A. A summary of environmental findings of the Limited Phase II Site Investigation includes the following:

1. The stratigraphy of the site, from the surface, down, consists of urban fill material extending to approximately 7 to 8 feet below ground surface (ft bgs), underlain by gray/black sand with varying amounts of silt and clay to approximately 15 ft bgs. Groundwater was encountered at approximately 9 ft bgs.
2. Soil - Five semi-volatile organic compounds (SVOC) including, benzo(a)anthracene (maximum concentration 6 mg/kg), benzo(a)pyrene (maximum concentration 6.6 mg/kg), benzo(b)fluoranthene (maximum concentration 6 mg/kg), dibenzo(a,h)anthracene (maximum concentration 0.81 mg/kg), and indeno(1,2,3-cd)pyrene (maximum concentration 4.8 mg/kg) were identified above RRSCOs in multiple shallow soil samples. Additionally, chrysene was detected above RRSCOs in SB4A (0-2') at a concentration of 6.6 mg/kg. In deep sample SB-3 (10-12'), benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were identified above RRSCOs.

   Several metals were detected above the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Restricted Residential Soil Cleanup Objectives (RRSCOs) in multiple borings including lead at a maximum concentration of 708 mg/kg in SB-2 (0-2') and mercury at a maximum concentration of 30.2 mg/kg, also in SB-2 (0-2'). Zinc was detected above UUSCOs in several shallow samples (maximum 463 mg/kg) and copper (maximum 102 mg/kg) was detected above UUSCOs in two shallow samples, SB-2 (0-2') and SB-3 (0-2'). Arsenic (18.3 mg/kg) and barium (1060 mg/kg) were detected above RRSCOs in soil sample SB-2 (0-2'). Lead was also detected above UUSCOs in one deep soil sample at 169 mg/kg in soil sample SB-3 (10-12').

3. Groundwater - One volatile organic compound (VOC), tetrachloroethene was detected above the NYSEDEC Ambient Water Quality Standards (AWQS) in TW-2 at 5.2 µg/L. Tetrachloroethene was also detected above laboratory detection limits in several other groundwater samples.

   Three dissolved metals were detected above the AWQS in several temporary wells including sodium (maximum 42,800 µg/L), manganese (maximum 679.2 µg/L), and antimony, only detected above the AWQS in TW-3 at 4.3 µg/L.

   All temporary monitoring wells were sampled for emerging contaminants including PFOA/PFAS. Several analytes were detected above the New York Maximum Contaminant Level for Drinking

Water in multiple groundwater samples. Perfluoropentanoic Acid (PFPeA) (maximum 0.0134 µg/L), Perfluorohexanoic Acid (PFHxA) (maximum 0.03 µg/L), Perfluorooctanoic Acid (PFOA) (maximum 0.077 µg/L), Perfluorooctanesulfonic Acid (PFOS) (maximum 0.0248 µg/L) were detected in several groundwater samples above the MCL. Several other PFOA/PFAS compounds were detected only in TW-3 including Perfluorobutanoic Acid (PFBA) at 0.0162 µg/L, Perfluorobutanesulfonic Acid (PFBS) at 0.035 µg/L, and Perfluoroheptanoic Acid (PFHpA) at 0.0173 µg/L. The total concentration of PFOA/PFOS was the greatest in TW-3 at 0.102 µg/L.

4. Soil Vapor - Soil vapor sample results were compared to New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (May 2017) Matrix A, B, and C guidance values. No soil vapor sample results exceeded these guidance values. Tetrachloroethene was detected at 17.2 µg/m^3 in SV-4, below the guidance value of 100 µg/m^3 and methylene chloride was detected at 6.15 µg/m^3 also below the guidance value of 100 µg/m^3.

3. Remedial Investigation

This section describes the field activities to be conducted during the RI and provides the sampling scope, objectives, methods, anticipated number of samples, and sample locations. A summary of the sampling and analysis plan is provided in Table 4 and Figure 3. The following activities will be conducted to fill data gaps and determine the nature and extent of contamination at the site.

3.1 BUILDING DEMOLITION

The existing structure prohibits the implementation of a comprehensive remedial investigation due to configuration of the interior structural walls, low ceilings, and the depth to the water table (estimated at 25 ft bgs). The building demolition will also facilitate the implementation of a sitewide Ground Penetrating Radar (GPR) scan to evaluate the potential presence of historical tanks as detailed below in section 3.2.

3.2 UTILITY MARKOUT

A full GPR scan will be performed prior to commencement of any intrusive activities. The GPR scan will potentially identify any underground structures including, but not limited to, utilities and underground storage tanks, in preparation of the proposed sampling work. There was a gasoline tank present in the eastern portion of the site near Shepherd Avenue indicated in Sanborn Fire Insurance Maps dated from 1928 through 1968. There is no documentation regarding the size of the tank, closure status, or proper removal of the tank.

It is noted that borings may be adjusted based on the results of the GPR scan and any adjustments to the locations presented below will be transmitted to the NYSDEC. Field personnel will mobilize to the site to stake (with flagging or paint) the proposed soil sample locations. Once the sample locations are marked, Dig Safely New York will be contacted to mark underground utilities. If necessary, the adjacent property owners and private vendors will be contacted for assistance with a mark out of utilities. Once the utilities are marked, field equipment and personnel will be mobilized to the site.

3.3 SOIL SAMPLING

To further characterize surface soil conditions, additional on-Site soil samples will be collected to meet NYSDEC DER-10 requirements for remedial investigations.

The sampling and analysis plan is summarized in Table 4. A total of 11 soil borings will be installed to 12 ft bgs. by a track-mounted direct-push drill rig (Geoprobe®) operated by a licensed operator. Soil samples will be collected from acetate liners using a stainless-steel trowel or sampling spoon. Samples will be collected using laboratory provided clean bottle ware. VOC grab samples will be collected using terra cores.

Soils will be logged continuously by a geologist or engineer using the Unified Soil Classification System. The presence of staining, odors, and photoionization detector (PID) response will be noted. Samples will be collected using laboratory-provided clean bottle ware. VOC grab samples will be collected using terra cores. Sampling methods are described in the Field Sampling Plan (FSP) provided as Appendix B. A Quality Assurance Project Plan (QAPP) is provided as Appendix C. Laboratory data will be reported in ASP Category B deliverable format.

Soil samples representative of Site conditions will be collected at five locations widely distributed across the site, as shown in Figure 3. Samples will be collected from the surface at 0 to 6 inches bgs. and from the groundwater interface at 10 to 12 ft bgs. Additional samples will be collected from any interval exhibiting elevated PID readings or visual and olfactory impacts. Soil samples will be analyzed for:

- Target Compound List (TCL) VOCs using EPA method 8260B
- TCL SVOCs using EPA method 8270C
- Total Analyte List (TAL) Metals using EPA method 6010
- PCBs using EPA method 8082
- TCL Pesticides EPA method 8081B
- Per- and polyfluoroalkyl substances (PFAS) by EPA Method 537.1
- 1,4-dioxane by EPA Method 8270 SIM

Samples to be analyzed for PFAS and 1,4-dioxane will be collected and analyzed in accordance with the Sampling for “1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFAS) Under DECs Part 375 Remedial Programs,” respectively.

3.4 GROUNDWATER SAMPLING

The purpose of the groundwater sampling is to obtain current groundwater data and analyze for additional parameters (i.e., per- and polyfluoroalkyl substances [PFAS] and 1,4-dioxane) to meet NYSDEC DER-10 requirements for remedial investigations.

Four two-inch permanent monitoring wells will be installed to 30 ft bgs. Monitoring wells will have a 2-inch annular space and be installed using either #0 or #00 certified clean sand fill. Wells will be screened from 20 to 30 ft bgs. Monitoring wells will be developed by surging a pump in the well several times to pull fine-grained material from the well. Development will be completed until the water turbidity is 50 nephelometric turbidity units (NTU) or less or ten well volumes are removed, if possible. Well development will occur at least one week after monitoring well installation. The well casings will be surveyed by a New York State licensed surveyor to facilitate the preparation of a groundwater contour map and to determine the direction of groundwater flow.

The sampling and analysis plan is summarized in Table 4. Well locations are provided in Figure 3.

Monitoring wells will be sampled and analyzed for:

- TCL VOCs using EPA method 8260B;
- TCL SVOCs using EPA method 8270C;
- Total Metals using EPA methods 6010/7471;
- PFAS using EPA method 537; and
- 1,4-Dioxane using EPA method 8260B.

Samples to be analyzed for PFAS and 1,4-dioxane will be collected and analyzed in accordance with the NYSDEC issued January 2020 “Guidelines for sampling and Analysis of PFAS” and the June 2019 Sampling for “1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFAS) Under DECs Part 375 Remedial Programs,” respectively.

Groundwater wells will be sampled using low-flow sampling methods described in the Field Sampling Plan (FSP). Following the low-flow purge, samples will be collected from monitoring wells for analysis of the analytes mentioned above. Groundwater sampling will be conducted at least one week after monitoring well development.

The FSP presented in Appendix B details field procedures and protocols that will be followed during field activities. The QAPP presented in Appendix C details the analytical methods and procedures that will be used to analyze samples collected during field activities. Select wells to be sampled for PFAS will be done following the purge and sampling method detailed in the NYSDEC guidance documents (see Appendix D).

3.5 INVESTIGATION DERIVED WASTE

Following sample collection, boreholes that are not converted to monitoring wells will be backfilled with soil cutting and an upper bentonite plug. Boreholes will be restored to grade with the surrounding area. If soil is identified as grossly contaminated, it will be separated and placed into a sealed and labeled Department of Transportation (DOT) approved 55-gallon drum pending characterization and offsite disposal. Groundwater purged from the monitoring wells during development and sample collected will be placed into a DOT approved 55-gallon drum pending offsite disposal.

3.6 SOIL VAPOR SAMPLING

Samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH October 2006). Six soil vapor probes will be installed to approximately 12 ft. bgs, or approximately one to two feet above the groundwater interface (if encountered above 12 ft bgs, estimated to be at 25 ft bgs). The vapor implants will be installed with a direct-push drilling rig (e.g., Geoprobe®) to advance a stainless-steel probe to the desired sample depth. Sampling will occur for the duration of two (2) hours.

Samples will be collected in appropriately sized Summa canisters that have been certified clean by the laboratory, and samples will be analyzed by using USEPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 L/min. Sampling methods are described in the Field Sampling Plan (FSP) provided as Appendix B.

3.7 PROPOSED SAMPLING RATIONALE

Haley & Aldrich has proposed the sample plan described herein and as shown in Figure 3, in consideration of the data generated during the Phase II Site Investigation (NYCOER) performed on the 25 and 27 August 2021. During the Phase II Site Investigation, Haley & Aldrich installed soil borings, temporary groundwater monitoring wells and soil vapor points throughout the site. The sampling map from the Phase II Site Investigation (included in Appendix A) shows data gaps throughout the Site, including an incomplete GPR scan to evaluate the potential for remaining chemical or petroleum related storage from historical site usage, and provides no analytical information for higher risk areas during historical site operations. Further, SB-3 identified elevated SVOCs and lead at 10 to 12 ft bgs that will be further evaluated.

4. Quality Assurance and Quality Control

Quality Assurance/Quality Control (QA/QC) procedures will be used to provide performance information with regard to the accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix or by laboratory techniques that may have introduced systematic or random errors to the analytical process.

QA/QC procedures are defined in the QAPP included in Appendix C.

5. Data Use

5.1 DATA SUBMITTAL

Analytical data will be supplied in ASP Category B Data Packages if more stringent than those suggested by the United States Environmental Protection Agency, the laboratory’s in-house QA/QC limits will be utilized. Validated data will be submitted to the NYSDEC EQuIS database in an EDD package.

5.2 DATA VALIDATION

Data packages will be sent to a qualified data validation specialist to evaluate the accuracy and precision of the analytical results. A Data Usability Summary Report (DUSR) will be created to confirm the compliance of methods with the protocols described in the NYSDEC Analytical service Protocol (ASP). DUSRs will summarize and confirm the usability of the data for project-related decisions. Data validation will be completed in accordance with the DUSR guidelines from the NYSDEC Division of Environmental Remediation. DUSRs will be included with the submittal of a Remedial Investigation Report (RIR), further discussed in Section 8.

6. Project Organization

A project team for the site has been created based on qualifications and experience with personnel suited for successfully completing the project.

The NYSDEC designated Case Manager (to be determined) will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDEC.

The NYSDOH designated Case Manager (to be determined) will be responsible for overseeing the successful completion of the project work and adherence to the work plan on behalf of NYSDOH.

James Bellew will be the Qualified Environmental Professional and Principal in Charge for this work. In this role, Mr. Bellew will be responsible for the overall completion of each task as per the requirements outlined in this work plan and accordance with the DER-10 guidance.

Emily Snead will be the Project Manager for this work. In this role, Ms. Snead will manage the day-to-day tasks, including coordination and supervision of field engineers and scientists, adherence to the work plan, and oversight of the project schedule. As the Project Manager, Ms. Snead will also be responsible for communications with the NYSDEC Case Manager regarding project status, schedule, issues, and updates for project work.

Yanxia Lin will be the field geologist responsible for implementing the field effort for this work. Mrs. Lin's responsibilities will include implementing the work plan activities and directing the subcontractors to ensure successful completion of all field activities.

The drilling subcontractor will be Coastal Environmental Solutions. Coastal Environmental Solutions will provide a geoprobe operator to implement the scope of work in this RIWP.

The analytical laboratory will be Alpha Analytical of Westborough, MA, a New York Environmental Laboratory Approval Program (ELAP) certified laboratory. Alpha Analytical will be responsible for analyzing samples as per the analyses and methods identified in Section 2.

7. Health and Safety

7.1 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been prepared in accordance with NYSDEC and NYSDOH guidelines and is provided as Appendix E of this work plan. The HASP includes a description of health and safety protocols to be followed by Haley & Aldrich field staff during implementation of the remedy, including monitoring within the work area, along with response actions should impacts be observed. The HASP has been developed in accordance with Occupational Health and Safety Administration (OSHA) 40 CFR Part 1910.120 regulatory requirements for use by Haley & Aldrich field staff that will work at the site during planned activities. Contractors or other personnel who perform work at the site are required to develop their own health and safety plan and procedures of comparable or higher content for their respective personnel in accordance with relevant OSHA regulatory requirements for work at hazardous waste sites as well as the general industry as applicable based on the nature of work being performed.

7.2 COMMUNITY AIR MONITORING PLAN

The proposed investigation work will be completed outdoors at the site. Where intrusive drilling operations are planned, community air monitoring will be implemented to protect the downwind receptors. A Haley & Aldrich representative will continually monitor the breathing air in the vicinity of the immediate work area using a PID to measure total volatile organic compounds in the air at concentrations as low as 1 part per million (ppm). The air in the work zone also will be monitored for visible dust generation.

If VOC measurements above 5 ppm are sustained for 15 minutes or visible dust generation is observed, the intrusive work will be temporarily halted, and a more rigorous monitoring of VOCs and dust using recordable meters will be implemented in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP). CAMP data will be provided to NYSDEC in the daily reports, further detailed in Section 8.

8. Reporting

Daily reports will be submitted to NYSDEC and NYSDOH summarizing the Site activities completed during the remedial investigation. Daily reports will include a Site figure, a description of Site activities, a photo log, and CAMP data. Daily reports will be submitted the following morning after Site work is completed.

Following the completion of the work, a summary of the RI will be provided to NYSDEC in a Remedial Investigation Report (RIR) to support the implementation of proposed remedial action. The report will include:

- Summary of the RI activities;
- Figure showing sampling locations;
- Tables summarizing laboratory analytical results;
- Laboratory analytical data reports;
- Field sampling data sheets;
- Findings regarding the nature and extent of contamination at the site; and
- Conclusions and recommendations.

The RIR may be combined with the Remedial Action Work Plan (RAWP) as an RIR/RAWP. The RIR/RAWP will include all data collected during the RI and adhere to the technical requirements of DER-10.

9. Schedule

The Site owner plans to implement this RIWP promptly upon execution of a Brownfield Cleanup Agreement and after approval of the RIWP.

Anticipated RI Schedule	
RIWP and 30-Day Public Comment Period (concurrent with BCP application)	November 2021-December 2021
Executed Brownfield Cleanup Agreement	December 2021-January 2022
NYSDEC Approval of RIWP	January 2022
RI Implementation	January-February 2022
Interim Remedial Measure (IRM) Work Plan (WP) /Change of Use Notification	February 2022
IRM Implementation/Change of Use Foundation Element	May 2022
RIR/RAWP Submittal and 45-Day Public Comment Period	March 2022 -June 2022
NYSDEC Approval of RIR/RAWP	June 2022-July 2022

References

1. Brownfield Cleanup Program Application. Former Garone Bros Auto Center, prepared by 362 Shepherd Development LLC & Haley & Aldrich of New York, prepared for the New York State Department of Environmental Conservation. Submitted October 2021.
2. ASTM Phase I Environmental Site Assessment, 352-362 Shepherd Avenue, Brooklyn, New York. Prepared by Singer Environmental Group, prepared for Shea Segal, May 2021.
3. Remedial Investigation Report, 352-362 Shepherd Avenue, Brooklyn, New York. Prepared by Haley & Aldrich of New York, prepared for 362 Shepherd Development LLC, September 2021.
4. Program Policy DER-10, “Technical Guidance for Site Investigation and Remediation,” New York State Department of Environmental Conservation, May 2010.

TABLES

Table 1.
352-362 Shepherd Avenue, Brooklyn, NY
Soil Analytical Results

LOCATION				**SB-1 (0-2')**		**SB-1 (10-12')**		**SB-2 (0-2')**		**SB-2 (10-12')**		**SB-3 (0-2')**		**SB-3 (10-12')**		**SB-4 (0-2')**	
SAMPLING DATE				**8/25/2021**		**8/25/2021**		**8/25/2021**		**8/25/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**	
LAB SAMPLE ID				**L2145699-07**		**L2145699-08**		**L2145699-01**		**L2145699-02**		**L2146283-03**		**L2146283-02**		**L2146283-05**	
SAMPLE TYPE				**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**	
	NY-RESRR	**NY-UNRES**	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
General Chemistry																	
Solids, Total			%	93.4		97.5		89.6		95.6		92.2		88.4		93	
Organochlorine Pesticides by GC																	
Delta-BHC	100	0.04	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Lindane	1.3	0.1	mg/kg	0.000675	U	0.000675	U	0.00143	U	0.000675	U	0.000707	U	0.00071	U	0.000692	U
Alpha-BHC	0.48	0.02	mg/kg	0.000675	U	0.000675	U	0.00143	U	0.000675	U	0.000707	U	0.00071	U	0.000692	U
Beta-BHC	0.36	0.036	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Heptachlor	2.1	0.042	mg/kg	0.00081	U	0.00081	U	0.00171	U	0.00081	U	0.000848	U	0.000852	U	0.00083	U
Aldrin	0.097	0.005	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Heptachlor epoxide			mg/kg	0.00304	U	0.00304	U	0.00643	U	0.00304	U	0.00318	U	0.0032	U	0.00311	U
Endrin	11	0.014	mg/kg	0.000675	U	0.000675	U	0.00143	U	0.000675	U	0.000707	U	0.00071	U	0.000692	U
Endrin aldehyde			mg/kg	0.00202	U	0.00202	U	0.00428	U	0.00202	U	0.00212	U	0.00213	U	0.00208	U
Endrin ketone			mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Dieldrin	0.2	0.005	mg/kg	0.00101	U	0.00101	U	0.00214	U	0.00101	U	0.00106	U	0.00106	U	0.00104	U
4,4'-DDE	8.9	0.0033	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
4,4'-DDD	13	0.0033	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
4,4'-DDT	7.9	0.0033	mg/kg	0.00304	U	0.00304	U	0.00643	U	0.00304	U	0.00318	U	0.0032	U	0.00311	U
Endosulfan I	24	2.4	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Endosulfan II	24	2.4	mg/kg	0.00162	U	0.00162	U	0.00343	U	0.00162	U	0.0017	U	0.0017	U	0.00166	U
Endosulfan sulfate	24	2.4	mg/kg	0.000675	U	0.000675	U	0.00143	U	0.000675	U	0.000707	U	0.00071	U	0.000692	U
Methoxychlor			mg/kg	0.00304	U	0.00304	U	0.00643	U	0.00304	U	0.00318	U	0.0032	U	0.00311	U
Toxaphene			mg/kg	0.0304	U	0.0304	U	0.0643	U	0.0304	U	0.0318	U	0.032	U	0.0311	U
cis-Chlordane	4.2	0.094	mg/kg	0.00202	U	0.00202	U	0.00428	U	0.00202	U	0.00212	U	0.00213	U	0.00208	U
trans-Chlordane			mg/kg	0.00202	U	0.00202	U	0.00428	U	0.00202	U	0.00212	U	0.00213	U	0.00208	U
Chlordane			mg/kg	0.0135	U	0.0135	U	0.0286	U	0.0135	U	0.0141	U	0.0142	U	0.0138	U
Polychlorinated Biphenyls by GC																	
Aroclor 1016	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1221	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1232	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1242	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1248	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1254	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1260	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0152	J
Aroclor 1262	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
Aroclor 1268	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0351	U
PCBs, Total	1	0.1	mg/kg	0.0346	U	0.0337	U	0.0369	U	0.0344	U	0.0352	U	0.0362	U	0.0152	J
Semivolatile Organics by GC/MS																	
Acenaphthene	100	20	mg/kg	0.3		0.13	U	0.22		0.14	U	0.2		0.6		0.14	U
1,2,4-Trichlorobenzene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Hexachlorobenzene	1.2	0.33	mg/kg	0.11	U	0.1	U	0.11	U	0.1	U	0.11	U	0.11	U	0.11	U
Bis(2-chloroethyl)ether			mg/kg	0.16	U	0.15	U	0.16	U	0.15	U	0.16	U	0.17	U	0.16	U
2-Chloronaphthalene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
1,2-Dichlorobenzene	100	1.1	mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
1,3-Dichlorobenzene	49	2.4	mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
1,4-Dichlorobenzene	13	1.8	mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
3,3'-Dichlorobenzidine			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2,4-Dinitrotoluene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2,6-Dinitrotoluene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Fluoranthene	100	100	mg/kg	5.4		0.1	U	6.4		0.1	U	8	E	4.4		0.58	
4-Chlorophenyl phenyl ether			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
4-Bromophenyl phenyl ether			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Bis(2-chloroisopropyl)ether			mg/kg	0.21	U	0.2	U	0.22	U	0.2	U	0.22	U	0.22	U	0.21	U
Bis(2-chloroethoxy)methane			mg/kg	0.19	U	0.18	U	0.2	U	0.18	U	0.19	U	0.2	U	0.19	U
Hexachlorobutadiene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Hexachlorocyclopentadiene			mg/kg	0.51	U	0.48	U	0.52	U	0.49	U	0.51	U	0.54	U	0.51	U
Hexachloroethane			mg/kg	0.14	U	0.13	U	0.14	U	0.14	U	0.14	U	0.15	U	0.14	U
Isophorone			mg/kg	0.16	U	0.15	U	0.16	U	0.15	U	0.16	U	0.17	U	0.16	U
Naphthalene	100	12	mg/kg	0.22		0.17	U	0.37		0.17	U	0.072	J	0.1	J	0.22	
Nitrobenzene			mg/kg	0.16	U	0.15	U	0.16	U	0.15	U	0.16	U	0.17	U	0.16	U
NDPA/DPA			mg/kg	0.14	U	0.13	U	0.14	U	0.14	U	0.14	U	0.15	U	0.14	U
n-Nitrosodi-n-propylamine			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Bis(2-ethylhexyl)phthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Butyl benzyl phthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Di-n-butylphthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Di-n-octylphthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Diethyl phthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Dimethyl phthalate			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Benzo(a)anthracene	1	1	mg/kg	3		0.1	U	2.7		0.1	U	3.5		2.4		0.25	
Benzo(a)pyrene	1	1	mg/kg	3		0.13	U	3.4		0.14	U	3		1.8		0.35	
Benzo(b)fluoranthene	1	1	mg/kg	3.7		0.1	U	4.6		0.1	U	4.4		2.2		0.82	
Benzo(k)fluoranthene	3.9	0.8	mg/kg	1		0.1	U	1.2		0.1	U	1.3		0.73		0.15	
Chrysene	3.9	1	mg/kg	3.1		0.1	U	3.2		0.1	U	3.5		2.1		0.46	
Acenaphthylene	100	100	mg/kg	0.21		0.13	U	0.27		0.14	U	0.54		0.15	U	0.063	J
Anthracene	100	100	mg/kg	0.82		0.1	U	0.48		0.1	U	0.9		1.3		0.051	J
Benzo(ghi)perylene	100	100	mg/kg	1.5		0.13	U	2.4		0.14	U	1.8		0.75		0.47	
Fluorene	100	30	mg/kg	0.29		0.17	U	0.18		0.17	U	0.39		0.53		0.18	U
Phenanthrene	100	100	mg/kg	3.7		0.1	U	3.8		0.1	U	6.4		4.1		0.31	
Dibenzo(a,h)anthracene	0.33	0.33	mg/kg	0.37		0.1	U	0.52		0.1	U	0.46		0.26		0.093	J
Indeno(1,2,3-cd)pyrene	0.5	0.5	mg/kg	1.7		0.13	U	2.7		0.14	U	2.2		1		0.51	
Pyrene	100	100	mg/kg	5.7		0.1	U	6		0.1	U	6.7		3.8		0.53	
Biphenyl			mg/kg	0.4	U	0.38	U	0.048	J	0.39	U	0.41	U	0.43	U	0.4	U
4-Chloroaniline			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2-Nitroaniline			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
3-Nitroaniline			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
4-Nitroaniline			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Dibenzofuran	59	7	mg/kg	0.21		0.17	U	0.2		0.17	U	0.29		0.3		0.023	J
2-Methylnaphthalene			mg/kg	0.13	J	0.2	U	0.11	J	0.2	U	0.076	J	0.12	J	0.083	J
1,2,4,5-Tetrachlorobenzene			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Acetophenone			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.071	J
2,4,6-Trichlorophenol			mg/kg	0.11	U	0.1	U	0.11	U	0.1	U	0.11	U	0.11	U	0.11	U
p-Chloro-m-cresol			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2-Chlorophenol			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2,4-Dichlorophenol			mg/kg	0.16	U	0.15	U	0.16	U	0.15	U	0.16	U	0.17	U	0.16	U
2,4-Dimethylphenol			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2-Nitrophenol			mg/kg	0.38	U	0.36	U	0.39	U	0.37	U	0.39	U	0.4	U	0.38	U
4-Nitrophenol			mg/kg	0.25	U	0.23	U	0.25	U	0.24	U	0.25	U	0.26	U	0.25	U
2,4-Dinitrophenol			mg/kg	0.85	U	0.8	U	0.87	U	0.82	U	0.86	U	0.9	U	0.85	U
4,6-Dinitro-o-cresol			mg/kg	0.46	U	0.43	U	0.47	U	0.44	U	0.47	U	0.49	U	0.46	U
Pentachlorophenol	6.7	0.8	mg/kg	0.14	U	0.13	U	0.14	U	0.14	U	0.14	U	0.15	U	0.14	U
Phenol	100	0.33	mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
2-Methylphenol	100	0.33	mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
3-Methylphenol/4-Methylphenol	100	0.33	mg/kg	0.26	U	0.24	U	0.047	J	0.24	U	0.26	U	0.27	U	0.26	U
2,4,5-Trichlorophenol			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Benzoic Acid			mg/kg	0.58	U	0.54	U	0.58	U	0.55	U	0.58	U	0.61	U	0.57	U
Benzyl Alcohol			mg/kg	0.18	U	0.17	U	0.18	U	0.17	U	0.18	U	0.19	U	0.18	U
Carbazole			mg/kg	0.36		0.17	U	0.46		0.17	U	0.36		0.4		0.043	J
1,4-Dioxane	13	0.1	mg/kg	0.027	U	0.025	U	0.027	U	0.026	U	0.027	U	0.028	U	0.027	U

Notes:

Yellow shaded results exceed Unrestricted SCOs

Red shaded results exceed both Unrestricted and Restricted Residential SCOs

NY-RESRR: New York NYCRR Part 375 Restricted-Residential Criteria

NY-UNRES: New York NYCRR Part 375 New York Unrestricted Use Criteria

No current EPA guidance for PFOA/PFAs

Sample SB-2 (0-2') was reanalyzed for VOCs due to low soil recovery.

U - Non Detect Result

E- Analtyical results from sample extration

J - Estimated Result

Table 1.
352-362 Shepherd Avenue, Brooklyn, NY
Soil Analytical Results

LOCATION				**SB-1 (0-2')**		**SB-1 (10-12')**		**SB-2 (0-2')**		**SB-2 (10-12')**		**SB-3 (0-2')**		**SB-3 (10-12')**		**SB-4 (0-2')**	
SAMPLING DATE				**8/25/2021**		**8/25/2021**		**8/25/2021**		**8/25/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**	
LAB SAMPLE ID				**L2145699-07**		**L2145699-08**		**L2145699-01**		**L2145699-02**		**L2146283-03**		**L2146283-02**		**L2146283-05**	
SAMPLE TYPE				**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**	
	NY-RESRR	**NY-UNRES**	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
Total Metals																	
Aluminum, Total			mg/kg	6540		2830		5260		2150		5140		7640		4540	
Antimony, Total			mg/kg	6.81		4.04	U	75.5		10.1		4.5		1.32	J	16.5	
Arsenic, Total	16	13	mg/kg	7.54		0.993		18.3		2.71		5.91		3.58		9.63	
Barium, Total	400	350	mg/kg	127		9.59		1060		7.15		216		41.5		95.7	
Beryllium, Total	72	7.2	mg/kg	0.343	J	0.162	J	0.32	J	0.139	J	0.275	J	0.324	J	0.235	J
Cadmium, Total	4.3	2.5	mg/kg	0.817	U	0.808	U	2.08		0.106	J	0.834	U	0.877	U	0.839	U
Calcium, Total			mg/kg	4740		316		2800		155		3740		3920		1570	
Chromium, Total			mg/kg	15.9		6.99		28.2		5.77		12.7		14.5		11.2	
Cobalt, Total			mg/kg	4.62		2.88		4.75		2.94		4.27		5.3		4.51	
Copper, Total	270	50	mg/kg	37.8		5.32		102		4.42		63.5		15		51	
Iron, Total			mg/kg	30300		9900		20600		10400		17400		15900		11400	
Lead, Total	400	63	mg/kg	130		2.32	J	708		2.07	J	440		169		143	
Magnesium, Total			mg/kg	1330		1060		1200		639		1210		2010		1020	
Manganese, Total	2000	1600	mg/kg	330		192		260		206		232		267		184	
Mercury, Total	0.81	0.18	mg/kg	0.557		0.064	U	30.2		0.066	U	0.493		0.147		1.95	
Nickel, Total	310	30	mg/kg	8.74		5.82		10.2		4.72		10.4		9.59		9.39	
Potassium, Total			mg/kg	450		298		458		165	J	532		538		477	
Selenium, Total	180	3.9	mg/kg	1.63	U	1.62	U	0.311	J	1.64	U	0.809	J	1.75	U	0.655	J
Silver, Total	180	2	mg/kg	0.817	U	0.808	U	1.76		0.818	U	0.834	U	0.877	U	0.462	J
Sodium, Total			mg/kg	224		61.2	J	336		65.1	J	275		131	J	370	
Thallium, Total			mg/kg	1.63	U	1.62	U	1.73	U	1.64	U	1.67	U	1.75	U	1.68	U
Vanadium, Total			mg/kg	21.2		11		17.8		10.1		17.7		21.7		16.3	
Zinc, Total	10000	109	mg/kg	222		11.4		463		34.9		238		48.8		70	
Volatile Organics by EPA 5035																	
Methylene chloride	100	0.05	mg/kg	0.0047	U	0.0054	U	0.0025	J	0.0054	U	0.0063	U	0.0059	U	0.007	U
1,1-Dichloroethane	26	0.27	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Chloroform	49	0.37	mg/kg	0.0014	U	0.0016	U	0.0016	U	0.0016	U	0.0019	U	0.0018	U	0.0021	U
Carbon tetrachloride	2.4	0.76	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,2-Dichloropropane			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Dibromochloromethane			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,1,2-Trichloroethane			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Tetrachloroethene	19	1.3	mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00029	J	0.0011		0.0007	U
Chlorobenzene	100	1.1	mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Trichlorofluoromethane			mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
1,2-Dichloroethane	3.1	0.02	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,1,1-Trichloroethane	100	0.68	mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Bromodichloromethane			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
trans-1,3-Dichloropropene			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
cis-1,3-Dichloropropene			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
1,3-Dichloropropene, Total			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
1,1-Dichloropropene			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Bromoform			mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
1,1,2,2-Tetrachloroethane			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Benzene	4.8	0.06	mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Toluene	100	0.7	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.00094	J	0.0013	U	0.0012	U	0.0014	U
Ethylbenzene	41	1	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.00017	J	0.0013	U	0.0012	U	0.0014	U
Chloromethane			mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
Bromomethane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
Vinyl chloride	0.9	0.02	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Chloroethane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,1-Dichloroethene	100	0.33	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
trans-1,2-Dichloroethene	100	0.19	mg/kg	0.0014	U	0.0016	U	0.0016	U	0.0016	U	0.0019	U	0.0018	U	0.0021	U
Trichloroethene	21	0.47	mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
1,2-Dichlorobenzene	100	1.1	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,3-Dichlorobenzene	49	2.4	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,4-Dichlorobenzene	13	1.8	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
Methyl tert butyl ether	100	0.93	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
p/m-Xylene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
o-Xylene			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.00088	J	0.0013	U	0.0012	U	0.0014	U
Xylenes, Total	100	0.26	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.00088	J	0.0013	U	0.0012	U	0.0014	U
cis-1,2-Dichloroethene	100	0.25	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,2-Dichloroethene, Total			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Dibromomethane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
Styrene			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Dichlorodifluoromethane			mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
Acetone	100	0.05	mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
Carbon disulfide			mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
2-Butanone	100	0.12	mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
Vinyl acetate			mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
4-Methyl-2-pentanone			mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
1,2,3-Trichloropropane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
2-Hexanone			mg/kg	0.0094	U	0.011	U	0.011	U	0.011	U	0.013	U	0.012	U	0.014	U
Bromochloromethane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
2,2-Dichloropropane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,2-Dibromoethane			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,3-Dichloropropane			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,1,1,2-Tetrachloroethane			mg/kg	0.00047	U	0.00054	U	0.00054	U	0.00054	U	0.00063	U	0.00059	U	0.0007	U
Bromobenzene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
n-Butylbenzene	100	12	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
sec-Butylbenzene	100	11	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
tert-Butylbenzene	100	5.9	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
o-Chlorotoluene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
p-Chlorotoluene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,2-Dibromo-3-chloropropane			mg/kg	0.0028	U	0.0033	U	0.0032	U	0.0033	U	0.0038	U	0.0035	U	0.0042	U
Hexachlorobutadiene			mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
Isopropylbenzene			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
p-Isopropyltoluene			mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
Naphthalene	100	12	mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
Acrylonitrile			mg/kg	0.0037	U	0.0044	U	0.0043	U	0.0044	U	0.005	U	0.0047	U	0.0056	U
n-Propylbenzene	100	3.9	mg/kg	0.00094	U	0.0011	U	0.0011	U	0.0011	U	0.0013	U	0.0012	U	0.0014	U
1,2,3-Trichlorobenzene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,2,4-Trichlorobenzene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,3,5-Trimethylbenzene	52	8.4	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,2,4-Trimethylbenzene	52	3.6	mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,4-Dioxane	13	0.1	mg/kg	0.075	U	0.087	U	0.086	U	0.087	U	0.1	U	0.094	U	0.11	U
p-Diethylbenzene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
p-Ethyltoluene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
1,2,4,5-Tetramethylbenzene			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
Ethyl ether			mg/kg	0.0019	U	0.0022	U	0.0022	U	0.0022	U	0.0025	U	0.0024	U	0.0028	U
trans-1,4-Dichloro-2-butene			mg/kg	0.0047	U	0.0054	U	0.0054	U	0.0054	U	0.0063	U	0.0059	U	0.007	U

Notes:

Yellow shaded results exceed Unrestricted SCOs

Red shaded results exceed both Unrestricted and Restricted Residential SCOs

NY-RESRR: New York NYCRR Part 375 Restricted-Residential Criteria

NY-UNRES: New York NYCRR Part 375 New York Unrestricted Use Criteria

No current EPA guidance for PFOA/PFAs

Sample SB-2 (0-2') was reanalyzed for VOCs due to low soil recovery.

U - Non Detect Result

J - Estimated Result

E- Analtyical results from sample extration

Table 1.
352-362 Shepherd Avenue, Brooklyn, NY
Soil Analytical Results

LOCATION				**SB-4 (10-12')**		**SB-4A (0-2')**		**SB-4A (0-2')**		**SB-5 (0-2')**		**SB-5 (10-12')**		**SB-6 (0-2')**		**SB-6 (10-12')**	
SAMPLING DATE				**8/27/2021**		**8/27/2021**		**8/27/2021**		**8/25/2021**		**8/25/2021**		**8/25/2021**		**8/25/2021**	
LAB SAMPLE ID				**L2146283-04**		**L2146283-01**		**L2146283-01 R1**		**L2145699-05**		**L2145699-06**		**L2145699-03**		**L2145699-04**	
SAMPLE TYPE				**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**		**SOIL**	
	NY-RESRR	**NY-UNRES**	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
General Chemistry				**General Chemistry**													
Solids, Total			%	98.6		92.4		-	-	90.3		96.2		91.4		97.7	
Organochlorine Pesticides by GC				**Organochlorine Pesticides by GC**													
Delta-BHC	100	0.04	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Lindane	1.3	0.1	mg/kg	0.000665	U	0.00071	U	-	-	0.000696	U	0.000692	U	0.00072	U	0.000665	U
Alpha-BHC	0.48	0.02	mg/kg	0.000665	U	0.00071	U	-	-	0.000696	U	0.000692	U	0.00072	U	0.000665	U
Beta-BHC	0.36	0.036	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Heptachlor	2.1	0.042	mg/kg	0.000798	U	0.000852	U	-	-	0.000835	U	0.00083	U	0.000864	U	0.000798	U
Aldrin	0.097	0.005	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Heptachlor epoxide			mg/kg	0.00299	U	0.0032	U	-	-	0.00313	U	0.00311	U	0.00324	U	0.00299	U
Endrin	11	0.014	mg/kg	0.000665	U	0.00071	U	-	-	0.000696	U	0.000692	U	0.00072	U	0.000665	U
Endrin aldehyde			mg/kg	0.002	U	0.00213	U	-	-	0.00209	U	0.00207	U	0.00216	U	0.00199	U
Endrin ketone			mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Dieldrin	0.2	0.005	mg/kg	0.000998	U	0.00106	U	-	-	0.00104	U	0.00104	U	0.00108	U	0.000997	U
4,4'-DDE	8.9	0.0033	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
4,4'-DDD	13	0.0033	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
4,4'-DDT	7.9	0.0033	mg/kg	0.00299	U	0.0032	U	-	-	0.00313	U	0.00311	U	0.00324	U	0.00299	U
Endosulfan I	24	2.4	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Endosulfan II	24	2.4	mg/kg	0.0016	U	0.0017	U	-	-	0.00167	U	0.00166	U	0.00173	U	0.0016	U
Endosulfan sulfate	24	2.4	mg/kg	0.000665	U	0.00071	U	-	-	0.000696	U	0.000692	U	0.00072	U	0.000665	U
Methoxychlor			mg/kg	0.00299	U	0.0032	U	-	-	0.00313	U	0.00311	U	0.00324	U	0.00299	U
Toxaphene			mg/kg	0.0299	U	0.032	U	-	-	0.0313	U	0.0311	U	0.0324	U	0.0299	U
cis-Chlordane	4.2	0.094	mg/kg	0.002	U	0.00213	U	-	-	0.00209	U	0.00207	U	0.00216	U	0.00199	U
trans-Chlordane			mg/kg	0.002	U	0.00213	U	-	-	0.00209	U	0.00207	U	0.00216	U	0.00199	U
Chlordane			mg/kg	0.0133	U	0.0142	U	-	-	0.0139	U	0.0138	U	0.0144	U	0.0133	U
Polychlorinated Biphenyls by GC				**Polychlorinated Biphenyls by GC**													
Aroclor 1016	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1221	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1232	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1242	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1248	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1254	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1260	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1262	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Aroclor 1268	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
PCBs, Total	1	0.1	mg/kg	0.0318	U	0.0358	U	-	-	0.035	U	0.0343	U	0.0346	U	0.0326	U
Semivolatile Organics by GC/MS				**Semivolatile Organics by GC/MS**													
Acenaphthene	100	20	mg/kg	0.13	U	0.66		-	-	0.057	J	0.14	U	0.028	J	0.13	U
1,2,4-Trichlorobenzene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Hexachlorobenzene	1.2	0.33	mg/kg	0.1	U	0.11	U	-	-	0.11	U	0.1	U	0.11	U	0.1	U
Bis(2-chloroethyl)ether			mg/kg	0.15	U	0.16	U	-	-	0.16	U	0.15	U	0.16	U	0.15	U
2-Chloronaphthalene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
1,2-Dichlorobenzene	100	1.1	mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
1,3-Dichlorobenzene	49	2.4	mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
1,4-Dichlorobenzene	13	1.8	mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
3,3'-Dichlorobenzidine			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2,4-Dinitrotoluene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2,6-Dinitrotoluene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Fluoranthene	100	100	mg/kg	0.1	U	12	E	11		0.94		0.1	U	0.38		0.1	U
4-Chlorophenyl phenyl ether			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
4-Bromophenyl phenyl ether			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Bis(2-chloroisopropyl)ether			mg/kg	0.2	U	0.22	U	-	-	0.22	U	0.2	U	0.21	U	0.2	U
Bis(2-chloroethoxy)methane			mg/kg	0.18	U	0.19	U	-	-	0.2	U	0.18	U	0.19	U	0.18	U
Hexachlorobutadiene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Hexachlorocyclopentadiene			mg/kg	0.48	U	0.51	U	-	-	0.52	U	0.49	U	0.51	U	0.48	U
Hexachloroethane			mg/kg	0.13	U	0.14	U	-	-	0.14	U	0.14	U	0.14	U	0.13	U
Isophorone			mg/kg	0.15	U	0.16	U	-	-	0.16	U	0.15	U	0.16	U	0.15	U
Naphthalene	100	12	mg/kg	0.17	U	0.68		-	-	0.18	U	0.17	U	0.18	U	0.17	U
Nitrobenzene			mg/kg	0.15	U	0.16	U	-	-	0.16	U	0.15	U	0.16	U	0.15	U
NDPA/DPA			mg/kg	0.13	U	0.14	U	-	-	0.14	U	0.14	U	0.14	U	0.13	U
n-Nitrosodi-n-propylamine			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Bis(2-ethylhexyl)phthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Butyl benzyl phthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Di-n-butylphthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Di-n-octylphthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Diethyl phthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Dimethyl phthalate			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Benzo(a)anthracene	1	1	mg/kg	0.1	U	6		-	-	0.49		0.1	U	0.18		0.1	U
Benzo(a)pyrene	1	1	mg/kg	0.13	U	6.6		-	-	0.48		0.14	U	0.16		0.13	U
Benzo(b)fluoranthene	1	1	mg/kg	0.1	U	9.4	E	6		0.58		0.1	U	0.23		0.1	U
Benzo(k)fluoranthene	3.9	0.8	mg/kg	0.1	U	1.9		-	-	0.18		0.1	U	0.065	J	0.1	U
Chrysene	3.9	1	mg/kg	0.1	U	6.6		-	-	0.54		0.1	U	0.17		0.1	U
Acenaphthylene	100	100	mg/kg	0.13	U	0.42		-	-	0.14	U	0.14	U	0.14	U	0.13	U
Anthracene	100	100	mg/kg	0.1	U	0.99		-	-	0.11		0.1	U	0.055	J	0.1	U
Benzo(ghi)perylene	100	100	mg/kg	0.13	U	4.2		-	-	0.32		0.14	U	0.098	J	0.13	U
Fluorene	100	30	mg/kg	0.17	U	0.59		-	-	0.039	J	0.17	U	0.019	J	0.17	U
Phenanthrene	100	100	mg/kg	0.1	U	8.7	E	8.7		0.64		0.1	U	0.29		0.1	U
Dibenzo(a,h)anthracene	0.33	0.33	mg/kg	0.1	U	0.81		-	-	0.071	J	0.1	U	0.027	J	0.1	U
Indeno(1,2,3-cd)pyrene	0.5	0.5	mg/kg	0.13	U	4.8		-	-	0.33		0.14	U	0.12	J	0.13	U
Pyrene	100	100	mg/kg	0.1	U	12	E	11		1		0.1	U	0.32		0.1	U
Biphenyl			mg/kg	0.38	U	0.11	J	-	-	0.41	U	0.39	U	0.4	U	0.38	U
4-Chloroaniline			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2-Nitroaniline			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
3-Nitroaniline			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
4-Nitroaniline			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Dibenzofuran	59	7	mg/kg	0.17	U	0.55		-	-	0.017	J	0.17	U	0.18	U	0.17	U
2-Methylnaphthalene			mg/kg	0.2	U	0.33		-	-	0.22	U	0.2	U	0.21	U	0.2	U
1,2,4,5-Tetrachlorobenzene			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Acetophenone			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2,4,6-Trichlorophenol			mg/kg	0.1	U	0.11	U	-	-	0.11	U	0.1	U	0.11	U	0.1	U
p-Chloro-m-cresol			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2-Chlorophenol			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2,4-Dichlorophenol			mg/kg	0.15	U	0.16	U	-	-	0.16	U	0.15	U	0.16	U	0.15	U
2,4-Dimethylphenol			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2-Nitrophenol			mg/kg	0.36	U	0.39	U	-	-	0.39	U	0.37	U	0.38	U	0.36	U
4-Nitrophenol			mg/kg	0.23	U	0.25	U	-	-	0.25	U	0.24	U	0.25	U	0.23	U
2,4-Dinitrophenol			mg/kg	0.8	U	0.86	U	-	-	0.87	U	0.82	U	0.85	U	0.8	U
4,6-Dinitro-o-cresol			mg/kg	0.43	U	0.47	U	-	-	0.47	U	0.44	U	0.46	U	0.44	U
Pentachlorophenol	6.7	0.8	mg/kg	0.13	U	0.14	U	-	-	0.14	U	0.14	U	0.14	U	0.13	U
Phenol	100	0.33	mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
2-Methylphenol	100	0.33	mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
3-Methylphenol/4-Methylphenol	100	0.33	mg/kg	0.24	U	0.045	J	-	-	0.26	U	0.24	U	0.26	U	0.24	U
2,4,5-Trichlorophenol			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Benzoic Acid			mg/kg	0.54	U	0.58	U	-	-	0.58	U	0.55	U	0.57	U	0.54	U
Benzyl Alcohol			mg/kg	0.17	U	0.18	U	-	-	0.18	U	0.17	U	0.18	U	0.17	U
Carbazole			mg/kg	0.17	U	0.89		-	-	0.043	J	0.17	U	0.025	J	0.17	U
1,4-Dioxane	13	0.1	mg/kg	0.025	U	0.027	U	-	-	0.027	U	0.025	U	0.026	U	0.025	U

Notes:

Yellow shaded results exceed Unrestricted SCOs

Red shaded results exceed both Unrestricted and Restricted Residential SCOs

NY-RESRR: New York NYCRR Part 375 Restricted-Residential Criteria

NY-UNRES: New York NYCRR Part 375 New York Unrestricted Use Criteria

No current EPA guidance for PFOA/PFAs

Sample SB-2 (0-2') was reanalyzed for VOCs due to low soil recovery.

U - Non Detect Result

E- Analtyical results from sample extration

J - Estimated Result

Table 1.
352-362 Shepherd Avenue, Brooklyn, NY
Soil Analytical Results

LOCATION				SB-4 (10-12')		SB-4A (0-2')		SB-4A (0-2')		SB-5 (0-2')		SB-5 (10-12')		SB-6 (0-2')		SB-6 (10-12')	
SAMPLING DATE				8/27/2021		8/27/2021		8/27/2021		8/25/2021		8/25/2021		8/25/2021		8/25/2021	
LAB SAMPLE ID				L2146283-04		L2146283-01		L2146283-01 R1		L2145699-05		L2145699-06		L2145699-03		L2145699-04	
SAMPLE TYPE				SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	NY-RESRR	NY-UNRES	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Total Metals				**Total Metals**													
Aluminum, Total			mg/kg	2400		7340		-	-	4660		2780		5290		2490	
Antimony, Total			mg/kg	3.96	U	14.9		-	-	31.1		4	U	4.11	U	1.96	J
Arsenic, Total	16	13	mg/kg	1.01		7.4		-	-	6.9		1.3		2.98		1.15	
Barium, Total	400	350	mg/kg	6.28		88.6		-	-	101		11.8		32.3		9.32	
Beryllium, Total	72	7.2	mg/kg	0.142	J	0.371	J	-	-	0.274	J	0.168	J	0.296	J	0.167	J
Cadmium, Total	4.3	2.5	mg/kg	0.791	U	0.843	U	-	-	0.858	U	0.8	U	0.823	U	0.797	U
Calcium, Total			mg/kg	232		4020		-	-	6030		258		777		295	
Chromium, Total			mg/kg	5.7		17.6		-	-	11.2		6.5		10.1		5.99	
Cobalt, Total			mg/kg	2.28		4.77		-	-	3.63		3.41		3.38		2.77	
Copper, Total	270	50	mg/kg	4.23		49		-	-	49.7		4.98		10.1		5.41	
Iron, Total			mg/kg	7780		18200		-	-	10400		9880		11000		9580	
Lead, Total	400	63	mg/kg	2.1	J	428		-	-	185		2.37	J	48.5		2.53	J
Magnesium, Total			mg/kg	722		1840		-	-	1650		984		1160		999	
Manganese, Total	2000	1600	mg/kg	126		365		-	-	202		257		243		228	
Mercury, Total	0.81	0.18	mg/kg	0.064	U	0.687		-	-	0.912		0.066	U	0.355		0.064	U
Nickel, Total	310	30	mg/kg	4.31		9.87		-	-	7.43		6.07		6.5		5.24	
Potassium, Total			mg/kg	228		906		-	-	376		230		382		215	
Selenium, Total	180	3.9	mg/kg	1.58	U	1.68	U	-	-	0.926	J	1.6	U	1.64	U	1.59	U
Silver, Total	180	2	mg/kg	0.791	U	0.843	U	-	-	0.446	J	0.8	U	0.823	U	0.797	U
Sodium, Total			mg/kg	43.4	J	299		-	-	100	J	49.7	J	166		41.4	J
Thallium, Total			mg/kg	1.58	U	1.68	U	-	-	1.72	U	1.6	U	1.64	U	1.59	U
Vanadium, Total			mg/kg	9.17		23.3		-	-	14.3		11.2		15.6		12.3	
Zinc, Total	10000	109	mg/kg	11		145		-	-	73.5		10.9		72.3		10.9	
Volatile Organics by EPA 5035				**Volatile Organics by EPA 5035**													
Methylene chloride	100	0.05	mg/kg	0.0055	U	0.0056	U	-	-	0.012	U	0.0062	U	0.0054	U	0.0056	U
1,1-Dichloroethane	26	0.27	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Chloroform	49	0.37	mg/kg	0.0016	U	0.0017	U	-	-	0.0035	U	0.0019	U	0.0016	U	0.0017	U
Carbon tetrachloride	2.4	0.76	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,2-Dichloropropane			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Dibromochloromethane			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,1,2-Trichloroethane			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Tetrachloroethene	19	1.3	mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Chlorobenzene	100	1.1	mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Trichlorofluoromethane			mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
1,2-Dichloroethane	3.1	0.02	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,1,1-Trichloroethane	100	0.68	mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Bromodichloromethane			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
trans-1,3-Dichloropropene			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
cis-1,3-Dichloropropene			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
1,3-Dichloropropene, Total			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
1,1-Dichloropropene			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Bromoform			mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
1,1,2,2-Tetrachloroethane			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Benzene	4.8	0.06	mg/kg	0.0002	J	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Toluene	100	0.7	mg/kg	0.0011		0.001	J	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Ethylbenzene	41	1	mg/kg	0.00018	J	0.00016	J	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Chloromethane			mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
Bromomethane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
Vinyl chloride	0.9	0.02	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Chloroethane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,1-Dichloroethene	100	0.33	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
trans-1,2-Dichloroethene	100	0.19	mg/kg	0.0016	U	0.0017	U	-	-	0.0035	U	0.0019	U	0.0016	U	0.0017	U
Trichloroethene	21	0.47	mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
1,2-Dichlorobenzene	100	1.1	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,3-Dichlorobenzene	49	2.4	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,4-Dichlorobenzene	13	1.8	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
Methyl tert butyl ether	100	0.93	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
p/m-Xylene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
o-Xylene			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.00072	J	0.00076	J
Xylenes, Total	100	0.26	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.00072	J	0.00076	J
cis-1,2-Dichloroethene	100	0.25	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,2-Dichloroethene, Total			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Dibromomethane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
Styrene			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Dichlorodifluoromethane			mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
Acetone	100	0.05	mg/kg	0.011	U	0.011	U	-	-	0.026		0.012	U	0.011	U	0.011	U
Carbon disulfide			mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
2-Butanone	100	0.12	mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
Vinyl acetate			mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
4-Methyl-2-pentanone			mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
1,2,3-Trichloropropane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
2-Hexanone			mg/kg	0.011	U	0.011	U	-	-	0.024	U	0.012	U	0.011	U	0.011	U
Bromochloromethane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
2,2-Dichloropropane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,2-Dibromoethane			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,3-Dichloropropane			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,1,1,2-Tetrachloroethane			mg/kg	0.00055	U	0.00056	U	-	-	0.0012	U	0.00062	U	0.00054	U	0.00056	U
Bromobenzene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
n-Butylbenzene	100	12	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
sec-Butylbenzene	100	11	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
tert-Butylbenzene	100	5.9	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
o-Chlorotoluene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
p-Chlorotoluene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,2-Dibromo-3-chloropropane			mg/kg	0.0033	U	0.0033	U	-	-	0.0071	U	0.0037	U	0.0032	U	0.0034	U
Hexachlorobutadiene			mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
Isopropylbenzene			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
p-Isopropyltoluene			mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
Naphthalene	100	12	mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
Acrylonitrile			mg/kg	0.0044	U	0.0044	U	-	-	0.0094	U	0.005	U	0.0043	U	0.0045	U
n-Propylbenzene	100	3.9	mg/kg	0.0011	U	0.0011	U	-	-	0.0024	U	0.0012	U	0.0011	U	0.0011	U
1,2,3-Trichlorobenzene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,2,4-Trichlorobenzene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,3,5-Trimethylbenzene	52	8.4	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,2,4-Trimethylbenzene	52	3.6	mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,4-Dioxane	13	0.1	mg/kg	0.088	U	0.089	U	-	-	0.19	U	0.099	U	0.086	U	0.09	U
p-Diethylbenzene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
p-Ethyltoluene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
1,2,4,5-Tetramethylbenzene			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
Ethyl ether			mg/kg	0.0022	U	0.0022	U	-	-	0.0047	U	0.0025	U	0.0021	U	0.0022	U
trans-1,4-Dichloro-2-butene			mg/kg	0.0055	U	0.0056	U	-	-	0.012	U	0.0062	U	0.0054	U	0.0056	U

Notes:

Yellow shaded results exceed Unrestricted SCOs

Red shaded results exceed both Unrestricted and Restricted Residential SCOs

NY-RESRR: New York NYCRR Part 375 Restricted-Residential Criteria

NY-UNRES: New York NYCRR Part 375 New York Unrestricted Use Criteria

No current EPA guidance for PFOA/PFAs

Sample SB-2 (0-2') was reanalyzed for VOCs due to low soil recovery.

U - Non Detect Result

E- Analtyical results from sample extration

J - Estimated Result

Table 1a.
352-362 Shepherd Avenue, Brooklyn, NY
Emerging Contaminant Soil Analytical Results

LOCATION				**SB-5 (10-12')**		**SB-4 (10-12')**	
SAMPLING DATE				**8/25/2021**		**8/27/2021**	
LAB SAMPLE ID				**L2145699-06**		**L2146283-04**	
SAMPLE TYPE				**SOIL**		**SOIL**	
	NY-RESRR	**NY-UNRES**	**Units**	**Results**	**Qual**	**Results**	**Qual**
Perfluorinated Alkyl Acids by Isotope Dilution							
Perfluorobutanoic Acid (PFBA)			mg/kg	0.000488	U	-	-
Perfluoropentanoic Acid (PFPeA)			mg/kg	0.000488	U	-	-
Perfluorobutanesulfonic Acid (PFBS)			mg/kg	0.000244	U	-	-
Perfluorohexanoic Acid (PFHxA)			mg/kg	0.000488	U	-	-
Perfluoroheptanoic Acid (PFHpA)			mg/kg	0.000244	U	-	-
Perfluorohexanesulfonic Acid (PFHxS)			mg/kg	0.000244	U	-	-
Perfluorooctanoic Acid (PFOA)			mg/kg	0.000244	U	-	-
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)			mg/kg	0.000488	U	-	-
Perfluoroheptanesulfonic Acid (PFHpS)			mg/kg	0.000488	U	-	-
Perfluorononanoic Acid (PFNA)			mg/kg	0.000244	U	-	-
Perfluorooctanesulfonic Acid (PFOS)			mg/kg	0.000244	U	-	-
Perfluorodecanoic Acid (PFDA)			mg/kg	0.000244	U	-	-
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)			mg/kg	0.000488	U	-	-
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)			mg/kg	0.000488	U	-	-
Perfluoroundecanoic Acid (PFUnA)			mg/kg	0.000488	U	-	-
Perfluorodecanesulfonic Acid (PFDS)			mg/kg	0.000488	U	-	-
Perfluorooctanesulfonamide (FOSA)			mg/kg	0.000488	U	-	-
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)			mg/kg	0.000488	U	-	-
Perfluorododecanoic Acid (PFDoA)			mg/kg	0.000488	U	-	-
Perfluorotridecanoic Acid (PFTrDA)			mg/kg	0.000488	U	-	-
Perfluorotetradecanoic Acid (PFTA)			mg/kg	0.000488	U	-	-
PFOA/PFOS, Total			mg/kg	0.000244	U	-	-
1,4 Dioxane by 8270D-SIM							
1,4-Dioxane	13	0.1	mg/kg	-	-	0.00803	U

Table 2. Groundwater Analytical Results
352-362 Shepherd Avenue,
Brooklyn, NY

LOCATION			**TW-1**		**TW-2**		**TW-3**		**TW-4**		**DUP-20210827**		**FIELD BLANK**		**TRIP BLANK**	
SAMPLING DATE			**8/27/2021**		**8/25/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**		**8/25/2021**	
LAB SAMPLE ID			**L2146282-01**		**L2145698-01**		**L2146282-02**		**L2146282-03**		**L2146282-04**		**L2146282-05**		**L2146282-06**	
SAMPLE TYPE			**WATER**		**WATER**		**WATER**		**WATER**		**WATER**		**WATER**		**WATER**	
	NY-AWQS	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
Dissolved Metals																
Aluminum, Dissolved		ug/l	6.43	J	3.44	J	10	U	10	U	10	U	-	-	-	-
Antimony, Dissolved	3	ug/l	0.89	J	0.81	J	4.3		0.65	J	0.75	J	-	-	-	-
Arsenic, Dissolved	25	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	-	-	-	-
Barium, Dissolved	1000	ug/l	26.7		39.72		65.01		47.1		24.24		-	-	-	-
Beryllium, Dissolved	3	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	-	-	-	-
Cadmium, Dissolved	5	ug/l	0.2	U	0.2	U	0.2	U	0.42		0.2	U	-	-	-	-
Calcium, Dissolved		ug/l	19000		34600		39500		34400		18100		-	-	-	-
Chromium, Dissolved	50	ug/l	0.42	J	0.92	J	0.21	J	0.43	J	0.37	J	-	-	-	-
Cobalt, Dissolved		ug/l	0.59		1.8		1.13		2.09		0.49	J	-	-	-	-
Copper, Dissolved	200	ug/l	1	U	1	U	1	U	0.39	J	1	U	-	-	-	-
Iron, Dissolved	300	ug/l	50	U	21	J	50	U	50	U	50	U	-	-	-	-
Lead, Dissolved	25	ug/l	1	U	1	U	1	U	1	U	1	U	-	-	-	-
Magnesium, Dissolved	35000	ug/l	2320		5280		5560		3090		2180		-	-	-	-
Manganese, Dissolved	300	ug/l	239.8		93.68		679.2		339.8		170.5		-	-	-	-
Mercury, Dissolved	0.7	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-	-	-	-
Nickel, Dissolved	100	ug/l	1.05	J	1.45	J	2.46		7.58		0.81	J	-	-	-	-
Potassium, Dissolved		ug/l	3880		7460		9990		4560		3580		-	-	-	-
Selenium, Dissolved	10	ug/l	5	U	3.32	J	2.82	J	2.39	J	5	U	-	-	-	-
Silver, Dissolved	50	ug/l	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	-	-	-	-
Sodium, Dissolved	20000	ug/l	30600		42800		88700		24700		29200		-	-	-	-
Thallium, Dissolved	0.5	ug/l	1	U	1	U	1	U	1	U	1	U	-	-	-	-
Vanadium, Dissolved		ug/l	5	U	5	U	5	U	5	U	5	U	-	-	-	-
Zinc, Dissolved	2000	ug/l	10	U	10	U	10	U	183.2		10	U	-	-	-	-
Organochlorine Pesticides by GC																
Delta-BHC	0.04	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Lindane	0.05	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Alpha-BHC	0.01	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Beta-BHC	0.04	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Heptachlor	0.04	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Aldrin	0	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Heptachlor epoxide	0.03	ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Endrin	0	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Endrin aldehyde	5	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Endrin ketone	5	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Dieldrin	0.004	ug/l	0.029	U	0.009	J	0.055		0.004	JP	0.008	J	0.029	U	-	-
4,4'-DDE	0.2	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
4,4'-DDD	0.3	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
4,4'-DDT	0.2	ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Endosulfan I		ug/l	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Endosulfan II		ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Endosulfan sulfate		ug/l	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	0.029	U	-	-
Methoxychlor	35	ug/l	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	-	-
Toxaphene	0.06	ug/l	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	-	-
cis-Chlordane		ug/l	0.014	U	0.018		0.014	U	0.014	U	0.014	U	0.014	U	-	-
trans-Chlordane		ug/l	0.014	U	0.006	J	0.014	U	0.014	U	0.014	U	0.014	U	-	-
Chlordane	0.05	ug/l	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	0.143	U	-	-
Polychlorinated Biphenyls by GC																
Aroclor 1016	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1221	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1232	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1242	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1248	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1254	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1260	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1262	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Aroclor 1268	0.09	ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
PCBs, Total		ug/l	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	-	-
Total Metals																
Aluminum, Total		ug/l	544		558		157		170		8880		10	U	-	-
Antimony, Total	3	ug/l	0.56	J	0.77	J	4.14		0.5	J	0.51	J	4	U	-	-
Arsenic, Total	25	ug/l	0.17	J	0.23	J	0.5	U	0.5	U	1.85		0.5	U	-	-
Barium, Total	1000	ug/l	35.2		43.98		67.23		49.77		140.7		0.5	U	-	-
Beryllium, Total	3	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.7		0.5	U	-	-
Cadmium, Total	5	ug/l	0.2	U	0.2	U	0.07	J	0.42		0.16	J	0.2	U	-	-
Calcium, Total		ug/l	20000		32000		39400		36500		20200		100	U	-	-
Chromium, Total	50	ug/l	3.15		2.49		1.3		1.37		30.5		0.49	J	-	-
Cobalt, Total		ug/l	1.62		2.35		1.49		2.43		17.32		0.5	U	-	-
Copper, Total	200	ug/l	1.42		1.7		0.96	J	0.97	J	27.85		1	U	-	-
Iron, Total	300	ug/l	1270		1170		371		374		18800		50	U	-	-
Lead, Total	25	ug/l	0.75	J	0.64	J	1	U	1	U	12.53		1	U	-	-
Magnesium, Total	35000	ug/l	2640		5090		5670		3310		6080		70	U	-	-
Manganese, Total	300	ug/l	302.1		126.4		699		386.5		1507		1	U	-	-
Mercury, Total	0.7	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	-	-
Nickel, Total	100	ug/l	3.43		2.41		3.44		9.2		48.03		2	U	-	-
Potassium, Total		ug/l	4280		6670		10200		4970		5180		100	U	-	-
Selenium, Total	10	ug/l	5	U	3.9	J	2.92	J	2.06	J	2.82	J	5	U	-	-
Silver, Total	50	ug/l	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	-	-
Sodium, Total	20000	ug/l	32200		40600		89500		26000		32600		126		-	-
Thallium, Total	0.5	ug/l	1	U	0.35	J	1	U	1	U	1	U	1	U	-	-
Vanadium, Total		ug/l	1.65	J	5	U	5	U	5	U	24.13		5	U	-	-
Zinc, Total	2000	ug/l	10	U	10	U	10	U	203.8		38.6		10	U	-	-

Notes:

NY-AWQS: New York TOGS 111 Ambient Water Quality Standards

Red shaded results exceed NY-AWQS

U- Non-detect Result

J - Estimated Result

Table 2. Groundwater Analytical Results
352-362 Shepherd Avenue,
Brooklyn, NY

LOCATION			**TW-1**		**TW-2**		**TW-3**		**TW-4**		**DUP-20210827**		**FIELD BLANK**		**TRIP BLANK**	
SAMPLING DATE			**8/27/2021**		**8/25/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**		**8/27/2021**		**8/25/2021**	
LAB SAMPLE ID			**L2146282-01**		**L2145698-01**		**L2146282-02**		**L2146282-03**		**L2146282-04**		**L2146282-05**		**L2146282-06**	
SAMPLE TYPE			**WATER**		**WATER**		**WATER**		**WATER**		**WATER**		**WATER**		**WATER**	
	NY-AWQS	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
Semivolatile Organics by GC/MS																
1,2,4-Trichlorobenzene	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Bis(2-chloroethyl)ether	1	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,2-Dichlorobenzene	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,3-Dichlorobenzene	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,4-Dichlorobenzene	3	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
3,3'-Dichlorobenzidine	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4-Dinitrotoluene	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,6-Dinitrotoluene	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
4-Chlorophenyl phenyl ether		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
4-Bromophenyl phenyl ether		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Bis(2-chloroisopropyl)ether	5	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Bis(2-chloroethoxy)methane	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Hexachlorocyclopentadiene	5	ug/l	20	U	20	U	20	U	20	U	20	U	20	U	-	-
Isophorone	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Nitrobenzene	0.4	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
NDPA/DPA	50	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
n-Nitrosodi-n-propylamine		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Bis(2-ethylhexyl)phthalate	5	ug/l	3	U	3	U	3	U	3	U	3	U	1.6	J	-	-
Butyl benzyl phthalate	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Di-n-butylphthalate	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Di-n-octylphthalate	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Diethyl phthalate	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Dimethyl phthalate	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Biphenyl		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
4-Chloroaniline	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2-Nitroaniline	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
3-Nitroaniline	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
4-Nitroaniline	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Dibenzofuran		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
1,2,4,5-Tetrachlorobenzene	5	ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
Acetophenone		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4,6-Trichlorophenol		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
p-Chloro-m-cresol		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
2-Chlorophenol		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
2,4-Dichlorophenol	1	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4-Dimethylphenol	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2-Nitrophenol		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
4-Nitrophenol		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
2,4-Dinitrophenol	10	ug/l	20	U	20	U	20	U	20	U	20	U	20	U	-	-
4,6-Dinitro-o-cresol		ug/l	10	U	10	U	10	U	10	U	10	U	10	U	-	-
Phenol	1	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2-Methylphenol		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
3-Methylphenol/4-Methylphenol		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
2,4,5-Trichlorophenol		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	-	-
Benzoic Acid		ug/l	50	U	50	U	50	U	50	U	50	U	50	U	-	-
Benzyl Alcohol		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Carbazole		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	-	-
Semivolatile Organics by GC/MS-SIM																
Acenaphthene	20	ug/l	0.1	U	0.1	U	0.03	J	0.1	U	0.1	U	0.02	J	-	-
2-Chloronaphthalene	10	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.03	J	-	-
Fluoranthene	50	ug/l	0.1	U	0.02	J	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Hexachlorobutadiene	0.5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	-	-
Naphthalene	10	ug/l	0.1	U	0.77		0.08	J	0.05	J	0.1	U	0.1	U	-	-
Benzo(a)anthracene	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.04	J	-	-
Benzo(a)pyrene	0	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Benzo(b)fluoranthene	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Benzo(k)fluoranthene	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Chrysene	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Acenaphthylene		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.02	J	-	-
Anthracene	50	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Benzo(ghi)perylene		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Fluorene	50	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Phenanthrene	50	ug/l	0.1	U	0.05	J	0.09	J	0.03	J	0.1	U	0.04	J	-	-
Dibenzo(a,h)anthracene		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Indeno(1,2,3-cd)pyrene	0.002	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
Pyrene	50	ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.03	J	-	-
2-Methylnaphthalene		ug/l	0.1	U	0.09	J	0.1	U	0.1	U	0.1	U	0.02	J	-	-
Pentachlorophenol	1	ug/l	0.1	J	0.8	U	0.8	U	0.8	U	0.8	U	0.14	J	-	-
Hexachlorobenzene	0.04	ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.02	J	-	-
Hexachloroethane	5	ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	-	-

Notes:

NY-AWQS: New York TOGS 111 Ambient Water Quality Standards

Red shaded results exceed NY-AWQS

U- Non-detect Result

J - Estimated Result

Table 2. Groundwater Analytical Results
352-362 Shepherd Avenue,
Brooklyn, NY

LOCATION			TW-1		TW-2		TW-3		TW-4		DUP-20210827		FIELD BLANK		TRIP BLANK	
SAMPLING DATE			8/27/2021		8/25/2021		8/27/2021		8/27/2021		8/27/2021		8/27/2021		8/25/2021	
LAB SAMPLE ID			L2146282-01		L2145698-01		L2146282-02		L2146282-03		L2146282-04		L2146282-05		L2146282-06	
SAMPLE TYPE			WATER		WATER		WATER		WATER		WATER		WATER		WATER	
	NY-AWQS	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Volatile Organics by GC/MS																
Methylene chloride	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1-Dichloroethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Chloroform	7	ug/l	2.5	U	3.2		1.1	J	1.7	J	2.5	U	2.5	U	2.5	U
Carbon tetrachloride	5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichloropropane	1	ug/l	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Dibromochloromethane	50	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	1	ug/l	1.5	U	1.5	U	1.5	U	1.5	U	1.5	U	1.5	U	1.5	U
Tetrachloroethene	5	ug/l	1.1		🟥 5.2		1.3		2.4		1.1		0.5	U	0.5	U
Chlorobenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Trichlorofluoromethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dichloroethane	0.6	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromodichloromethane	50	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,3-Dichloropropene	0.4	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3-Dichloropropene, Total		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloropropene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromoform	50	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,1,2,2-Tetrachloroethane	5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Benzene	1	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Ethylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Chloromethane		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromomethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Vinyl chloride	2	ug/l	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Chloroethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1-Dichloroethene	5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Trichloroethene	5	ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichlorobenzene	3	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,3-Dichlorobenzene	3	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,4-Dichlorobenzene	3	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Methyl tert butyl ether	10	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
p/m-Xylene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
o-Xylene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Xylenes, Total		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
cis-1,2-Dichloroethene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dichloroethene, Total		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Dibromomethane	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2,3-Trichloropropane	0.04	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Acrylonitrile	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Styrene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Dichlorodifluoromethane	5	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Acetone	50	ug/l	2	J	5	U	5	U	2.5	J	5	U	5	U	5	U
Carbon disulfide	60	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
2-Butanone	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Vinyl acetate		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
4-Methyl-2-pentanone		ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
2-Hexanone	50	ug/l	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Bromochloromethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
2,2-Dichloropropane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dibromoethane	0.0006	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,3-Dichloropropane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1,1,2-Tetrachloroethane	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromobenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
n-Butylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
sec-Butylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
tert-Butylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
o-Chlorotoluene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
p-Chlorotoluene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dibromo-3-chloropropane	0.04	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Hexachlorobutadiene	0.5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Isopropylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
p-Isopropyltoluene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Naphthalene	10	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
n-Propylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,3-Trichlorobenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,4-Trichlorobenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,3,5-Trimethylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,4-Trimethylbenzene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,4-Dioxane		ug/l	250	U	250	U	250	U	250	U	250	U	250	U	250	U
p-Diethylbenzene		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	2	U
p-Ethyltoluene		ug/l	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2,4,5-Tetramethylbenzene	5	ug/l	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Ethyl ether		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
trans-1,4-Dichloro-2-butene	5	ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U

Notes:

NY-AWQS: New York TOGS 111 Ambient Water Quality Standards

🟥 Red shaded results exceed NY-AWQS

U- Non-detect Result

J - Estimated Result

Table 2A. Emerging Contaminants in Groundwater Analytical Results
352-362 Shepherd Avenue
Brooklyn, NY

LOCATION			**TW-1**		**TW-2**		**TW-3**		**TW-4**	
SAMPLING DATE			**8/27/2021**		**8/25/2021**		**8/27/2021**		**8/27/2021**	
LAB SAMPLE ID			**L2146282-01**		**L2145698-01**		**L2146282-02**		**L2146282-03**	
SAMPLE TYPE			**WATER**		**WATER**		**WATER**		**WATER**	
SAMPLE DEPTH (ft.)										
	NY-MCL	**Units**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**	**Results**	**Qual**
1,4 Dioxane by 8270D-SIM										
1,4-Dioxane	1	ug/l	0.139	U	0.139	U	0.139	U	0.144	U
Perfluorinated Alkyl Acids by Isotope Dilution										
Perfluorobutanoic Acid (PFBA)	0.01	ug/l	0.00729		0.00475		0.0162		0.00837	
Perfluoropentanoic Acid (PFPeA)	0.01	ug/l	0.0134		0.00433		0.0335		0.0106	
Perfluorobutanesulfonic Acid (PFBS)	0.01	ug/l	0.00731		0.00506		0.035		0.00741	
Perfluorohexanoic Acid (PFHxA)	0.01	ug/l	0.0113		0.00478		0.03		0.0123	
Perfluoroheptanoic Acid (PFHpA)	0.01	ug/l	0.00711		0.00515		0.0173		0.00871	
Perfluorohexanesulfonic Acid (PFHxS)	0.01	ug/l	0.00164	J	0.00174	J	0.00613		0.00275	
Perfluorooctanoic Acid (PFOA)	0.01	ug/l	0.0257		0.0281		0.077		0.0585	
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluoroheptanesulfonic Acid (PFHpS)	0.01	ug/l	0.00185	U	0.00183	U	0.000804	J	0.00178	U
Perfluorononanoic Acid (PFNA)	0.01	ug/l	0.00242		0.00132	J	0.00557		0.00201	
Perfluorooctanesulfonic Acid (PFOS)	0.01	ug/l	0.0185		0.017		0.0248		0.0205	
Perfluorodecanoic Acid (PFDA)	0.01	ug/l	0.000285	J	0.00166	J	0.000288	JF	0.000539	J
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluoroundecanoic Acid (PFUnA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluorodecanesulfonic Acid (PFDS)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluorooctanesulfonamide (FOSA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluorododecanoic Acid (PFDoA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluorotridecanoic Acid (PFTrDA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
Perfluorotetradecanoic Acid (PFTA)	0.01	ug/l	0.00185	U	0.00183	U	0.00178	U	0.00178	U
PFOA/PFOS, Total	0.01	ug/l	0.0442		0.0451		0.102		0.079	
1,4 Dioxane by 8270D-SIM										
1,4-Dioxane		ug/l	0.139	U	0.139	U	0.139	U	0.144	U

Notes:

MCL- Maximum Contaminant Level

MCL for drinking water as per July 2020 New York State Department of Health

U- Not detected at the reported detection limit for the sample

J- Estimated result

F- Ratio of quantifier ion response to qualifier ion response falls outside
of the laboratory criteria. Results are estimated maximum concentration

Table 3. Soil Vapor Analytical Results
352-362 Shepherd Avenue
Brooklyn, NY

LOCATION					SV-1		SV-2		SV-3		SV-4		SV-5	
SAMPLING DATE					8/25/2021		8/25/2021		8/27/2021		8/27/2021		8/25/2021	
LAB SAMPLE ID					L2145694-03		L2145694-01		L2146257-01		L2146257-02		L2145694-02	
SAMPLE TYPE					SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR		SOIL_VAPOR	
SAMPLE DEPTH (ft.)														
	NY-SSC-A	NY-SSC-B	NY-SSC-C	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Volatile Organics in Air														
Dichlorodifluoromethane				ug/m3	18.1	U	2.27		3.24		1.99		3.53	U
Chloromethane				ug/m3	7.58	U	0.626	U	0.669		1.04		1.47	U
Freon-114				ug/m3	25.7	U	2.12	U	2	U	1.4	U	4.99	U
Vinyl chloride			6	ug/m3	9.38	U	0.775	U	0.731	U	0.511	U	1.83	U
1,3-Butadiene				ug/m3	8.12	U	2.03		2.94		3.52		2.21	
Bromomethane				ug/m3	14.3	U	1.18	U	1.11	U	0.777	U	2.77	U
Chloroethane				ug/m3	9.68	U	0.8	U	0.755	U	0.528	U	1.88	U
Ethanol				ug/m3	173	U	21.7		121		183		35.2	
Vinyl bromide				ug/m3	16	U	1.32	U	1.25	U	0.874	U	3.12	U
Acetone				ug/m3	591		152		404		76.5		133	
Trichlorofluoromethane				ug/m3	20.6	U	2.26		3.14		1.12	U	4.01	U
Isopropanol				ug/m3	22.6	U	3.47		18.4		3.76		4.38	U
1,1-Dichloroethene	6			ug/m3	14.6	U	1.2	U	1.13	U	0.793	U	2.83	U
Tertiary butyl Alcohol				ug/m3	49.7		3.21		250		44		7.52	
Methylene chloride		100		ug/m3	31.9	U	6.15		2.48	U	1.74	U	6.18	U
3-Chloropropene				ug/m3	11.5	U	0.948	U	0.895	U	0.626	U	2.23	U
Carbon disulfide				ug/m3	11.4	U	27.3		3.24		1.47		6.98	
Freon-113				ug/m3	28.1	U	2.32	U	2.19	U	1.53	U	5.47	U
trans-1,2-Dichloroethene				ug/m3	14.6	U	1.2	U	1.13	U	0.793	U	2.83	U
1,1-Dichloroethane				ug/m3	14.9	U	1.23	U	1.16	U	0.809	U	2.89	U
Methyl tert butyl ether				ug/m3	13.2	U	1.09	U	1.03	U	0.721	U	2.57	U
2-Butanone				ug/m3	2600		307		246		139		634	
cis-1,2-Dichloroethene	6			ug/m3	14.6	U	1.2	U	1.13	U	0.793	U	2.83	U
Ethyl Acetate				ug/m3	33.1	U	2.73	U	2.57	U	1.8	U	6.41	U
Chloroform				ug/m3	17.9	U	2.04		1.4	U	1.75		3.49	U
Tetrahydrofuran				ug/m3	27.1	U	2.44		4.72		3.75		5.25	U
1,2-Dichloroethane				ug/m3	14.9	U	1.23	U	1.16	U	0.809	U	2.89	U
n-Hexane				ug/m3	12.9	U	10.2		42.6		70.8		18	
1,1,1-Trichloroethane		100		ug/m3	20	U	1.65	U	1.56	U	1.09	U	3.9	U
Benzene				ug/m3	11.7	U	7.16		22.9		16.7		8.63	
Carbon tetrachloride	6			ug/m3	23.1	U	1.91	U	1.8	U	1.26	U	4.49	U
Cyclohexane				ug/m3	12.6	U	2.31		19		26.9		3.36	
1,2-Dichloropropane				ug/m3	17	U	1.4	U	1.32	U	0.924	U	3.3	U
Bromodichloromethane				ug/m3	24.6	U	2.03	U	1.92	U	1.34	U	4.78	U
1,4-Dioxane				ug/m3	13.2	U	1.09	U	1.03	U	0.721	U	2.57	U
Trichloroethene	6			ug/m3	19.7	U	1.63	U	1.54	U	1.07	U	3.84	U
2,2,4-Trimethylpentane				ug/m3	17.1	U	2.47		145		87.8		3.33	U
Heptane				ug/m3	20.6		5.82		27.9		31.7		10.4	
cis-1,3-Dichloropropene				ug/m3	16.7	U	1.38	U	1.3	U	0.908	U	3.24	U
4-Methyl-2-pentanone				ug/m3	37.6	U	3.11		5.9		3.81		7.29	U
trans-1,3-Dichloropropene				ug/m3	16.7	U	1.38	U	1.3	U	0.908	U	3.24	U
1,1,2-Trichloroethane				ug/m3	20	U	1.65	U	1.56	U	1.09	U	3.9	U
Toluene				ug/m3	13.8	U	141		118		90.4		237	
2-Hexanone				ug/m3	381		31.8		61.5		32.4		65.6	
Dibromochloromethane				ug/m3	31.3	U	2.58	U	2.44	U	1.7	U	6.08	U
1,2-Dibromoethane				ug/m3	28.2	U	2.33	U	2.2	U	1.54	U	5.49	U
Tetrachloroethene		100		ug/m3	24.9	U	8.68		1.94	U	17.2		57.5	
Chlorobenzene				ug/m3	16.9	U	1.4	U	1.32	U	0.921	U	3.29	U
Ethylbenzene				ug/m3	15.9	U	24.9		25.7		20		42.9	
p/m-Xylene				ug/m3	31.9	U	99.5		88.2		69.9		171	
Bromoform				ug/m3	37.9	U	3.13	U	2.96	U	2.07	U	7.38	U
Styrene				ug/m3	15.6	U	2.09		1.22		1.05		3.33	
1,1,2,2-Tetrachloroethane				ug/m3	25.2	U	2.08	U	1.96	U	1.37	U	4.9	U
o-Xylene				ug/m3	15.9	U	30.2		39.3		30.2		51.3	
4-Ethyltoluene				ug/m3	18	U	4.27		3.83		4.97		7.52	
1,3,5-Trimethylbenzene				ug/m3	18	U	5.11		6.78		7.03		9.54	
1,2,4-Trimethylbenzene				ug/m3	18	U	21.9		21.5		23.8		38.2	
Benzyl chloride				ug/m3	19	U	1.57	U	1.48	U	1.04	U	3.7	U
1,3-Dichlorobenzene				ug/m3	22.1	U	1.82	U	1.72	U	1.2	U	4.29	U
1,4-Dichlorobenzene				ug/m3	22.1	U	1.82	U	1.72	U	1.2	U	4.29	U
1,2-Dichlorobenzene				ug/m3	22.1	U	1.82	U	1.72	U	1.2	U	4.29	U
1,2,4-Trichlorobenzene				ug/m3	27.2	U	2.25	U	2.12	U	1.48	U	5.3	U
Hexachlorobutadiene				ug/m3	39.1	U	3.23	U	3.05	U	2.13	U	7.62	U

Notes:

Yellow shaded results exceed one of Matrices U- Non-Detect Results

NY-SSC-A: New York DOH Matrix A Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.

NY-SSC-B: New York DOH Matrix B Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.

NY-SSC-C: New York DOH Matrix C Sub-slab Vapor Concentrations Criteria per Guidance for Evaluating Soil Vapor Intrusion, October 2006, and updated May 2017.

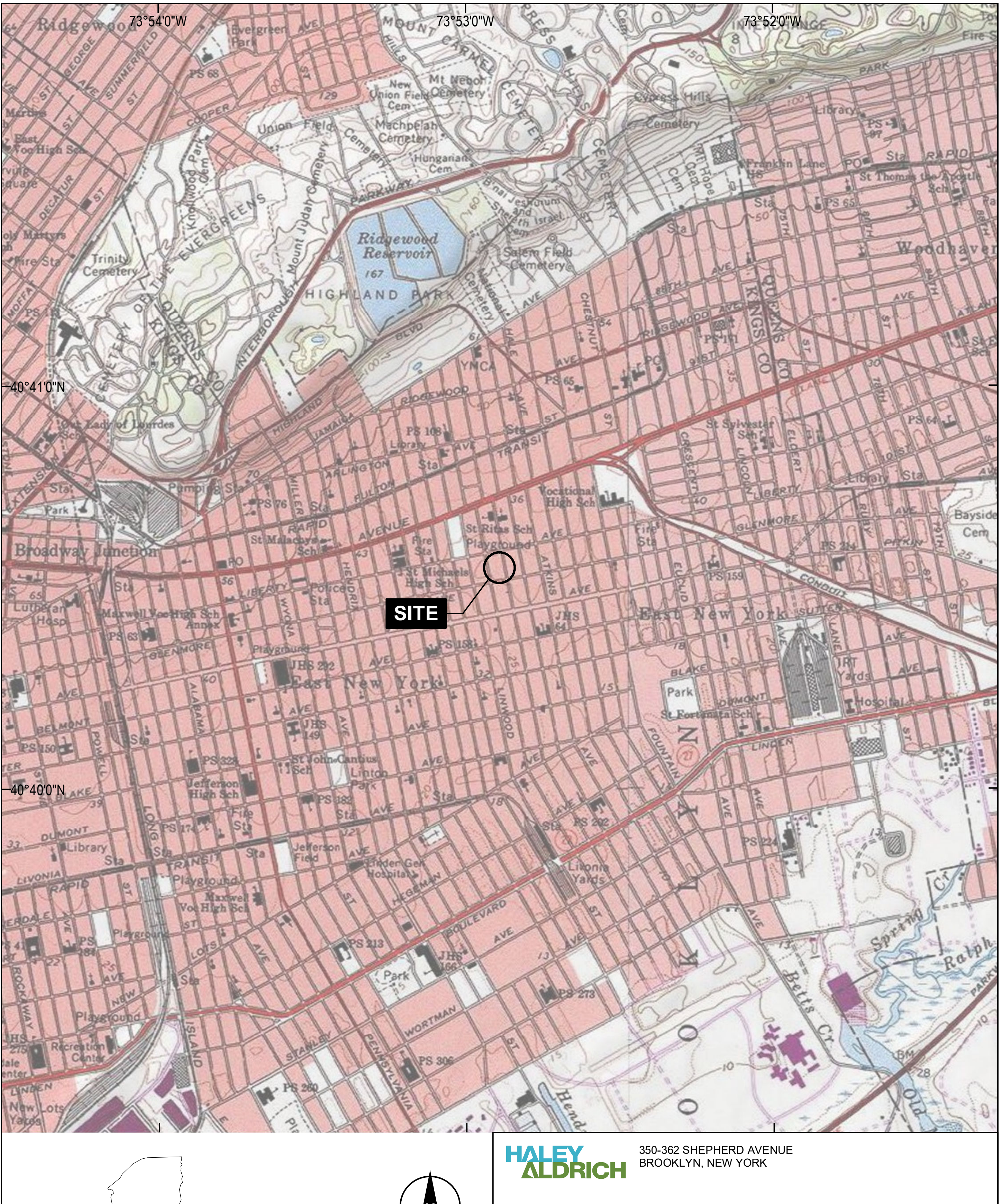
Table 4. Sample and Analysis Plan

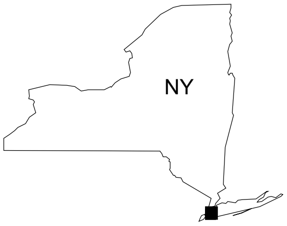
352-362 Shepherd Avenue, Brooklyn, NY

Boring Number	Sample Depth	Target Compound List VOCs (8260B)	Target Compound List SVOCs (8270C)	Total Analyte List Metals (6010)	PCBs (8082)	Pesticides (8081)	PFAS (537)	1,4-Dioxane (8270 SIM)	VOCs (TO-15)
SOIL									
B01	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B02	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B03	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B04	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B05	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B06	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B07	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B08	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B09	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B10	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
B11	0-6"	X	X	X	X	X	X	X	
	10-12'	X	X	X	X	X	X	X	
GROUNDWATER									
MW01	9-10'	X	X	X			X	X	
MW02	9-10'	X	X	X			X	X	
MW03	9-10'	X	X	X			X	X	
MW04	9-10'	X	X	X			X	X	
SOIL VAPOR									
SG01	-								X
SG02	-								X
SG03	-								X
SG04	-								X
SG05	-								X

Notes:
VOCs - Volatile Organic Compounds
SVOCs - Semi-volatile Organic Compounds
PCBs - Polychlorinated biphenyls
PFAS - Per- and Polyfluoroalkyl Substances
QAQC samples include:
MS/MSD - 1 for every 20 samples
Field Duplicate - 1 for every 20 samples
Trip Blanks - 1 per cooler of samples to be analyzed for VOCs
Field Blanks - 1 for every 20 samples

FIGURES





MAP SOURCE: USGS
SITE COORDINATES: 40°40'33"N, 73°52'53"W

HALEY ALDRICH

350-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
OCTOBER 2021

FIGURE 1

GIS: \\haleyaldrich.com\share\CF\Projects\0201831\GIS\Maps\2021_10\201831_001_0001_PROJECT_LOCUS.mxd - hwachholz - 10/12/2021 4:38:08 PM

LEGEND

⬚ SITE BOUNDAR

● APPROXIMATE LOCATIONS OF VENT PIPES (ROOF)

⬚ APPROXIMATE LOCATIONS OF HYDRAULIC LIFTS

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NEW YORK STATE GIS
3. AERIAL IMAGERY SOURCE: NEARMAP, 10 MARCH 2021

N

0 40 80
SCALE IN FEET

HALEY ALDRICH

352-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

SITE FEATURES MAP

SEPTEMBER 2021

FIGURE 2

GIS: C:\Users\lphillips\Desktop\gis_working\0201831\GIS\Maps\2021_06\201831_001_0002_SITE_PLAN.mxd - lphillips - 6/11/2021 10:02:22 AM

LEGEND

⬚ SITE BOUNDARY

⊕ PROPOSED SOIL BORING LOCATION

◈ PROPOSED SOIL BORING/PERMANENT MONITORING WELL LOCATION

▲ PROPOSED SOIL VAPOR SAMPLING LOCATION

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NEW YORK STATE GIS
3. AERIAL IMAGERY SOURCE: NEARMAP, 10 MARCH 2021
4. B06 WILL BE INSTALLED WITHIN PARTIAL CELLAR USING A LIMITED ACCESS RIG.

N

0 40 80

SCALE IN FEET

HALEY ALDRICH

352-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

PROPOSED SAMPLE LOCATION MAP

SEPTEMBER 2021

FIGURE 3

GIS: C:\Users\lphillips\Desktop\gis_working\0201831\GIS\Maps\2021_06\201831_001_0002_SITE_PLAN.mxd - lphillips - 6/11/2021 10:02:22 AM

APPENDIX A

Previous Reports

(SEPARATED ON USB)

APPENDIX B

Field Sampling Plan

www.haleyaldrich.com

FIELD SAMPLING PLAN
352-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

by
Haley & Aldrich of New York
New York, New York

for
362 Shepherd Development LLC
1475 37th Street, Suite 611
Brooklyn, New York 11218

File No. 203454-002
October 2021

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Table of Contents

1. Introduction

This Field Sampling Plan (FSP) has been prepared as a component of the Remedial Investigation Work Plan (RIWP) for the subject Site located at 352-362 Shepherd Avenue in Brooklyn, New York. This document was prepared to establish field procedures for field data collection to be performed in support of the RIWP for the Site.

The RIWP includes this Field Sampling Plan, a Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Community Air Monitoring Plan (CAMP), which are included as part of this plan by reference.

The standard operating procedures (SOP) included as components of this plan will provide the procedures necessary to meet the project objectives. The SOPs will be used as reference for the methods to be employed for field sample collection and handling and the management of field data collected in the execution of the approved RIWP. The SOPs include numerous methods to execute the tasks of the RIWP. The Project Manager will select the appropriate method as required by field conditions and/or the objective the respective project task at the time of sample collection. Field procedures will be conducted in general accordance with the New York State Department of Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (DER-10) and the Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program when applicable.

2. Field Program

This FSP provides the general purpose of sampling as well as procedural information. The RIWP contains the details on sampling and analysis (locations, depths, frequency, analyte lists, etc.).

The field program has been designed to acquire the necessary data to comply with the RIWP, and includes the following tasks:

- Soil sampling;
- Groundwater sampling;
- Soil vapor sampling;
- Sampling of investigation of derived wastes (IDW) as needed for disposal.

A Limited Phase II Site Investigation (ESI) was performed at the Site in March 2018 to investigate the anticipated contaminants of concern identified based on the Site's current and former uses. The Limited Phase II ESI has determined baseline information regarding volatile organic compound (VOC), semi-volatile organic compound (SVOC), and metal contaminants. The site characterization did not identify a source of contamination on the Site, therefore additional targeted soil, groundwater, and soil vapor sampling is proposed.

These SOPs presented herein may be changed as required, dependent on-site conditions, or equipment limitations, at the time of sample collection. If the procedures employed differ from the SOP, the deviations will be documented in the associated sampling report.

3. Utility Clearance

Invasive remedial activities such as excavation or remedial construction activities require location of underground utilities prior to initiating work. Such clearance is sound practice in that it minimizes the potential for damage to underground facilities and more importantly, is protective of the health and safety of personnel. Under no circumstances will invasive activities be allowed to proceed without obtaining proper utility clearance by the appropriate public agencies and/or private entities. This clearance requirement applies to all work on both public and private property, whether located in a dense urban area or a seemingly out-of-the-way rural location.

The drilling contractor performing the work will be responsible for obtaining utility clearance.

Utility clearance is required by law, and obtaining clearance includes contacting a public or private central clearance agency via a “one-call” telephone service and providing the proposed exploration location information. It is important to note that public utility agencies may not, and usually do not have information regarding utility locations on private property.

Before beginning subsurface work at any proposed exploration locations, it is critical that all readily-available information on underground utilities and structures be obtained. This includes publicly available information as well as information in the possession of private landowners. Any drawings obtained must be reviewed in detail for information pertaining to underground utilities.

Using the information obtained, the site should be viewed in detail for physical evidence of buried lines or structures, including pavement cuts and patches, variation in or lack of vegetation, variations in grading, etc. Care must also be taken to avoid overhead utilities as well. Presence of surface elements of buried utilities should be documented, such as manholes, gas or water service valves, catch basins, monuments or other evidence.

Overhead utility lines must be considered when choosing exploration and excavation locations. Most states require a minimum of 10 ft of clearance between equipment and energized wires. Such separation requirements may also be voltage-based and may vary depending on state or municipality regulations. In evaluating clearance from overhead lines, the same restrictions may apply to “drops”, or wires on a utility pole connecting overhead and underground lines.

Using the information obtained and observations made, proposed exploration or construction locations should be marked in the field. Marking locations can be accomplished using spray paint on the ground, stakes, or other means. All markings of proposed locations should be made in white, in accordance with the generally-accepted universal color code for facilities identification (AWMA 4/99):

- White: Proposed Excavation or Drilling location
- Pink: Temporary Survey Markings
- Red: Electrical Power Lines, Cables, Conduit and Lighting Cables
- Yellow: Gas, Oil, Steam, Petroleum or Gaseous Materials
- Orange: Communication, Alarm or Signal Lines, Cables or Conduits
- Blue: Potable Water
- Purple: Reclaimed Water, Irrigation and Slurry Lines

- Green: Sewers and Drain Lines

In order to effectively evaluate the proposed locations with these entities, detailed, accurate measurements between the proposed locations and existing surface features should be obtained. Such features can be buildings, street intersections, utility poles, guardrails, etc.

Obtaining the utility clearance generally involves the designated “One-Call” underground facilities protection organization for the area and the landowner and one or both following entities:

- A third-party utility locator company will be utilized to locate underground utilities outside of the public right-of-way; and/or
- “Soft dig” excavation techniques to confirm or deny the presence of underground utilities in the area.

The proposed locations should be evaluated in light of information available for existing underground facilities. The detailed measurement information described above will be required by the “one call” agency. The owners of the applicable, participating underground utilities are obligated to mark their respective facilities at the site in the colors described above. Utility stake-out activities will typically not commence for approximately 72 hours after the initial request is made.

The public and private utility entities generally only mark the locations of their respective underground facilities within public rights-of-way. Determination of the locations of these facilities on private property will be the responsibility of the property owner or Contractor. If available information does not contain sufficient detail to locate underground facilities with a reasonable amount of confidence, alternate measures may be appropriate, as described below. In some cases, the memory of a long-time employee of a facility on private property may be the best or only source of information. It is incumbent on the Consultant or Contractor to exercise caution and use good judgement when faced with uncertainty.

Note: It is important to note that not all utilities are participants in the “one-call” agency or process. As such, inquiries must be made with the “one-call” agency to determine which entities do not participate, so they can be contacted independently.

Most utility stakeouts have a limited time period for which they remain valid, typically two to three weeks. It is critical that this time period be considered to prevent expiration of clearance prior to completion of the invasive activities, and the need to repeat the stake-out process.

Care must be exercised to document receipt of notice from the involved agencies of the presence or absence of utilities in the vicinity of the proposed locations.

Most agencies will generally provide a telephone or fax communication indicating the lack of facilities in the project area. If contact is not made by all of the agencies identified by the “one-call” process, do not assume that such utilities are not present. Re-contact the “one-call” agency to determine the status.

For complicated sites with multiple proposed locations and multiple utilities, it is advisable to arrange an on-site meeting with utility representatives. This will minimize the potential for miscommunication amongst the involved parties.

Completion of the utility stake out process is not a guarantee that underground facilities will not be encountered in excavations or boreholes; in fact, most "one-call" agencies and individual utilities do not offer guarantees, nor do they accept liability for damage that might occur. In areas outside the public right-of-way, a utility locating service may be utilized to locate underground utilities. It is advisable that any invasive activities proceed with extreme caution in the upper four to five feet in the event the clearance has failed to identify an existing facility. This may necessitate hand-excavation or probing to confirm potential presence of shallow utilities. If uncertainty exists for any given utility, extra activities can be initiated to solve utility clearance concerns. These options include:

- Screening the proposed work areas with utility locating devices, and/or hiring a utility locating service to perform this task.
- Hand digging, augering or probing to expose or reveal shallow utilities and confirm presence and location. In northern climates, this may require advancing to below frost line, typically at least four feet.
- Using "soft dig" techniques that utilize specialized tools and compressed air to excavate soils and locate utilities. This technique is effective in locating utilities to a depth of four to five feet.

Equipment/Materials:

- White Spray paint
- Wooden stakes, painted white or containing white flagging
- Color-code key
- Available drawings

4. Field Data Recording

This procedure describes protocol for documenting the investigation activities in the field. Field data serves as the cornerstone for an environmental project, not only for site characterization but for additional phases of investigation or remedial design. Producing defensible data includes proper and appropriate recording of field data as it is obtained in a manner to preserve the information for future use. This procedure provides guidelines for accurate, thorough collection and preservation of written and electronic field data.

Field data to be recorded during the project generally includes, but is not limited to, the following:

- general field observations;
- numeric field measurements and instrument readings;
- quantity estimates;
- sample locations and corresponding sample numbers;
- relevant comments and details pertaining to the samples collected;
- documentation of activities, procedures and progress achieved;
- contractor pay item quantities;
- weather conditions;
- a listing of personnel involved in site-related activities;
- a log of conversations, site meetings and other communications; and,
- field decisions and pertinent information associated with the decisions.

4.1 Written Field Data

Written field data will be collected using a standardized, pre-printed field log form. In general, use of a field log form is preferable as it prompts field personnel to make appropriate observations and record data in a standardized format. This promotes completeness and consistency from one person to the next. Otherwise, electronic data collection using a handheld device produces equal completeness and consistency using a preformatted log form.

In the absence of an appropriate pre-printed form, the data should be recorded in an organized and structured manner in a dedicated project field log book. Log books must be hard cover, bound so that pages cannot be added or removed, and should be made from high-grade 50% rag paper with a water-resistant surface.

The following are guidelines for use of field log forms and log books:

1. Information must be factual and complete.
2. All entries will be made in black indelible ink with a ballpoint pen and will be written legibly. Do not use “rollerball” or felt tip-style pens, since the water-soluble ink can run or smear in the presence of moisture.
3. Field log forms should be consecutively numbered.
4. Each day’s work must start a new form/page.
5. At the end of each day, the current log book page or forms must be signed and dated by the field personnel making the entries.

6. Make data entries immediately upon obtaining the data. Do not make temporary notes in other locations for later transfer; this only increases the potential for error or loss of data.
7. Entry errors are to be crossed out with a single line and initialed by the person making the correction.
8. Do not leave blanks on log forms, if no entry is applicable for a given data field, indicate so with "NA" or a dash ("--").
9. At the earliest practical time, photocopies or typed versions of log forms and log book pages should be made and placed in the project file as a backup in the event the book or forms are lost or damaged.
10. Log books should be dedicated to one project only, i.e., do not record data from multiple projects in one log book.

4.2 Electronic Data

Electronic data recording involves electronic measurement of field information through the use of monitoring instruments, sensors, gauges, and equipment controls. The following is a list of guidelines for proper recording and management of electronic field data:

1. Field data management should follow requirements of a project-specific data management plan (DMP), if applicable.
2. Use only instruments that have been calibrated in accordance with manufacturer's recommendations.
3. Usage of instruments, controls and computers for the purpose of obtaining field data should only be performed by personnel properly trained and experienced in the use of the equipment and software.
4. Use only fully-licensed software on personal computers and laptops.
5. Loss of electronic files may mean loss of irreplaceable data. Every effort should be made to back up electronic files obtained in the field as soon as practical. A backup file placed on the file server will minimize the potential for loss.
6. Electronic files, once transferred from field instruments or laptops to office computers, should be protected if possible, to prevent unwanted or inadvertent manipulation or modification of data. Several levels of protection are usually available for spreadsheets, including making a file "read-only" or assigning a password to access the file.
7. Protect CD disks from exposure to moisture, excessive heat or cold, magnetic fields, or other potentially damaging conditions.
8. Remote monitoring is often used to obtain stored electronic data from site environmental systems. A thorough discussion of this type of electronic field data recording is beyond the scope of this Section. Such on-site systems are generally capable of storing a limited amount of data as a comma-delimited or spreadsheet file. Users must remotely access the monitoring equipment files via modem or other access and download the data. In order to minimize the potential for loss of data, access and downloading of data should be performed frequently enough to ensure the data storage capacity of the remote equipment is not exceeded.

Equipment/Materials:

- Appropriate field log forms, or iPad® or equivalent with preformatted log forms.
- Indelible ball point pen (do not use "rollerball" or felt-tip style pens);
- Straight edge;

- Pocket calculator; and
- Laptop computer (if required).

5. Aquifer Characterization

This procedure describes measurement of water levels in groundwater monitoring.

A synoptic gauging round will be completed to obtain water levels in monitoring wells. Water levels will be acquired in a manner that provides accurate data that can be used to calculate vertical and horizontal hydraulic gradients and other hydrogeologic parameters. Accuracy in obtaining the measurements is critical to ensure the usability of the data.

5.1 Procedure

In order to provide reliable data, water level monitoring events should be collected over as short a period of time as practical. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements must be noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level collection period, it is imperative that the time of data collection at each station be accurately recorded. Water levels will also be collected prior to any sample collection that day.

The depth to groundwater will be measured with an electronic depth-indicating probe. Prior to obtaining a measurement, a fixed reference point on the well casing will be established for each well to be measured. Unless otherwise established, the reference point is typically established and marked on the north side of the well casing. Do not use protective casings or flush-mounted road boxes as a reference, due to the potential for damage or settlement. The elevation of the reference point shall be obtained by accepted surveying methods, to the nearest 0.01 ft.

The water level probe will be lowered into the well until the meter indicates (via indicator light or tone) the water is reached. The probe will be raised above water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading taken. This procedure will be followed three times or until a consistent value is obtained. The value will be recorded to the nearest 0.01 feet on the Groundwater Level Monitoring Report form.

Upon completion, the probe will be raised to the surface and together with the amount of cable that entered the well casing, will be decontaminated in accordance with methods described in Equipment Decontamination Procedure.

Equipment/Materials:

- Battery-operated, non-stretch electronic water level probe with permanent markings at 0.01 ft. increments, such as the Solinst Model 101 or equivalent.
- The calibrated cable on the depth indicator will be checked against a surveyor's steel tape once per quarter year. A new cable will be installed if the cable has changed by more than 0.01% (0.01 feet for a 100-foot cable). See also the Field Instruments – Use and Calibration Procedure.
- Groundwater Level Monitoring Report form.

6. Sample Collection for Laboratory Analysis

6.1 SOIL SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following procedure is an introduction to soil sampling techniques and an outline of field staff responsibilities. All samples will be collected with dedicated sampling equipment.

6.1.1 Preparatory Requirements

Prior to the beginning of any remedial investigation or remedial measures activities, staff must attend a project briefing for the purpose of reviewing the project work plan, site and utility plans, drawings, applicable regulations, sampling location, depth, and criteria, site contacts, and other related documents. Health and safety concerns will be documented in a site-specific Health & Safety Plan.

A file folder for the field activities should be created and maintained such that all relevant documents and log forms likely to be useful for the completion of field activities by others are readily available in the event of personnel changes.

6.1.2 Soil Classification

The stratigraphic log is a factual description of the soil at the borehole location and is relied upon to interpret the soil characteristics, and their influence and significance in the subsurface environment. The accuracy of the stratigraphic log is to be verified by the person responsible for interpreting subsurface conditions. An accurate description of the soil stratigraphy is essential for a reasonable understanding of the subsurface conditions. Confirmation of the field description by examination of representative soil samples by the project geologist, hydrogeologist, or geotechnical engineer (whenever practicable) is recommended.

The ability to describe and classify soil correctly is a skill that is learned from a person with experience and by systematic training and comparison of laboratory results to field descriptions.

6.1.2.1 Data Recording

Several methods for classifying and describing soils or unconsolidated sediments are in relatively widespread use. The Unified Soil Classification System (USCS) is the most common. With the USCS, a soil is first classified according to whether it is predominantly coarse-grained or fine-grained.

The description of fill soil is similar to that of natural undisturbed soil except that it is identified as fill and not classified by USCS group, relative density, or consistency. Those logging soils must attempt to distinguish between soils that have been placed (i.e., fill) and not naturally present; or soils that have been naturally present but disturbed (i.e., disturbed native).

It is necessary to identify and group soil samples consistently to determine the subsurface pattern or changes and non-conformities in soil stratigraphy in the field at the time of drilling. The stratigraphy in each borehole during drilling is to be compared to the stratigraphy found at the previously completed boreholes to ensure that pattern or changes in soil stratigraphy are noted and that consistent terminology is used.

Visual examination, physical observations and manual tests (adapted from ASTM D2488, visual-manual procedures) are used to classify and group soil samples in the field and are summarized in this subsection. ASTM D2488 should be reviewed for detailed explanations of the procedures. Visual-manual procedures used for soil identification and classification include:

- visual determination of grain size, soil gradation, and percentage fines;
- dry strength, dilatancy, toughness, and plasticity (thread or ribbon test) tests for identification of inorganic fine-grained soil (e.g., CL, CH, ML, or MH); and
- soil compressive strength and consistency estimates based on thumb indent and pocket penetrometer (preferred) methods.

Soil characteristics like plasticity, strength and dilatancy should be determined using the Haley & Aldrich Soil Identification Field Form.

6.1.2.2 Field Sample Screening

Upon the collection of soil samples, the soil is screened with a photoionization detector (PID) for the presence of organic vapor. This is accomplished by running the PID across the soil sample. The highest reading and sustained readings are recorded.

Note: The PID measurement must be done upwind of the excavating equipment or any running engines so that exhaust fumes will not affect the measurements.

Another method of field screening is head space measurements. This consists of placing a portion of the soil sample in a sealable glass jar, placing aluminum foil over the jar top, and tightening the lid. Alternatively, plastic sealable bags may be utilized for field screen in lieu of glass containers. The jar should only be partially filled. Shake the jar and set aside for at least 30 minutes. After the sample has equilibrated, the lid of the jar can be opened; the foil is punctured with the PID probe and the air (headspace) above the soil sample is monitored. This headspace reading on the field form or in the field book is recorded. All head space measurements must be completed under similar conditions to allow comparability of results. Soil classification and PID readings will be recorded in the daily field report.

Equipment/Materials:

- Pocket knife or small spatula
- Small handheld lens
- Stratigraphic Log (Overburden) (Form 2001)
- Tape Measure
- When sampling for PFAS, acceptable materials for sampling include stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate, and polypropylene.

6.1.3 Soil Sampling

Soil samples will be collected from acetate liners installed by a track-mounted direct push drill rig (Geoprobe®) operated by a licensed operator. Soil samples will be collected using a stainless-steel trowel or sampling spoon into laboratory provided sample containers. If it is necessary to relocate any proposed sampling location due to terrain, utilities, access, etc., the Project Manager must be notified, and an alternate location will be selected.

Prior to use and between each sampling location at an environmental site, the sampling equipment must be decontaminated. All decontamination must be conducted in accordance with the project specific plans or the methods presented in SOP 7.0.

6.1.4 Sampling Techniques

The following procedure describes typical soil sample collection methods for submission of samples to a laboratory for chemical analysis. The primary goal of soil sampling is to collect representative samples for examination and chemical analysis (if required).

Environmental soil samples obtained for chemical analyses are collected with special attention given to the rationale behind determining the precise zone to sample, the specifics of the method of soil extraction and the requisite decontamination procedures. Preservation, handling and glassware for environmental soil samples varies considerably depending upon several factors including the analytical method to be conducted, and the analytical laboratory being used.

6.1.4.1 Grab Versus Composite Samples

A grab sample is collected to identify and quantify conditions at a specific location or interval. The sample is comprised of the minimum amount of soil necessary to make up the volume of sample dictated by the required sample analyses. Composite samples may be obtained from several locations or along a linear trend (in a test pit or excavation). Sampling may occur within or across stratification.

6.2 GROUNDWATER SAMPLE COLLECTION FOR LABORATORY ANALYSIS

The following section describes two techniques for groundwater sampling: "Low Stress/Low Flow Methods" and "Typical Sampling Methods."

"Low Stress/Low Flow" methods will be employed when collecting groundwater samples for the evaluation of volatile constituents (i.e. dissolved oxygen (DO)) or in fine-grained formations where sediment/colloid transport is possible. Analyses typically sensitive to colloidal transport issues include polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs) and metals.

The "Typical Sampling Methods" will be employed where the collection of parameters less sensitive to turbidity/sediment issues are being collected (general chemistry, pesticides and other semi-volatile organic compounds (SVOCs)).

NOTE: If non-aqueous phase liquids (NAPL) (light or dense) are detected in a monitoring well, groundwater sample collection will not be conducted, and the Project Manager must be contacted to determine a course of action.

6.2.1 Preparatory Requirements

- Verify well identification and location using borehole log details and location layout figures. Note the condition of the well and record any necessary repair work required.

- Prior to opening the well cap, measure the breathing space above the well casing with a handheld organic vapor analyzer to establish baseline breathing space VOC levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the HASP, field personnel should adjust their PPE accordingly.

- Prior to commencing the groundwater purging/sampling, a water level must be obtained to determine the well volume for hydraulic purposes. In some settings, it may be necessary to allow the water level time to equilibrate. This condition exists if a water tight seal exists at the well cap and the water level has fluctuated above the top of screen; creating a vacuum or pressurized area in this air space. Three water level checks will verify static water level conditions have been achieved.

- Calculate the volume of water in the well. Typically overburden well volumes consider only the quantity of water standing in the well screen and riser; bedrock well volumes are calculated on the quantity of water within the open core hole and within the overburden casing.

6.2.2 Well Development

Well development is completed to remove fine grained materials from the well but in such a manner as to not introduce fines from the formation into the sand pack. Well development continues until the well responds to water level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

- Attach appropriate pump and lower tubing into well.
- Gauge well and calculate one well volume. Turn on pump. If well runs dry, shut off pump and allow to recover.
- Surging will be performed by raising and lowering the pump several times to pull fine-grained material from the well. Periodically measure turbidity level using a La Motte turbidity reader.
- The second and third steps will be repeated until turbidity is less than 50 nephelometric turbidity units (NTU) or when 10 well volumes have been removed.
- All water generated during cleaning and development procedures will be collected and contained on site in 55-gallon drums for future analysis and appropriate disposal.

Equipment:

- Appropriate health and safety equipment
- Knife
- Power source (generator)
- Field book
- Well Development Form (Form 3006)
- Well keys
- Graduated pails
- Pump and tubing

- Cleaning supplies (including non-phosphate soap, buckets, brushes, laboratory-supplied distilled/deionized water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.) Water level meter

6.2.3 Well Purging and Stabilization Monitoring (Low Stress/Low Flow Method)

The preferred method for groundwater sampling will be the low stress/low flow method described below.

- Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified by the project requirements. The pump intake must be at the midpoint of the well screen to prevent disturbance and resuspension of any sediment in the screen base.

- Before starting the pump, measure the water level again with the pump in the well leaving the water level measuring device in the well when completed.

- Purge the well at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level should be monitored approximately every 5 minutes, or as appropriate. A steady flow rate should be maintained that results in drawdown of 0.3 feet or less. The rate of pumping should not exceed the natural flow rate conditions of the well. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record adjustments made to the pumping rates and water levels immediately after each adjustment.

- During the purging of the well, monitor and record the field indicator parameters (pH, temperature, conductivity, oxidation-reduction (redox) reaction potential (ORP), dissolved oxygen (DO), and turbidity) approximately every five minutes. Stabilization is considered to be achieved when the final groundwater flow rate is achieved, and three consecutive readings for each parameter are within the following limits:

    - pH: 0.1 pH units of the average value of the three readings;
    - Temperature: 3 percent of the average value of the three readings;
    - Conductivity: 0.005 milliSiemen per centimeter (mS/cm) of the average value of the three readings for conductivity <1 mS/cm and 0.01 mS/cm of the average value of the three readings for conductivity >1 mS/cm;
    - ORP: 10 millivolts (mV) of the average value of the three readings;
    - DO: 10 percent of the average value of the three readings; and
    - Turbidity: 10 percent of the average value of the three readings, or a final value of less than 50 nephelometric turbidity units (NTU).

- The pump must not be removed from the well between purging and sampling.

6.2.4 Sampling Techniques

- If an alternate pump is utilized, the first pump discharge volumes should be discarded to allow the equipment a period of acclimation to the groundwater.

- Samples are collected directly from the pump with the groundwater being discharged directly into the appropriate sample container. Avoid handling the interior of the bottle or bottle cap and don new gloves for each well sampled to avoid contamination of the sample.

- Order of sample collection:

    - Polyfluoroalkyl substances (PFAS)
    - Volatile organic compounds (VOC)
    - 1,4-Dioxane
    - Semi-volatile organic compounds (SVOC)
    - Total Analyte List (TAL) metals

- No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

- For low stress/low flow sampling, samples should be collected at a flow rate between 100 and 500 mL/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 feet.

- The pumping rate used to collect a sample for VOC should not exceed 100 mL/min. Samples should be transferred directly to the final container 40 mL glass vials completely full and topped with a Teflon cap. Once capped the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present, the sample will be discarded, and recollected until free of air.

- All samples must be labeled with:

    - A unique sample number
    - Date and time
    - Parameters to be analyzed
    - Project Reference ID
    - Samplers initials

- Labels should be written in indelible ink and secured to the bottle with clear tape.

Equipment/Materials:

- pH meter, conductivity meter, DO meter, ORP meter, nephelometer, temperature gauge
- Field filtration units (if required)
- Purging/sampling equipment
    - Bladder pump
- Water level probe
- Sampling materials (containers, log book/forms, coolers, chain of custody)
- Work Plan
- Health and Safety Plan

- When sampling for PFAS, acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene.

Note: 1,4-Dioxane and PFAS purge and sample techniques will be conducted following the NYSDEC guidance documents (see Appendix C of the RIWP). Acceptable groundwater pumps include stainless steel inertia pump with HDPE tubing, bladder pump equipped with HDPE tubing and silicone tubing, stainless steel bailer with stainless steel ball or bladder pump (identified as PFAS-free) with HDPE tubing.

Field Notes:

- Field notes must document all the events, equipment used, and measurements collected during the sampling activities. Section 2.0 describes the data/recording procedure for field activities.
- The log book should document the following for each well sampled:
  - Identification of well
  - Well depth
  - Static water level depth and measurement technique
  - Sounded well depth
  - Presence of immiscible layers and detection/collection method
  - Well yield – high or low
  - Purge volume and pumping rate
  - Time well purged
  - Measured field parameters
  - Purge/sampling device used
  - Well sampling sequence
  - Sampling appearance
  - Sample odors
  - Sample volume
  - Types of sample containers and sample identification
  - Preservative(s) used
  - Parameters requested for analysis
  - Field analysis data and method(s)
  - Sample distribution and transporter
  - Laboratory shipped to
  - Chain of custody number for shipment to laboratory
  - Field observations on sampling event
  - Name collector(s)
  - Climatic conditions including air temperature
  - Problems encountered and any deviations made from the established sampling protocol.

A standard log form for documentation and reporting groundwater purging and sampling events are presented on the Groundwater Sampling Record, Low Flow Groundwater Sampling Form, and Low Flow Monitored Natural Attenuation (MNA) Field Sampling Form. Refer to Appendix A for example field forms.

Groundwater/Decon Fluid Disposal:

- Groundwater disposal methods will vary on a case-by-case basis but may range from:

  - Off-site treatment at private treatment/disposal facilities or public owned treatment facilities
  - On-site treatment at Facility operated facilities
  - Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers.

6.3 SOIL VAPOR SAMPLING

The following procedure is an introduction to soil vapor sampling techniques and an outline of field staff responsibilities.

6.3.1 Preparatory Requirements

Prior to collecting the field sample, ensure the stainless steel oil vapor probe has been installed to the desired depth and sealed completely to the surface using a material such as bentonite. As part of the vapor intrusion evaluation, a tracer gas should be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer gas prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring should be performed a second time to confirm the integrity of the probe seals.

6.3.2 Sampling Techniques

Samples will be collected in appropriate sized Summa canisters that have been certified clean by the laboratory and samples will be analyzed by using USEPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 L/min. One to three implant volumes shall be purged prior to the collection of any soil-gas samples. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

6.4 SAMPLE HANDLING AND SHIPPING

Sample management is the continuous care given to each sample from the point of collection to receipt at the analytical laboratory. Good sample management ensures that samples are properly recorded, properly labeled, and not lost, broken, or exposed to conditions which may affect the sample's integrity.

All sample submissions must be accompanied with a chain of custody (COC) document to record sample collection and submission. Personnel performing sampling tasks must check the sample preparation and preservation requirements to ensure compliance with the Quality Assurance Project Plan.

The following sections provide the minimum standards for sample management.

6.4.1 Sample Handling

Prior to entering the field area where sampling is to be conducted, especially at sites with defined exclusion zones, the sampler should ensure that all materials necessary to complete the sampling are on hand. If samples must be maintained at a specified temperature after collection, dedicated coolers and ice must be available for use. Conversely, when sampling in cold weather, proper protection of water samples, trip blanks, and field blanks must be considered. Sample preservation will involve pH adjustment, cooling to 4°C, and sample filtration and preservation.

6.4.2 Sample Labeling

Samples must be properly labeled immediately upon collection.

Note that the data shown on the sample label is the minimum data required. The sample label data requirements are listed below for clarity.

- Project name
- Sample name/number/unique identifier
- Sampler's initials
- Date of sample collection
- Time of sample collection
- Analysis required
- Preservatives

To ensure that samples are not confused, a clear notation should be made on the container with a permanent marker. If the containers are too soiled for marking, the container can be put into a "zip lock" bag which can then be labeled.

All sample names will be as follows:

- Sample unique identifier: Enter the sample name or number. There should be NO slashes, spaces or periods in the date.
- Date: Enter the six-digit date when the sample was collected. Note that for one-digit days, months, and/or years, add zeros so that the format is MMDDYY (050210). There should be NO slashes, dashes, or periods in the date.

The QA/QC samples will be numbered consecutively as collected with a sample name, date and number of sample collected throughout the day (i.e. when multiple QA/QC samples are collected in one day).

Examples of this naming convention are as follows:

Sample Name:	Comments
TB-050202-0001	TRIP BLANK
TB-050202-0002	TRIP BLANK
FD-050202-0001	FIELD DUPLICATE
FD-050202-0002	FIELD DUPLICATE

NOTE: The QA/QC Sample # resets to 0001 EACH DAY, this will avoid having to look back to the previous day for the correct sequential number.

6.4.3 Field Code

The field code will be written in the 'Comments' field on the chain of custody for EVERY sample but will not be a part of the actual sample name. Enter the one/two-character code for type of sample (must be in CAPITALS):

N	Normal Field Sample
FD	Field Duplicate (note sample number (i.e. 0001) substituted for time)
TB	Trip Blank (note sample number (i.e. 0001) substituted for time)
EB	Equipment Blank (note sample number (i.e. 0001) substituted for time)
FB	Field Blank (note sample number (i.e. 0001) substituted for time)
KD	Known Duplicate
FS	Field Spike Sample
MS	Matrix Spike Sample (note on ‘Comments’ field of COC – laboratory to spike matrix.
MD	Matrix Spike Duplicate Sample (note on ‘Comments’ field of COC – laboratory to spike matrix.
RM	Reference Material

The sample labeling – both chain and sample bottles must be EXACTLY as detailed above. In addition, the Field Sample Key for each sample collected must be filled out.

6.4.4 Packaging

Sample container preparation and packing for shipment should be completed in a well-organized and clean area, free of any potential cross contamination. The following is a list of standard guidelines which must be followed when packing samples for shipment.

- Double bag ice in "Zip Lock" bags.
- Double check to ensure trip and temperature blanks have been included for all shipments containing VOCs, or where otherwise specified in the QAPP.
- Enclose the Chain of Custody form in a "Zip Lock" bag.
- Ensure custody seals (two, minimum) are placed on each cooler. Coolers with hinged lids should have both seals placed on the opening edge of the lid. Coolers with "free" lids should have seals placed on opposite diagonal corners of the lid. Place clear tape over custody seals.
- Containers should be wiped clean of all debris/water using paper towels (paper towels must be disposed of with other contaminated materials).
- Clear, wide packing tape should be placed over the sample label for protection.
- Do not bulk pack. Each sample must be individually padded.
- Large glass containers (1 liter and up) require much more space between containers.
- Ice is not a packing material due to the reduction in volume when it melts.

Note: Never store sterile sample containers in enclosures containing equipment which use any form of fuel or volatile petroleum-based product. When conducting sampling in freezing conditions at sites without a heated storage area (free of potential cross contaminants), unused trip blanks should be isolated from coolers immediately after receipt. Trip blanks should be double bagged and kept from freezing.

6.4.5 Chain-of-Custody Records

Chain of custody (COC) forms will be completed for all samples collected. The form documents the transfer of sample containers. The COC record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The COC document will be signed and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a COC form. The cooler will be sealed properly for shipment. The laboratory will maintain a copy for their records. One copy will be returned with the data deliverables package.

The following list provides guidance for the completion and handling of all COCs:

- COCs used should be a Haley & Aldrich standard form or supplied by the analytical laboratory.
- COCs must be completed in black ball point ink only.
- COCs must be completed neatly using printed text.
- If a simple mistake is made, cross out the error with a single line and initial and date the correction.
- Each separate sample entry must be sequentially numbered.
- If numerous repetitive entries must be made in the same column, place a continuous vertical arrow between the first entry and the next different entry.
- When more than one COC form is used for a single shipment, each form must be consecutively numbered using the "Page ___ of ___" format.
- If necessary, place additional instructions directly onto the COC in the Comment Section. Do not enclose separate instructions.
- Include a contact name and phone number on the COC in case there is a problem with the shipment.
- Before using an acronym on a COC, define clearly the full interpretation of your designation [i.e., polychlorinated biphenyls (PCBs)].

6.4.6 Shipment

Prior to the start of the field sampling, the carrier should be contacted to determine if pickup will be at the field site location. If pick-up is not available at the Site, the nearest pick-up or drop off location should be determined. Sample shipments must not be left at unsecured drop locations.

Copies of all shipment manifests must be maintained in the field file.

7. Field Instruments – Use and Calibration

A significant number of field activities involve usage of electronic instruments to monitor for environmental conditions and health and safety purposes. It is imperative the instruments are used and maintained properly to optimize their performance and minimize the potential for inaccuracies in the data obtained. This section provides guidance on the usage, maintenance and calibration of electronic field equipment.

- All monitoring equipment will be in proper working order and operated in accordance with manufacturer's recommendations.

- Field personnel will be responsible for ensuring that the equipment is maintained and calibrated in the field in accordance with manufacturer's recommendations.

- Instruments will be operated only by personnel trained in the proper usage and calibration.

- Personnel must be aware of the range of conditions such as temperature and humidity for instrument operation. Usage of instruments in conditions outside these ranges will only proceed with approval of the Project Manager and/or Health and Safety Officer as appropriate.

- Instruments that contain radioactive source material, such as x-ray fluorescence (XRF) analyzers or moisture-density gauges require specific transportation, handling and usage procedures that are generally associated with a license from the Nuclear Regulatory Commission (NRC) or an NRC-Agreement State. Under no circumstance will operation of such instruments be allowed on site unless by properly authorized and trained personnel, using the proper personal dosimetry badges or monitoring instruments.

7.1 GENERAL PROCEDURE DISCUSSION

Care must be taken to minimize the potential for transfer of contaminated materials to the ground or onto other materials. Regardless of the size or nature of the equipment being decontaminated, the process will utilize a series of steps that involve removal of gross material (dirt, grease, oil etc.), washing with a detergent, and multiple rinsing steps. In lieu of a series of washes and rinse steps, steam cleaning with low-volume, high-pressure equipment (i.e., steam cleaner) is acceptable.

Exploration equipment, and all monitoring equipment in contact with the sampling media must be decontaminated prior to initiating site activities, in between exploration locations to minimize cross-contamination, and prior to mobilizing off site after completion of site work.

The following specific decontamination procedure is recommended for sampling equipment and tools:

- Brush loose soil off equipment;
- Wash equipment with laboratory grade detergent (i.e., Alconox or equivalent);
- Rinse with tap water;
- Rinse equipment with distilled water;
- Allow water to evaporate before reusing equipment; and

- Wrap equipment in aluminum foil when not being used.

7.2 DECONTAMINATION OF MONITORING EQUIPMENT

Because monitoring equipment is difficult to decontaminate, care should be exercised to prevent contamination. Sensitive monitoring instruments should be protected when they are at risk of exposure to contaminants. This may include enclosing them in plastic bags allowing an opening for the sample intake. Ventilation ports should not be covered.

If contamination does occur, decontamination of the equipment will be required; however, immersion in decontamination fluids is not possible. As such, care must be taken to wipe the instruments down with detergent-wetted wipes or sponges, and then with de-ionized water-wetted wipes or sponges.

7.3 DISPOSAL OF WASH SOLUTIONS AND CONTAMINATED EQUIPMENT

All contaminated wash water, rinses, solids and materials used in the decontamination process that cannot be effectively decontaminated (such as polyethylene sheeting) will be containerized and disposed of in accordance with applicable regulations. All containers will be labeled with an indelible marker as to contents and date of placement in the container, and any appropriate stickers required (such as PCBs). Storage of decontamination wastes on site will not exceed 90 days under any circumstances.

Equipment/Materials:

Decontamination equipment and solutions are generally selected based on ease of decontamination and disposability.

- Polyethylene sheeting;
- Metal racks to hold equipment;
- Soft-bristle scrub brushes or long-handle brushes for removing gross contamination and scrubbing with wash solutions;
- Large galvanized wash tubs, stock tanks, or wading pools for wash and rinse solutions;
- Plastic buckets or garden sprayers for rinse solutions;
- Large plastic garbage cans or other similar containers lined with plastic bags can be used to store contaminated clothing;
- Contaminated liquids and solids should be segregated and containerized in DOT-approved plastic or metal drums, appropriate for offsite shipping/disposal if necessary.

8. Investigation Derived Waste Disposal

8.1 RATIONALE/ASSUMPTIONS

This procedure applies to the disposition of investigation derived waste (IDW) including soils and/or groundwater. IDW is dealt with the following "Best Management Practices" and is not considered a listed waste due to the lack of generator knowledge concerning chemical source, chemical origin, and timing of chemical introduction to the subsurface.

Consequently, waste sampling and characterization is performed to determine if the wastes exhibit a characteristic of hazardous waste. The disposal of soil cuttings, test pit soils and/or purged groundwater will be reviewed on a case by case basis prior to initiation of field activities. Two scenarios typically exist:

- When no information is available in the area of activity or investigation, and impacted media/soils are identified. Activities such as new construction and /or maintenance below grade may encounter environmental conditions that were unknown.
- Disposal Required/Containerization Required – When sufficient Site information regarding the investigative Site conditions warrant that all materials handled will be contained and disposed.

If a known listed hazardous and/or characteristically hazardous waste/contaminated environmental media is being handled, then handling must be performed in accordance with RCRA Subtitle C (reference 2, Part V, Section 1(a),(b),(c)).

The following outlines the waste characterization procedures to be employed when IDW disposal is required.

The following procedure describes the techniques for characterization of IDW for disposal purposes. IDW may consist of soil cuttings (augering, boring, well installation soils, test pit soils), rock core or rock flour (from coring, reaming operations), groundwater (from well development, purging and sampling activities), decontamination fluids, personal protective equipment (PPE), and disposal equipment (DE).

8.2 PROCEDURE

The procedures for handling and characterization of field activity generated wastes are:

A.) Soil Cuttings - Soils removed from boring activities will be contained within an approved container, suitable for transportation and disposal.

  - Once placed into the approved container, any free - liquids (i.e., groundwater) will be removed for disposal as waste fluids or solidified within the approved container using a solidification agent such as Speedy Dri (or equivalent).
  - Contained soils will be screened for the presence of Volatile Organic Compounds (VOCs), using a Photo ionization detector (PID); this data will be logged for future reference.
  - Once screened, full and closed; the container will be labeled and placed into the container storage area. At a minimum, the following information will be shown on each container

label: date of filling/generation, Site name, source of soils (i.e., borehole or well), and contact.
- Prior to container closure, representative samples from the containers will be collected for waste characterization purposes and submitted to the project laboratory.
- Typically, at a location where an undetermined site-specific parameter group exists, sampling and analysis may consist of the full RCRA Waste Characterization (ignitability, corrosivity, reactivity, toxicity), or a subset of the above based upon data collected, historical information, and generator knowledge.

B.) Groundwater - purging, and sampling groundwater, which requires disposal, will be contained.

- Containment may be performed in 55-gallon drums, tanks suitable for temporary storage (i.e., Nalgene tanks 500 to 1,000 gallons) or if large volumes of groundwater are anticipated, tanker trailer (5,000 to 10,000 gallons ±), or drilling "Frac" tanks may be utilized (20,000 gallons ±). In all cases the container/tank used for groundwater storage must be clean before use such that cross contamination does not occur.

C.) Decon Waters/Decon Fluids - Decon waters and/or fluids will be segregated, contained, and disposed accordingly.

- Decon waters may be disposed of with the containerized groundwater once analytical results have been acquired.

D.) PPE/DE – A number of disposal options exists for spent PPE/DE generated from investigation tasks. The options typically employed are:

- Immediately disposed of within on-Site dumpster/municipal trash; or
- If known to be contaminated with RCRA hazardous waste, dispose off-Site at a RCRA Subtitle C facility.
- Spent Solvent/Acid Rinses - The need for sampling must be determined in consultation with the waste management organization handling the materials. If known that only the solvent and/or acids are present, then direct disposal/treatment using media specific options may be possible without sampling (i.e., incineration).
- PPE/DE – Typically not sampled and included with the disposal of the solid wastes.

Equipment/Materials:

- Sample spoons, trier, auger,
- Sample mixing bowl,
- Sampling bailer, or pump,
- Sample glassware.

References

1. American Public Works Association, April 1999, Uniform Color Code (http://www.apwa.net/)
2. ASTM Standard D 2487, “Classification of Soils for Engineering Purposes (Unified Soil Classification System)”.
3. ASTM 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)
4. ASTM D6000 Guide for Presentation of Water Level Information from Ground Water Sites
5. ASTM D5474: Guide for Selection of Data Elements for Groundwater Investigations
6. ASTM D4696: Guide for Pore-liquid Sampling from the Vadose Zone
7. ASTM D5979: Guide for Conceptualization and Characterization of Groundwater Systems
8. ASTM D5903: Guide for Planning and Preparing for a Groundwater Sampling Event
9. ASTM D4448: Standard Guide for Sampling Groundwater Wells
10. ASTM D6001: Standard Guide for Direct Push Water Sampling for Geo-environmental Investigations.
11. ASTM (1991), Standard D1452-80, “Practice for Soil Investigation and Sampling by Auger Borings”, Annual Book of ASTM Standard, Section 4, Volume 04.08.
12. ASTM Standards on Environmental Sampling (1995), Standard D 2488-93, “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)”
13. ASTM Standards on Environmental Sampling (1995), Standard D 4700-91, “Guide for Soil Sampling from the Vadose Zone”.
14. ASTM Standards on Environmental Sampling (1995), Standard D 1586-92, “Test Method for Penetration Test and Split-Barrel Sampling of Soils”.
15. ASTM D5088 - Practice for Decontamination of Field Equipment Used at Non-Radioactive Waste Sites
16. Geotechnical Gauge, Manufactured by W.F. McCollough, Beltsville, MD.
17. New York State Code Rule 753
18. New York State Department of Environmental Conservation Technical Guidance for Site Investigation and Remediation, DER-10, (3 May 2010).
19. New York State Department of Environmental Conservation, Division of Environmental Remediation, Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program (January 2021).
20. Sand Grading Chart, by Geological Specialty Company, Northport, Alabama.
21. USEPA Office of Solid Waste- SW846 Chapter 9 Sampling Plan, Chapter 10 Sampling Methods (September 1986).
22. USEPA (1986), RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.
23. USEPA (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001.

24. USEPA (1988), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER-9950.1.
25. USEPA RCRA - Guidance and Policies: Management of Remediation Waste Under RCRA (October 1998).
26. USEPA RCRA - Management of Contaminated Media (October 1998).
27. USEPA CERCLA Guidance (Options Relevant to RCRA Facilities): Guide to Management of Investigation - Derived Wastes (January 1992).
28. USEPA: Low-flow (Minimal Drawdown) Groundwater Sampling Procedures (EPA/540/S-95/504)
29. USEPA: RCRA Groundwater Monitoring: Draft Technical guidance (EPA/530 R 93 001)
30. The Occupational Safety and Health Administration’s (OSHA) Excavation and Trenching Standard Title 29 of the Code of Federal Regulation (CFR) Part 1926.650.

APPENDIX A
Field Forms

HALEY
ALDRICH

EQUIPMENT CALIBRATION LOG

Project:
Location:
Model Name:
Model Number: **Serial Number:**
Cal. Standards:

Instruments will be calibrated in accordance with manufacturer's recommendations at least once per day.

Date	Time	Calibration Satandard Solution	Calibration Result	Calibrated by

Other Comments:

Groundwater Field Sampling Form

Location:

Job Number: ____________________
Well ID: ____________________
Field Sampling Crew: ___________

Date: ____________________
Start Time: ____________________
Finished Time: ____________________

Initial Depth to Water: ____________________
Well Depth: ____________________
Depth to top of screen: ____________________
Depth to bottom of screen: ____________________
Depth of Pump Intake: ____________________

Purging Device:________________
Tubing present in well? __________
Tubing type: __________________

Time Elapsed (24 hour)	Depth to Water (from casing)	Pump Setting (ml/min or gal/min)	Purge Rate (ml/min or gal/min)	Cumulative Purge Volume (liters or gallons)	Temperature (degrees Celsius)	pH	Conductivity us/cm	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments

Comments:

HALEY ALDRICH

SAMPLE IDENTIFICATION KEY

Page **of**

PROJECT ______________________

LOCATION ______________________

CLIENT ______________________

CONTRACTOR ______________________

H&A FILE NO. ______________________

PROJECT MGR. ______________________

Sample ID	Parent Sample ID	Location ID	Sample Date	Sample Time (military)	Sample Type Code	Filtered (Water Only T/D/N)	Composite Y/N	Soil Type	Depth To Top Of Sample	Depth To Bottom Of Sample	C.O.C. Number	Notes	Collected By

Notes:

Common Sample Type Codes:

N Normal Environmental Samp	WG Groundwater	WS Surface Water	SO Soil	GS Soil Gas	SE Sediment
WQ Water for Quality Control	FD Field Duplicate	EB Equipment Blank	TB Trip Blank	MS Matris Spike	MSD Matrix Spike Duplicate

see Memorandum dated 08/08/05 from Melanie Satanek "Sample Labeling for Submission to Analytical Laboratory" for less common codes

HALEY ALDRICH

DAILY FIELD REPORT

Page of

Project		**Report No.**	
Location		**Date**	
Client		**Page**	of
Contractor		**File No.**	
Weather		**Temperature**	

Field Representative(s)	Time on site	Report/Travel/Other	Total hours

Distribution:

Haley & Aldrich, Inc.

Form 4004

GEOPROBE BORING REPORT

BORING NO.

Page 1 **of**

PROJECT
LOCATION
CLIENT
CONTRACTOR
DRILLER

PROJECT MGR.
FIELD REP.
DATE STARTED
DATE FINISHED

Elevation ft.	**Datum**	**Boring Location**

Item	**Casing**	**Sampler**	**Core Barrel**
Type			
Inside Diameter (in.)			
Hammer Weight (lb.)			▨
Hammer Fall (in.)			▨

Rig Make & Model

☐ Truck	☐ Tripod	☐ Cat-Head
☐ ATV	☐ Geoprobe	☐ Winch
☐ Track	☐ Air Track	☐ Roller Bit
☐ Skid	☐ __________	☐ Cutting Head

Hammer Type	**Drilling Mud**	**Casing Advance**
☐ Safety	☐ Bentonite	**Type Method Depth**
☐ Doughnut	☐ Polymer	
☐ Automatic	☐ None	

Drilling Notes:

Depth (ft.)	Casing Blows	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft)	Elev./ Depth (ft)	**Visual-Manual Identification & Description** (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)

Water Level Data					
			Depth in feet to:		
Date	**Time**	**Elapsed Time (hr.)**	**Bottom of Casing**	**Bottom of Hole**	**Water**
Date					

Sample ID

O	Open End Rod
T	Thin Wall Tube
U	Undisturbed Sample
S	Split Spoon Sample
G	Geoprobe

Summary

Overburden (Linear ft.) ______________
Rock Cored (Linear ft.) ______________
Number of Samples ______________

BORING NO.

***NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.**

NOTE: Soil descriptions based on a modified Burmister method of visual-manual identification

Form #3000

APPENDIX C

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
FORMER GARONE BROS AUTO SERVICE CENTER SITE
352-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK

by
Haley & Aldrich of New York
New York, New York

for
362 Shepherd Development LLC
Brooklyn, New York

File No. 0201831-002
October 2021

Executive Summary

This Quality Assurance Project Plan (QAPP) outlines the scope of the quality assurance and quality control (QA/QC) activities associated with the site monitoring activities associated with the Remedial Investigation Work Plan (RIWP) for the Former Garone Bros Auto Service Center Site located at 352-362 Shepherd Avenue (Site) in Brooklyn, New York.

Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described herein or specifically referenced to related project documents.

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1. Project Description

This Quality Assurance Project Plan (QAPP) has been prepared as a component of the RIWP for the Former Garone Bros Auto Service Center Site located at 352-362 Shepherd Avenue Site in Brooklyn, New York.

1.1 PROJECT OBJECTIVES

The primary objective for data collection activities is to collect sufficient data necessary to monitor the nature of any remaining groundwater and soil impacts.

1.2 SITE DESCRIPTION AND HISTORY

The general Site description and Site history is provided in the Site Description and History Summary that accompanies the RIWP appended to the Brownfield Cleanup Program application for the Site and incorporated herein by reference.

1.3 LABORATORY PARAMETERS

The laboratory parameters for soil include:

- Target Compound List volatile organic compounds (VOCs) using EPA method 8260B
- Target Compound List semi-volatile organic compounds (SVOCs) using EPA method 8270C
- Total Analyte List (TAL) Metals using EPA method 6010
- Polychlorinated biphenyls (PCBs) using EPA method 8082
- Pesticides using EPA 8081
- Per- and polyfluoroalkyl substances (PFAS) using EPA method 537
- 1,4-Dioxane using EPA method 8260B

The laboratory parameters for groundwater include:

- Target Compound List volatile organic compounds (VOCs) using EPA method 8260B
- Target Compound List semi-volatile organic compounds (SVOCs) using EPA method 8270C
- Total Analyte List (TAL) Metals using EPA method 6010
- Per- and polyfluoroalkyl substances (PFAS) using EPA method 537
- 1,4-Dioxane using EPA method 8260B

Note: 1,4-Dioxane and PFAS sampling techniques will be conducted following the NYSDEC Collection of Groundwater Samples for Per- and Polyfluoroalkyl Substances (PFAS) from Monitoring Wells Sample Protocol.

During the collection of groundwater samples, pH, specific conductivity, temperature, dissolved oxygen (DO), and oxidation/reduction potential (ORP) will be measured until stabilized.

The laboratory parameter for soil vapor includes:

- VOCs using EPA method TO-15

Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

1.4 SAMPLING LOCATIONS

The RIWP provides the locations of soil samples and groundwater monitoring wells that will be sampled.

2. Project Organization and Responsibilities

This section defines the roles and responsibilities of the individuals who will perform the RIWP monitoring activities. A NYSDOH certified analytical laboratory will perform the analyses of environmental samples collected at the Site.

2.1 MANAGEMENT RESPONSIBILITIES

The Project Manager is responsible for managing the implementation of the RIWP and monitoring and coordinating the collection of data. The Project Manager is responsible for technical quality control and project oversight. The Project Manager responsibilities include the following:

- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule restraints;
- Review work performed to ensure quality, responsiveness, and timeliness;
- Communicate with the client point of contact concerning the progress of the monitoring activities;
- Assure corrective actions are taken for deficiencies cited during audits of RIWP monitoring activities; and
- Overall Site health and safety plan compliance.

2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance team will consist of a Quality Assurance Officer and the Data Validation staff. Quality Assurance responsibilities are described as follows:

2.2.1 Quality Assurance (QA) Officer

The QA Officer reports directly to the Project Manager and will be responsible for overseeing the review of field and laboratory data. Additional responsibilities include the following:

- Assure the application and effectiveness of the QAPP by the analytical laboratory and the project staff;
- Provide input to the Project Manager as to corrective actions that may be required as a result of the above-mentioned evaluations;
- Prepare and/or review data validation and audit reports.

The QA Officer will be assisted by the data validation staff in the evaluation and validation of field and laboratory generated data.

2.2.2 Data Validation Staff

The data validation staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 9.2 of this document and be presented in a Data Usability Summary Report (DUSR) for submittal to the QA Officer.

2.3 LABORATORY RESPONSIBILITIES

Laboratory services in support of the RIWP monitoring include the following personnel:

2.3.1 Laboratory Project Manager

The Laboratory Project Manager will report directly to the QA Officer and Project Manager and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports.

2.3.2 Laboratory Operations Manager

The Laboratory Operations Manager will report to the Laboratory Project Manager and will be responsible for coordinating laboratory analysis, supervising in-house chain-of-custody reports, scheduling sample analyses, overseeing data review and overseeing preparation of analytical reports.

2.3.3 Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for review and validation of the analytical laboratory data. The Laboratory QA Officer will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory. The QA Officer will also define appropriate QA procedures, overseeing QA/QC documentation.

2.3.4 Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager and will be responsible for the following:

- Receive and inspect the incoming sample containers;
- Record the condition of the incoming sample containers;
- Sign appropriate documents;
- Verify chain-of-custody and its correctness;
- Notify the Project Manager and Operations Manager of sample receipt and inspection;
- Assign a unique identification number and enter each into the sample receiving log;
- Initiate transfer of samples to laboratory analytical sections; and
- Control and monitor access/storage of samples and extracts.

2.3.5 Laboratory Technical Personnel

The laboratory technical staff will have the primary responsibility in the performance of sample analysis and the execution of the QA procedures developed to determine the data quality. These activities will include the proper preparation and analysis of the project samples in accordance with the laboratory's Quality Assurance Manual (QAM) and associated Standard Operating Procedures (SOP).

2.4 FIELD RESPONSIBILITIES

2.4.1 Field Coordinator

The Field Coordinator is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field Coordinator works with the project Health & Safety Officer (HSO) to conduct operations in compliance with the project Health & Safety Plan (HASP). The Field Coordinator will facilitate communication and coordinate efforts between the Project Manager and the field team members.

Other responsibilities include the following:

- Develop and implement field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
- Coordinate and manage field staff;
- Perform field system audits;
- Oversee quality control for technical data provided by the field staff;
- Prepare and approve text and graphics required for field team efforts;
- Coordinate and oversee technical efforts of subcontractors assisting the field team;
- Identify problems in the field; resolve difficulties in consultation with the Project QAO, and Project Manager; implement and document corrective action procedures; and,
- Participate in preparation of the final reports.

2.4.2 Field Team Personnel

Field Team Personnel will be responsible for the following:

- Perform field activities as detailed in the RIWP and in compliance with the Field Sampling Plan (FSP) and QAPP.
- Immediately report any accidents and/or unsafe conditions to the Site Health & Safety Officer and take reasonable precautions to prevent injury.

3. Sampling Procedures

The FSP provides the SOPs for sampling required by the RIWP. Sampling will be conducted in general accordance with the New York State Department of Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (DER-10) and the Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program when applicable.

3.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the laboratory performing the analysis. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the U.S. EPA, "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used will be maintained by the laboratory.

The appropriate sample containers, preservation method, maximum holding times, and handling requirements for each sampling task are provided in Table I.

3.2 SAMPLE LABELING

Each sample will be labeled with a unique sample identifier that will facilitate tracking and cross-referencing of sample information. Equipment rinse blank and field duplicate samples also will be numbered with a unique sample identifier to prevent analytical bias of field QC samples.

Refer to the FSP for the sample labeling procedures.

3.3 FIELD QC SAMPLE COLLECTION

3.3.1 Field Duplicate Sample Collection

3.3.1.1 Water Samples

Field duplicate samples will be collected by filling the first sample container to the proper level and sealing and then repeated for the second set of sample container.

1. The samples are properly labeled as specified in Section 3.2.
2. Steps 1 through 4 are repeated for the bottles for each analysis. The samples are collected in order of decreasing analyte volatility as detailed in Section 3.3.1.
3. Chain-of-custody documents are executed.
4. The samples will be handled as specified in Table I.

3.3.1.2 Soil Samples

Soil field duplicates will be collected as specified in the following procedure:

1. Soils will be sampling directly from acetate liners.

2. Soil for VOC analysis will be removed from the sampling device as specified in the FSP.
3. Soil for non-VOC analysis will be removed from the sampling device and collected into clean laboratory provided containers.

4. Custody Procedures

Sample custody is addressed in three parts: field sample collection, laboratory analysis and final project files. Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample.

A sample is under custody if:

1. The item is in actual possession of a person;
2. The item is in the view of the person after being in actual possession of the person;
3. The item was in actual possession and subsequently stored to prevent tampering; or
4. The item is in a designated and identified secure area.

4.1 FIELD CUSTODY PROCEDURES

Field personnel will keep written records of field activities on applicable preprinted field forms or in a bound field notebook to record data collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated, and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field Coordinator.

The beginning of each entry in the logbook or preprinted field form will contain the following information:

- Date
- Start time
- Weather
- Names of field personnel (including subcontractors)
- Level of personal protection used at the Site
- Names of all visitors and the purpose of their visit.

For each measurement and sample collected, the following information will be recorded:

- Detailed description of sample location,
- Equipment used to collect sample or make measurement and the date equipment was calibrated,
- Time sample was collected,
- Description of the sample conditions,
- Depth sample was collected (if applicable),
- Volume and number of containers filled with the sample; and,
- Sampler’s identification.

4.1.1 Field Procedures

The following procedure describes the process to maintain the integrity of the samples:

- Upon collection samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. Refer to the FSP for sample packaging procedures.

- Samples will be assigned a unique sample number and will be affixed to a sample label. Refer to the FSP for sample labeling procedures.

- Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms.

- Appropriate volumes will be collected to ensure that the appropriate reporting limits can be successfully achieved and that the required QC sample analyses can be performed.

4.1.2 Transfer of Custody and Shipment Procedures

- A chain-of-custody (COC) record will be completed at the time of sample collection and will accompany each shipment of project samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record.

- Samples will be shipped or delivered in a timely fashion to the laboratory so that holding times and/or analysis times as prescribed by the methodology can be met.

- Samples will be transported in containers (coolers) which will maintain the refrigeration temperature for those parameters for which refrigeration is required in the prescribed preservation protocols.

- Samples will be placed in an upright position and limited to one layer of samples per cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping containers will be secured with strapping tape and custody tape for shipment to the laboratory.

- When samples are split with the NYSDEC representatives, a separate chain-of-custody will be prepared and marked to indicate with whom the samples are shared. The person relinquishing the samples will require the representative’s signature acknowledging sample receipt.

- If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of the permanent record. Commercial carriers will not sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.

- Samples will be picked up by a laboratory courier or transported to the laboratory the same day they are collected unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the laboratory. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

4.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A sample custodian will be designated by the laboratory and will have the responsibility to receive all incoming samples. Once received, the custodian will document if the sample is received in good condition (i.e., unbroken, cooled, etc.) and that the associated paperwork, such as chain-of-custody forms have been completed. The custodian will sign the chain-of-custody forms.

The custodian will also document if sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage (refrigerated storage, if required). The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log with the verified time and date of receipt also noted.

Consistent with the analyses requested on the chain-of-custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage with internal chain-of-custody sign-out procedures followed.

4.3 STORAGE OF SAMPLES

Empty sample bottles will be returned to secure and limited access storage after the available volume has been consumed by the analysis. Upon completion of the entire analytical work effort, samples will be disposed of by the sample custodian. The length of time that samples are held will be at least thirty (30) days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all Federal, State and local requirements.

4.4 FINAL PROJECT FILES CUSTODY PROCEDURES

The final project files will be the central repository for all documents with information relevant to sampling and analysis activities as described in this QAPP. The Haley & Aldrich Project Manager will be the custodian of the project file. The project files including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews will be maintained in a secured, limited access area and under custody of the Project Director or his designee.

The final project file will include the following:

- Project plans and drawings
- Field data records
- Sample identification documents and soil boring/monitoring well logs
- All chain-of-custody documentation
- Correspondence
- References, literature
- Laboratory data deliverables
- Data validation and assessment reports
- Progress reports, QA reports
- Final report

The laboratory will be responsible for maintaining analytical logbooks, laboratory data and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six (6) years at which time the laboratory will contact the Haley & Aldrich Project Manager regarding the disposition of the project related files.

5. Calibration Procedures and Frequency

5.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

Several field instruments will be used for both on-site screening of samples and for health and safety monitoring, as described in the Health and Safety Plan (HASP). On-site air monitoring for health and safety purposes may be accomplished using a vapor detection device, such as a Photo-ionization Detector (PID).

Field instruments will be calibrated at the beginning of each day and checked during field activities to verify performance. Instrument specific calibration procedures will be performed in accordance with the instrument manufacturer's requirements.

5.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Reference materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the preparation and use of reference materials including solutions, standards, and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be rated as "reagent grade" or better. All gases will be "high" purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) materials will be obtained from approved vendors of the National Institute of Standards and Technology (formerly National Bureau of Standards), the U.S. EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources.

6. Analytical Procedures

Analytical procedures to be utilized for analysis of environmental samples will be based on referenced USEPA analytical protocols and/or project specific SOP.

6.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH, temperature, ORP, DO and specific conductivity during sampling of groundwater, and the qualitative measurement of Volatile Organic Compounds (VOC) during the collection of soil samples.

6.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analyses will be based on the U.S. EPA methodology requirements promulgated in:

- "Test Methods for Evaluating Solid Waste," SW-846 EPA, Office of Solid Waste, and promulgated updates, 1986.

6.2.1 List of Project Target Compounds and Laboratory Detection Limits

The laboratory reporting limits (RLs) and associated method detection limits (MDLs) for the target analytes and compounds for the environmental media to be analyzed are presented in Table I. MDLs have been experimentally determined by the project laboratory using the method provided in 40 CFR, Part 136 Appendix B.

Laboratory parameters for soil samples are listed in the RIWP. Laboratory parameters for disposal samples will be determined by the disposal facility after an approved facility has been determined.

6.2.2 List of Method Specific Quality Control (QC) Criteria

The laboratory SOPs include a section that presents the minimum QC requirements for the project analyses. Section 7.0 references the frequency of the associated QC samples for each sampling effort and matrix.

7. Internal Quality Control Checks

This section presents the internal quality control checks that will be employed for field and laboratory measurements.

7.1 FIELD QUALITY CONTROL

7.1.1 Field Blanks

Internal quality control checks will include analysis of field blanks to validate equipment cleanliness. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

7.1.2 Trip Blanks

Trip blanks samples will be prepared by the project laboratory using ASTM Type II or equivalent water placed within pre-cleaned 40 milliliter (ml) VOC vials equipped with Teflon septa. Trip blanks will accompany each sample delivery group (SDG) of environmental samples collected for analysis of VOCs.

Trip blank samples will be placed in each cooler that stores and transports project samples that are to be analyzed for VOCs.

7.2 LABORATORY PROCEDURES

Procedures which contribute to maintenance of overall laboratory quality assurance and control include appropriately cleaned sample containers, proper sample identification and logging, applicable sample preservation, storage, and analysis within prescribed holding times, and use of controlled materials.

7.2.1 Field Duplicate Samples

The precision or reproducibility of the data generated will be monitored through the use of field duplicate samples. Field duplicate analysis will be performed at a frequency of 1 in 20 project samples.

Precision will be measured in terms of the absolute value of the relative percent difference (RPD) as expressed by the following equation:

$$RPD = [|R1-R2|/[(R1+R2)/2]] \times 100\%$$

Acceptance criteria for duplicate analyses performed on solid matrices will be 100% and aqueous matrices will be 35%. RPD values outside these limits will require an evaluation of the sampling and/or analysis procedures by the project QA Officer and/or laboratory QA Director. Corrective actions may include re-analysis of additional sample aliquots and/or qualification of the data for use.

7.2.2 Matrix Spike Samples

Ten percent of each project sample matrix for each analytical method performed will be spiked with known concentrations of the specific target compounds/analytes.

The amount of the compound recovered from the sample compared to the amount added will be expressed as a percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis within the site-specific sample matrix. Percent recovery will be calculated for MS/MSD using the following equation.

$$\% \, Recovery = \frac{Spiked \, Sample - Background}{Known \, Value \, of \, Spike} \, x \, 100\%$$

If the quality control value falls outside the control limits (UCL or LCL) due to sample matrix effects, the results will be reported with appropriate data qualifiers. To determine the effect a non-compliant MS recovery has on the reported results, the recovery data will be evaluated as part of the validation process.

7.2.3 Laboratory Control Sample (LCS) Analyses

The laboratory will perform LCS analyses prepared from Standard Reference Materials (SRMs). The SRMs will be supplied from an independent manufacturer and traceable to NIST materials with known concentrations of each target analyte to be determined by the analytical methods performed. In cases where an independently supplied SRM is not available, the LCS may be prepared by the laboratory from a reagent lot other than that used for instrument calibration.

The laboratory will evaluate LCS analyses in terms of percent recovery using the most recent laboratory generated control limits.

LCS recoveries that do not meet acceptance criteria will be deemed invalid. Analysis of project samples will cease until an acceptable LCS analysis has been performed. If sample analysis is performed in association with an out-of-control LCS sample analysis, the data will be deemed invalid.

Corrective actions will be initiated by the Haley & Aldrich QA Officer and/or Laboratory QA Officer to investigate the problem. After the problem has been identified and corrected, the solution will be noted in the instrument run logbook and re-analysis of project samples will be performed, if possible.

The analytical anomaly will be noted in the sample delivery group (SDG) Case Narrative and reviewed by the data validator. The data validator will confirm that appropriate corrective actions were implemented and recommend the applicable use of the affected data.

7.2.4 Surrogate Compound/Internal Standard Recoveries

For VOCs, surrogates will be added to each sample prior to analysis to establish purge and trap efficiency. Quantitation will be accomplished via internal standardization techniques.

The recovery of surrogate compounds and internal standards will be monitored by laboratory personnel to assess possible site-specific matrix effects on instrument performance.

For semi-volatile organics analyses, surrogates will be added to the raw sample to assess extraction efficiency. Internal standards will be added to all sample extracts and instrument calibration standard immediately before analysis for quantitation via internal standardization techniques.

Method specific quality control (QC) limits are provided in the attached laboratory method SOPs. Surrogate compound/internal standard recoveries that do not fall within accepted QC limits for the analytical methodology performed will have the analytical results flagged with data qualifiers as appropriate by the laboratory and will not be noted in the laboratory report Case Narrative.

To ascertain the effect non-compliant surrogate compound/internal standard recoveries may have on the reported results, the recovery data will be evaluated as part of the validation process. The data validator will provide recommendations for corrective actions including but not limited to additional data qualification.

7.2.5 Calibration Verification Standards

Calibration verification (CV) standards will be utilized to confirm instrument calibrations and performance throughout the analytical process. CV standards will be prepared as prescribed by the respective analytical protocols. Continuing calibration will be verified by compliance with method-specific criteria prior to additional analysis of project samples.

Non-compliant analysis of CV standards will require immediate corrective action by the project laboratory QA officer and/or designated personnel. Corrective action may include re-analysis of each affected project sample, a detailed description of the problem, the corrective action undertaken, the person who performed the action, and the resolution of the problem.

7.2.6 Laboratory Method Blank Analyses

Method blank sample analysis will be performed as part of each analytical batch for each methodology performed. If target compounds are detected in the method blank samples, the reported results will be flagged by the laboratory in accordance with standard operating procedures. The data validator will provide recommendations for corrective actions including but not limited to additional data qualification.

8. Data Quality Objectives

Sampling that will be performed as described in the RIWP is designed to produce data of the quality necessary to achieve the minimum standard requirements of the field and laboratory analytical objectives described below. These data are being obtained with the primary objective to assess levels of contaminants of concern associated with the Site.

The overall project data quality objective (DQO) is to implement procedures for field data collection, sample collection, handling, and laboratory analysis and reporting that achieve the project objectives. The following section is a general discussion of the criteria that will be used to measure achievement of the project DQO.

8.1 PRECISION

8.1.1 Definition

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The overall precision of measurement data is a mixture of sampling and analytical factors. The analytical results from the field duplicate samples will provide data on sampling precision. The results from duplicate samples created by the laboratory will provide data on analytical precision. The measurement of precision will be stated in terms of relative percent difference (RPD).

8.1.2 Field Precision Sample Objectives

Field precision will be assessed through collection and measurement of field duplicate samples at a rate of 1 duplicate per 20 investigative samples. The RPD criteria for the project field duplicate samples will be +/- 100% for soil, +/- 35 % for groundwater for parameters of analysis detected at concentrations greater than 5 times (5X) the laboratory reporting limit (RL).

8.1.3 Laboratory Precision Sample Objectives

Laboratory precision will be assessed through the analysis of laboratory control and laboratory control duplicate samples (LCS/LCSD) and matrix spike and matrix spike duplicate (MS/MSD) samples for groundwater and soil samples and the analysis of laboratory duplicate samples for air and soil vapor samples. Air and soil vapor laboratory duplicate sample analyses will be performed by analyzing the same SUMMA canister twice. The RPD criteria for the air/soil vapor laboratory duplicate samples will be +/- 35 % for parameters of analysis detected at concentrations greater than 5 times (5X) the laboratory reporting limit (RL).

8.2 ACCURACY

8.2.1 Definition

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical procedure limitations.

8.2.2 Field Accuracy Objectives

Sampling bias will be assessed by evaluating the results of field equipment rinse and trip blanks. Equipment rinse and trip blanks will be collected as appropriate based on sampling and analytical methods for each sampling effort.

If non-dedicated sampling equipment is used, equipment rinse blanks will be collected by passing ASTM Type II water over and/or through the respective sampling equipment utilized during each sampling effort. One equipment rinse blank will be collected for each type of non-dedicated sampling equipment used for the sampling effort. Equipment rinse blanks will be analyzed for each target parameter for the respective sampling effort for which environmental media have been collected. (Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.)

Trip blank samples will be prepared by the laboratory and provided with each shipping container that includes containers for the collection of groundwater samples for the analysis of VOC. Trip blank samples will be analyzed for each VOC for which groundwater samples have been collected for analysis.

8.3 LABORATORY ACCURACY OBJECTIVES

Analytical bias will be assessed through the use of laboratory control samples (LCS) and Site-specific matrix spike (MS) sample analyses. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

One (1) set of MS/MSD analyses will be performed with each batch of 20 project samples collected for analysis to assess the accuracy of the identification and quantification of analytes within the Site-specific sample matrices. Additional sample volume will be collected at sample locations selected for the preparation of MS/MSD samples so that the standard laboratory reporting limits (RLs) are achieved.

The accuracy of analyses that include a sample extraction procedure will be evaluated through the use of system monitoring or surrogate compounds. Surrogate compounds will be added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compound percent recoveries will provide information on the effect of the sample matrix on the accuracy of the analyses.

8.4 REPRESENTATIVENESS

8.4.1 Definition

Representativeness expresses the degree to which sample data represent a characteristic of a population, a parameter variation at a sampling point or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied through the proper selection of sampling locations, the quantity of samples and the use of appropriate procedures to collect and analyze the samples.

8.4.2 Measures to Ensure Representativeness of Field Data

Representativeness will be addressed by prescribing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches).

8.5 COMPLETENESS

8.5.1 Definition

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the total amount of the anticipated to be obtained. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a sufficient degree of confidence.

8.5.2 Field Completeness Objectives

Completeness is a measure of the amount of valid measurements obtained from measurements taken in this project versus the number planned. Field completeness objective for this project will be greater than (>) 90%.

8.5.3 Laboratory Completeness Objectives

Laboratory data completeness objective is a measure of the amount of valid data obtained from laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total laboratory data set. The completeness goal will be >90%.

8.6 COMPARABILITY

8.6.1 Definition

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another.

8.6.2 Measures to Ensure Comparability of Laboratory Data

Comparability of laboratory data will be measured from the analysis of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST). The reported analytical data will also be presented in standard units of mass of contaminant within a known volume of environmental media. The standard units for various sample matrices are as follows:

- Solid Matrices – mg/kg of media (Dry Weight).
- Aqueous Matrices – ng/L for PFAS analyses, ug/L of media for organic analyses, and mg/L for inorganic analyses.

8.7 LEVEL OF QUALITY CONTROL EFFORT

If non-dedicated sampling equipment is used, equipment rinse blanks will be prepared by field personnel and submitted for analysis of target parameters. Equipment rinse blank samples will be analyzed to check for potential cross-contamination between sampling locations that may be introduced during the investigation. One (1) equipment rinse blank will be collected per sampling event to the extent that non-dedicated sampling equipment is used.

If necessary, A separate equipment rinse blank sample will be collected for PFAS using the sample collection procedure described in Section 8.1.1 of the NYSDEC-approved Avangrid Field Sampling Plan. (Note: If dedicated or disposable sampling equipment is used, equipment rinse samples will not be collected as part of that field effort.)

Trip blanks will be used to assess the potential for contamination during sample storage and shipment. Trip blanks will be provided with the sample containers to be used for the collection of groundwater samples for the analysis of VOC. Trip blanks will be preserved and handled in the same manner as the project samples. One (1) trip blank will be included along with each shipping container containing project samples to be analyzed for VOC.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

Field duplicate samples will be collected and analyzed to determine sampling and analytical reproducibility. One (1) field duplicate will be collected for every 20 or fewer investigative samples collected for off-Site laboratory analysis.

Matrix spikes will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected. One (1) matrix spike/matrix spike duplicate (MS/MSD) will be collected for every 20 or fewer investigative samples per sample matrix.

(Note: Soil MS/MSD samples require triple sample volume for VOC only. Aqueous MS/MSD samples require triple the normal sample volume for VOC analysis and double the volume for the remaining parameters.)

9. Data Reduction, Validation and Reporting

Data generated by the laboratory operation will be reduced and validated prior to reporting in accordance with the following procedures:

9.1 DATA REDUCTION

9.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. The pH, conductivity, temperature, turbidity, DO, ORP and breathing zone VOC readings collected in the field will be generated from direct read instruments. The data will be written into field logbooks immediately after measurements are taken. If errors are made, data will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry.

9.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures are provided by the appropriate chapter of USEPA, “Test Methods for Evaluating Solid Waste”, SW-846, Third Edition. Errors will be noted; corrections made with the original notations crossed out legibly. Analytical results for soil samples will be calculated and reported on a dry weight basis.

9.1.3 Quality Control Data

Quality control data (e.g., laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data determined to be acceptable will be entered into the laboratory information management system.

Unacceptable data will be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

9.2 DATA VALIDATION

Data validation procedures of the analytical data will be performed by the Haley & Aldrich QA Officer or designee using the following documents as guidance for the review process:

- "U.S. EPA National Functional Guidelines for Organic Data Review”, and the "U.S. EPA National Functional Guidelines for Inorganic Data Review".

- The specific data qualifiers used will be applied to the reported results as presented and defined in the EPA National Functional Guidelines. Validation will be performed by qualified personnel at the direction of the Haley & Aldrich QAO.

- The completeness of each data package will be evaluated by the Data Validator. Completeness checks will be administered on all data to determine that the deliverables are consistent with the NYSDEC Analytical Services Protocol (ASP) Category A and Category B data package requirements. The validator will determine whether the required items are present and request copies of missing deliverables (if necessary) from the laboratory.

9.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as indicated below:

- Field Data Reporting: Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of measurements made in the field and documentation of field calibration activities.

- Laboratory Data Reporting: The laboratory data reporting package will enable data validation based on the protocols described above. The final laboratory data report format will include the QA/QC sample analysis deliverables to enable the development of a data usability summary report (DUSR) based on Department DER-10 Appendix 2B.

10. Performance and System Audits

A performance audit is an independent quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 Internal Field Audit Responsibilities

Internal audits of field activities will be initiated at the discretion of the Project Manager and will include the review of sampling and field measurements. The audits will verify that all procedures are being followed. Internal field audits will be conducted periodically during the project. The audits will include examination of the following:

- Field sampling records, screening results, instrument operating records
- Sample collection
- Handling and packaging in compliance with procedures
- Maintenance of QA procedures
- Chain-of-custody reports

10.1.2 External Field Audit Responsibilities

External audits may be conducted by the Project Coordinator at any time during the field operations. These audits may or may not be announced and are at the discretion of the NYSDEC. The external field audits can include (but are not limited to) the following:

- Sampling equipment decontamination procedures
- Sample bottle preparation procedures
- Sampling procedures
- Examination of health and safety plans
- Procedures for verification of field duplicates
- Field screening practices

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 Internal Laboratory Audit Responsibilities

The laboratory system audits are typically conducted by the laboratory QA Officer or designee on an annual basis. The system audit will include an examination of laboratory documentation including sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis and instrument operating records.

At the conclusion of internal system audits, reports will be provided to the laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Records of audits and corrective actions will be maintained by the Laboratory QA Officer.

10.2.2 External Laboratory Audit Responsibilities

External audits will be conducted as required, by the NYSDOH or designee. External audits may include any of the following:

- Review of laboratory analytical procedures
- Laboratory on-site visits
- Submission of performance evaluation samples for analysis

Failure of any of the above audit procedures can lead to laboratory de-certification. An audit may consist of but not limited to:

- Sample receipt procedures
- Custody, sample security and log-in procedures
- Review of instrument calibration logs
- Review of QA procedures
- Review of log books
- Review of analytical SOPs
- Personnel interviews

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- Comparison of resulting data to the SOP or method
- Verification of initial and continuing calibrations within control limits
- Verification of surrogate recoveries and instrument timing results
- Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable
- Assurance that samples are run within holding times

11. Preventive Maintenance

11.1 FIELD INSTRUMENT PREVENTIVE MAINTENANCE

The field equipment preventive maintenance program is designed to ensure the effective completion of the sampling effort and to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities
- Maintenance schedules
- Inventory of critical spare parts and equipment

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that an inventory of spare parts will be maintained with the field equipment. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventive maintenance. The extent of the preventive maintenance will be a function of the complexity of the equipment.

Generally, annual preventive maintenance service will involve cleaning, adjusting, inspecting and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

12. Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

12.1 FIELD MEASUREMENTS

Field generated information will be reviewed by the Field Coordinator and typically include evaluation of bound logbooks/forms, data entry and calculation checks. Field data will be assessed by the Project Coordinator who will review the field results for compliance with the established QC criteria that are specified in Section 7.0 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Accuracy will be measured by determining the percent recovery (% R) of calibration check standards. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a field sample and will be measured by determining the relative percent difference (RPD). Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \text{ X } 100$$

12.2 LABORATORY DATA

Surrogate, internal standard and matrix spike recoveries will be used to evaluate data quality. The laboratory quality assurance/quality control program will include the following elements:

- Precision, in terms of relative percent difference (RPD), will be determined by relative sample analysis at a frequency of one duplicate analysis for each batch of ten project samples or a frequency of 10 percent (10%). RPD is defined as the absolute difference of duplicate measurements divided by the mean of these analyses normalized to percentage.

- Accuracy, in terms of percent recovery (recovery of known constituent additions or surrogate recoveries), will be determined by the analysis of spiked and unspiked samples. MS/MSD will be used to determine analytical accuracy. The frequency of MS/MSD analyses will be one project sample MS/MSD per set of 20 project samples.

- One method blank will be prepared and analyzed with each batch of project samples. The total number of method blank sample analyses will be determined by the laboratory analytical batch size.

- Standard Reference Materials (SRMs) will be used for each analysis. Sources of SRM's include the U.S. EPA, commercially available material from CRADA certified vendors and/or laboratory produced solutions. SRMs, when available and appropriate, will be processed and analyzed on a frequency of one per set of samples.

- Completeness is the evaluation of the amount of valid data generated versus the total set of data produced from a particular sampling and analysis event. Valid data is determined by independent confirmation of compliance with method-specific and project-specific data quality objectives. The calculation of data set completeness will be performed by the following equation.

$$\frac{Number\ of\ Valid\ Sample\ Results}{Total\ Number\ of\ Samples\ Planned}\ X\ 100 = \%\ Complete$$

13. Quality Assurance (QA) Reports

Critically important to the successful implementation of the QA Plan is a reporting system that provides the means by which the program can be reviewed, problems identified, and programmatic changes made to improve the plan.

QA reports to management can include:

- Audit reports, internal and external audits with responses
- Performance evaluation sample results; internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Haley & Aldrich QA Officer when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of the laboratory management.

References

1. United States Environmental Protection Agency, (1999). EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. EPA QA/R-5 Interim Final, November 1999.
2. United States Environmental Protection Agency (1991). Preparation Aids for the Development of Category I Quality Assurance Project Plans. U.S. EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio, February 1991.
3. United States Environmental Protection Agency, (1993). Data Quality Objectives Process for Superfund Interim Final Guidance. U.S. EPA/540/R-93-071, Office of Solid Waste and Emergency Response (OSWER), September 1993.
4. United States Environmental Protection Agency, (1992). Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 9240.0-05A, April 1992.
5. United States Environmental Protection Agency. U.S. EPA National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-2017-002.
6. United States Environmental Protection Agency. U.S. EPA National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-2017-001.
7. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Office of Solid Waste, U.S. EPA, SW-846, November 1986, with updates.
8. New York State Department of Environmental Conservation, NYSDEC Analytical Services Protocol (ASP), Bureau of Environmental Investigation, 1991 with updates.
9. New York State Department of Environmental Conservation, NYSDEC, Division of Environmental Remediation, Technical Guidance for Site Investigation and Remediation, DER-10, May 2010.
10. New York State Department of Environmental Conservation, NYSDEC, Division of Environmental Remediation, Sampling, Analysis and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC Part 375 Remedial Program, January 2021.

TABLES

TABLE I

SUMMARY OF ANALYSIS METHOD, PRESERVATION METHOD, HOLDING TIME, SAMPLE SIZE REQUIREMENTS AND SAMPLE CONTAINERS

352-362 Shepherd Avenue
Brooklyn, NY

Analysis/Method	Sample Type	Preservation	Holding Time	Volume/Weight	Container
Volatile Organic Compounds/8260C	Soil	1 - 1 Vial MeOH/2 Vial Water, Cool, 4 ± 2 °C	14 days[1]	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270D	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Pesticides/8081B	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Polychlorinated Biphenyls/8082A	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Metals/6010D	Soil	Cool, 4 ± 2 °C	180 days	60 mL	1 - 2 oz Glass
PFAS 537	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
1,4-Dioxane 8270	Soil	Cool, 4 ± 2 °C	14 days	250 mL	1 - 8 oz Glass
Volatile Organic Compounds/8260C	Groundwater	HCl, Cool, 4 ± 2 °C	14 days	120 mL	3 - 40ml glass vials
Semivolatile Organic Compounds/8270D	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	2 - 250 mL amber glass
TAL Metals 6020	Groundwater	HNO_3Cool, 4 ± 2 °C	180 days	500 mL	1 - 500 mL plastic bottle
PFAS 537	Groundwater	H2O Cool, 4 ± 2 °C	14 days	500 mL	2 - teflon free 250 ml plastic containers
1,4-Dioxane 8270	Groundwater	Cool, 4 ± 2 °C	7 days	500 mL	1 - 500 mL plastic bottle
Volatile Organic Compounds/TO-15	Soil Vapor	N/A	30 days	2.7 - 6 L	1 2.7 or 6 L Summa Canister

Notes:

1. Terracores and encores must be frozen within 48 hours of collection
2. Refer to text for additional information.

APPENDIX D

NYSDEC Emerging Contaminant Field Sampling Guidance

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

January 2021

www.dec.ny.gov

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ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	"In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils."	9/15/2020
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Water Sample Results Page 10	PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (…) If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (…) If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	9/15/2020
Soil Sample Results, page 10	"The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase."	"Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. " [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. "	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. [2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases… soil parameters, such as Total Organic Carbon (EPA Method 9060), soil…	In cases… soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil…	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

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Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix F) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533. Laboratories should adhere to the guidelines and criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids). Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist.

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below. In addition, further assessment of water may be warranted if either of the following screening levels are met:

a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or
b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values.

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	1.1	3.7

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[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

[2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an “Analytical Methods/Quality Assurance Summary Table” specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation’s Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8).

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

1. Project and Site Name.

2. DEC Region.

3. All personnel (and affiliation) involved in the collection.

4. Method of collection (gill net, hook and line, etc.)

5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

3. Date collected.

4. Sample location (waterway and nearest prominent identifiable landmark).

5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate “Age” column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish’s tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs. Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

page ______ of ______

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name ____ DEC Region ____________

Collections made by (include all crew) ____

Sampling Method: ☐Electrofishing ☐Gill netting ☐Trap netting ☐Trawling ☐Seining ☐Angling ☐Other ____________________

Preservation Method: ☐Freezing ☐Other ______________________ Notes (SWFDB survey number): ____________________

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, ______________________________, of ____ collected the
(Print Name) (Print Business Address)

following on ____________________, 20____ from ____
(Date) (Water Body)

in the vicinity of ____
(Landmark, Village, Road, etc.)

Town of ____, in __________________________________ County.

Item(s) ____

____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on ____________________________________, 20______.

____ ____________________________
Signature Date

I, ___________________________________, received the above mentioned sample(s) on the date specified and assigned identification number(s) ____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_______________________________________ ___________________
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov prior to analysis of samples.

Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

Blanks

There should be no detections in the method blanks above the reporting limits.

Ion Transitions

The ion transitions listed below should be used for the following PFAS:

PFOA	413 > 369
PFOS	499 > 80
PFHxS	399 > 80
PFBS	299 > 80
6:2 FTS	427 > 407
8:2 FTS	527 > 507
N-EtFOSAA	584 > 419
N-MeFOSAA	570 > 419

Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

Appendix I - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 14 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of five standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%. Linear fit calibration curves should have an R^2 value greater than 0.990.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects
R^2 >0.990	J flag detects and UJ non detects
Low-level calibration check <50% or >150%	J flag detects and UJ non detects
Mid-level calibration check <70% or >130%	J flag detects and UJ non detects

Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

ICV recovery <70% or >130%	J flag detects and non-detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

APPENDIX E

Health and Safety Plan

HALEY & ALDRICH, INC.
SITE-SPECIFIC SAFETY PLAN

FOR

352-362 Shepherd Avenue

352-362 Shepherd Avenue, Brooklyn, NY

Project/File No. 0201831

Gensuite EZ Scan®

BI - Developers

Prepared By: Sarah Commisso **Date: 8/16/2021**

Approvals: The following signatures constitute approval of this Health & Safety Plan.

Field Safety Manager: Brian Ferguson **Date: 8/16/2021**

Mari Cate Conlon Insert Project Manager's electronic signature.

Project Manager: Mari Cate Conlon **Date: 8/16/2021**

HASP Valid Through: 12-31-2021

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No table of contents entries found.

Attachments

STOP WORK AUTHORITY

In accordance with Haley & Aldrich (Haley & Aldrich) Stop Work Authority Operating Procedure (OP1035), any individual has the right to refuse to perform work that he or she believes to be unsafe without fear of retaliation. He or she also has the authority, obligation, and responsibility to stop others from working in an unsafe manner.

STOP Work Authority is the stop work policy for all personnel and subcontractors on the Site. When work has been stopped due to an unsafe condition, Haley & Aldrich site management (e.g., Project Manager [PM], Site Health & Safety Officer [SHSO], etc.) and the Haley & Aldrich Senior Project Manager (SPM) will be notified immediately.

Reasons for issuing a stop work order include, but are not limited to:

- The belief/perception that injury to personnel or accident-causing significant damage to property or equipment is imminent.
- A Haley & Aldrich subcontractor is in breach of site safety requirements and/or their own site HASP.
- Identifying a substandard condition (e.g., severe weather) or activity that creates an unacceptable safety risk as determined by a qualified person.

Work will not resume until the unsafe act has been stopped OR sufficient safety precautions have been taken to remove or mitigate the risk to an acceptable degree. Stop work orders will be documented as part of an on-site stop work log, on daily field reports to include the activity/activities stopped, the duration, person stopping work, person in-charge of stopped activity/activities, and the corrective action agreed to and/or taken. Once work has been stopped, only the Haley & Aldrich SPM or SHSO can give the order to resume work. Haley & Aldrich senior management is committed to support anyone who exercises his or her “Stop Work” authority.

ISSUANCE AND COMPLIANCE

This HASP has been prepared in accordance with Occupational Safety and Health Administration (OSHA) regulations (CFR 29, Parts 1904, 1910, and 1926) if such are applicable.

The specific requirements of this HASP include precautions for hazards that exist during this project and may be revised as new information is received or as site conditions change.

- This HASP must be signed by all Haley & Aldrich personnel involved in implementation of the SOW (Section 2 of this HASP).
- This HASP, or a current signed copy, must be retained at all times when Haley & Aldrich staff are present.
- Revisions to this HASP must be outlined within the contents of the HASP. If immediate or minor changes are necessary, the Field Safety Manager (FSM), Haley & Aldrich, SSO and/or Project Manager (PM) may use Attachment 1 (HASP Amendment Form), presented at the end of this HASP. Any revision to the HASP requires employees and subcontractors to be informed of the changes so that they understand the requirements of the change.
- Deviations from this HASP are permitted with approval from the Haley & Aldrich FSM, PM, or Senior Health & Safety Manager (SHSM). Unauthorized deviations may constitute a violation of Haley & Aldrich company procedures/policies and may result in disciplinary action.
- This HASP will be relied upon by Haley & Aldrich's subcontractors and visitors to the site. Haley & Aldrich's subcontractors must have their own HASP which will address hazards specific to their trade that is not included in this HASP. This HASP will be made available for review to Haley & Aldrich's subcontractors and other interested parties (e.g. Facility personnel and regulatory agencies) to ensure that Haley & Aldrich has properly informed our subcontractors and others of the potential hazards associated with the implementation of the SOW to the extent that Haley &Aldrich is aware.

This site-specific HASP provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this HASP (e.g., injury reporting, medical surveillance, personal protective equipment (PPE) selection, etc.) are described in detail in the Haley &Aldrich Corporate Health and Safety Program Manual and within Haley & Aldrich's Standard Operating Procedures Both the manual and SOPs can be located on the Haley & Aldrich's Company Intranet. When appropriate, users of this HASP should always refer to these resources and incorporate to the extent possible. The manual and SOPs are available to clients and regulators upon request.

EMERGENCY EVENT PROCEDURES

1 - ASSESS THE SCENE

- STOP WORK
- Review the situation and ascertain if it's safe to enter the area.
- Evacuate the site if the conditions are unsafe.

2 - EVALUATE THE EMERGENCY

- **Call 911, or designated emergency number, if required.**
- **Provide first aid for the victim if qualified and safe to do so.**
  - First aid will be addressed using the onsite first aid kit. *
    - If providing first aid, remember to use proper first aid universal precautions if blood or bodily fluids are present.
- **If exposure to hazardous substance is suspected, immediately vacate the contaminated area.**
  - Remove any contaminated clothing and/or equipment.
  - Wash any affected dermal/ocular area(s) with water for at least 15 minutes.
  - Seek immediate medical assistance if any exposure symptoms are present.

** Note: Haley & Aldrich employees are not required or expected to administer first aid / CPR to any Haley & Aldrich staff member, Contractor, or Civilian personnel at any time; it is Haley & Aldrich´s position that those who do are doing so on their own behalf and not as a function of their job.*

3 - SECURE THE AREA

- **Cordon off the incident area, if possible.**
  - Notify any security personnel, if required.
  - Escort all non-essential personnel out of the area, if able.

4 - REPORT ON-SITE ACCIDENTS / INCIDENTS TO PM / SSO

- **Notify the PM and SSO as soon as it is safe to do so.**
  - Assist PM and SSO in completing any additional tasks, as required.

5 - INVESTIGATE / REPORT THE INCIDENT

- **Record details of the incident for input to the Gensuite.**
  - Complete any additional forms as requested by the PM and SSO.

6 - TAKE CORRECTIVE ACTION

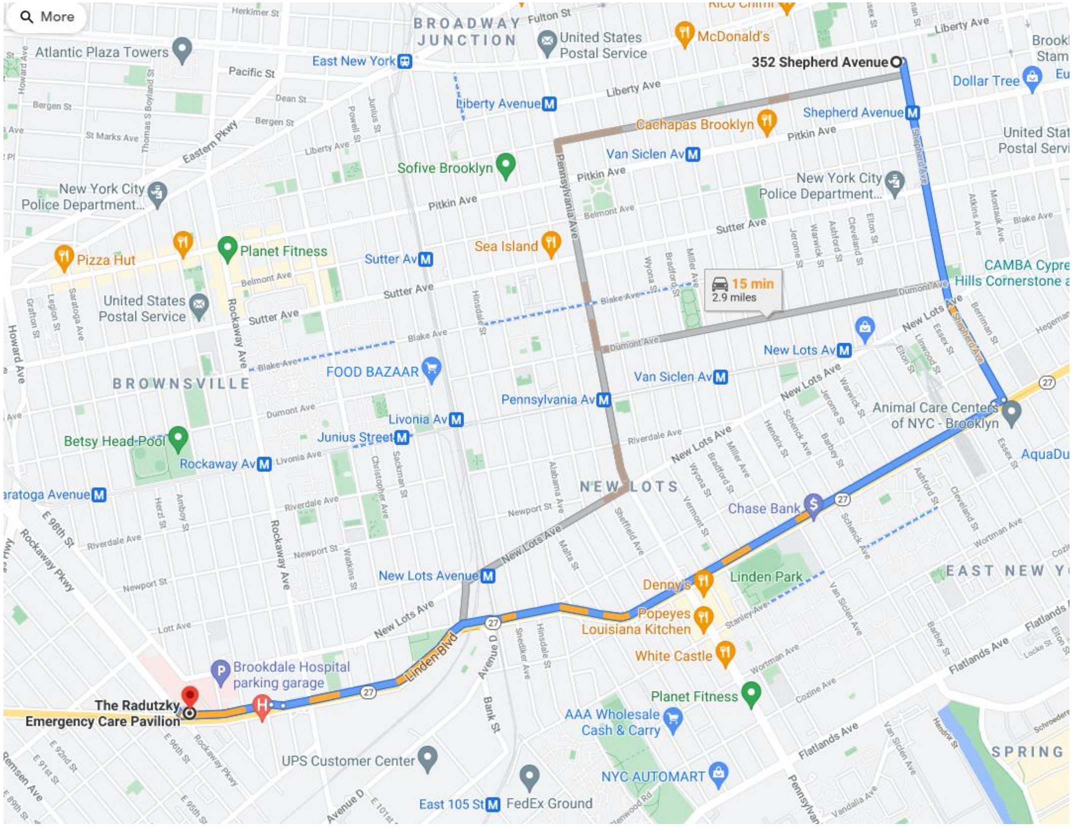
- **Implement corrective actions per the PM following root cause analysis.**
  - Complete Lessons Learned form.

PROJECT INFORMATION AND CONTACTS

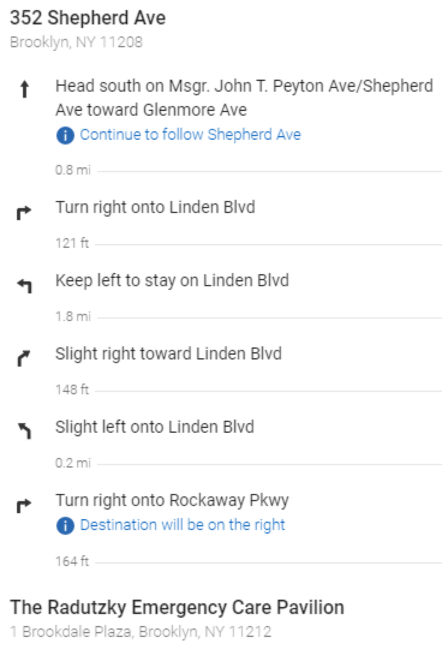
Project Name: 352-362 Shepherd Avenue	**Haley & Aldrich File No.:** 0201831
Location: **352-362 Shepherd Avenue, Brooklyn, NY**	
Client/Site Contact: Phone Number:	Moshe Monheit 917.407.5735
Haley & Aldrich Field Representative: Phone Number: Emergency Phone Number:	Sarah Commisso 516.317.9861 631.332.9546
Haley & Aldrich Project Manager: Phone Number: Emergency Phone Number:	Mari Cate Conlon 347.271.1521 646.277.5688
Field Safety Manager: Phone Number: Emergency Phone Number:	Sarah Commisso 516.317.9861 631.332.9546
Subcontractor Project Manager: Phone Number:	Marc Morgenstern 516.587.9570
Nearest Hospital: Address: (See map on next page) Phone Number:	The Radutzky Emergency Care Pavillion 1 Brookdale Plaza, Brooklyn, NY 11212 718.240.5363
Nearest Occ. Health Clinic: http://www.talispoint.com/liberty/ext/ Address: (See map on next page) Phone Number:	NYC Health and Hospitals/Gotham Health, East New York 2094 Pitkin Ave, Brooklyn, NY 844.692.4692
Liberty Mutual Claim Policy	**WC6-Z11-254100-031**
Emergency Response Number:	**911**
Other Local Emergency Response Number:	N/A
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	N/A

DIRECTIONS TO THE NEAREST HOSPITAL

Liberty Mutual Medical Location Directory



Directions to the Nearest Hospital:



352 Shepherd Ave
Brooklyn, NY 11208

Head south on Msgr. John T. Peyton Ave/Shepherd Ave toward Glenmore Ave
Continue to follow Shepherd Ave
0.8 mi

Turn right onto Linden Blvd
121 ft

Keep left to stay on Linden Blvd
1.8 mi

Slight right toward Linden Blvd
148 ft

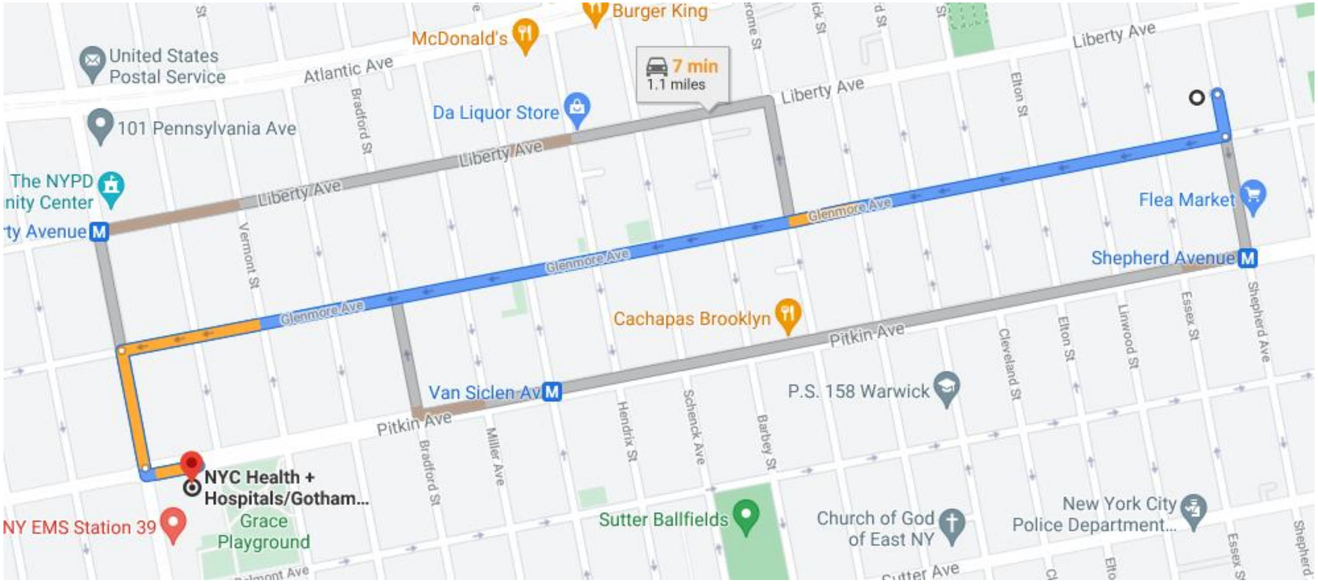
Slight left onto Linden Blvd
0.2 mi

Turn right onto Rockaway Pkwy
Destination will be on the right
164 ft

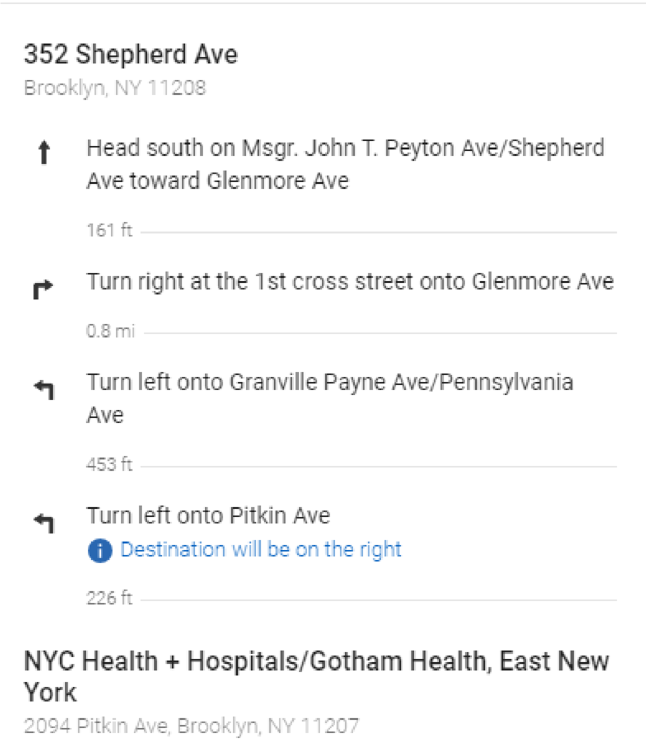
The Radutzky Emergency Care Pavilion
1 Brookdale Plaza, Brooklyn, NY 11212

DIRECTIONS TO THE NEAREST URGENT CARE

[Liberty Mutual Medical Location Directory]



Directions to the Nearest Occupational Clinic: Paste map and directions showing route to nearest hospital here.



352 Shepherd Ave
Brooklyn, NY 11208

Head south on Msgr. John T. Peyton Ave/Shepherd Ave toward Glenmore Ave

161 ft

Turn right at the 1st cross street onto Glenmore Ave

0.8 mi

Turn left onto Granville Payne Ave/Pennsylvania Ave

453 ft

Turn left onto Pitkin Ave
Destination will be on the right

226 ft

NYC Health + Hospitals/Gotham Health, East New York
2094 Pitkin Ave, Brooklyn, NY 11207

WORK SCOPE

This Site-Specific Health and Safety Plan addresses the health and safety practices and procedures that will be exercised by all Haley & Aldrich employees participating in all work on the Project Site. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich and Haley & Aldrich's experience with other similar project sites. The scope of work includes the following:

A Phase II Investigation will be performed at the site located at 352-362 Shepherd Avenue, Brooklyn, NY. An investigation of soil, soil vapor, and groundwater will be performed to property characterize the site for potential environmental impacts from historic on-site/off-site uses, operations, etc. Additionally, a geophysical survey will be performed across the entire site to investigate for the presence of any potential USTs.

Project Task Breakdown

Task No.	Task Description	Employee(s) Assigned	Work Date(s) or Duration
1	**Drilling**- Oversee installation of soil borings, temporary groundwater monitoring wells, and soil vapor implants by Eastern Environmental Solutions using a Geoprobe drilling rig. Eastern will provide a one call markout prior to drilling	Sarah Commisso	2 days
2	**Soil, Soil Vapor, & Groundwater Sampling**- Collect soil samples, soil vapor samples, and groundwater samples into laboratory provided containers	Sarah Commisso	2 days
3	**Geophysical Survey**- Oversee a geophysical survey of the entire property to investigate for the presence of any potential USTs.	Sarah Commisso	1 day

Subcontractor(s) Tasks

Firm Name	Work Activity	Work Date(s) or Duration
Eastern Environmental Solutions	Drilling	2 days

Projected Start Date: 8/19/2021

Projected Completion Date: 8/20/2021

Subcontractor(s) Tasks

Firm Name	Work Activity	Work Date(s) or Duration

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

GPRS	GPR Survey	1 day
Projected Start Date: 8/23/2021		
Projected Completion Date: 8/23/2021		

SITE OVERVIEW / DESCRIPTION

Site Classification

Commercial/Garage

Site Description

The Site is located at 352-362 Shepherd Ave in the East New York neighborhood of Brooklyn, New York and is identified as Block 3988, Lot 28 on the New York City Tax Map. The site is 10,000 square feet in size and currently operates as an auto body shop. The site contains a one-story commerical/garage building encompassing the entire site footprint with a partial cellar.

Background and Historic Site Usage

The property is currently an E-Designation Site identified under E-366- East New York Rezoning Action. The requirements under the E-Designation program are satisfaction of the requirements for Hazardous Material and Air Components with the New York City Office of Environmental Remediation (NYCOER). The air requirement for this site is the exclusive use of natural gas.

The site was developed in the late 1880s with several dwellings. By the late 1920s, the previous site buildings were demolished, and the site began operating as a garage. The site continued to operate as a garage until the late 1960s/early 1970s. There was a gas tank present in the eastern portion of the site near Shepherd Avenue indicated in Sanborn Fire Insurance Maps from 1928 through 1968. There is no documentation regarding the size of the tank, closure status, or proper removal of the tank. The subject site operated as a gasoline service station from 1969-1972. From the late 1970s through the present the site was used for various auto-related purposes including an auto body shop, garages, used car sales, and towing. The property is currently operated by Gils Auto Body.

Site Status

Indicate current activity status and describe operations at the site:

Active

Auto Body Shop

Site Plan

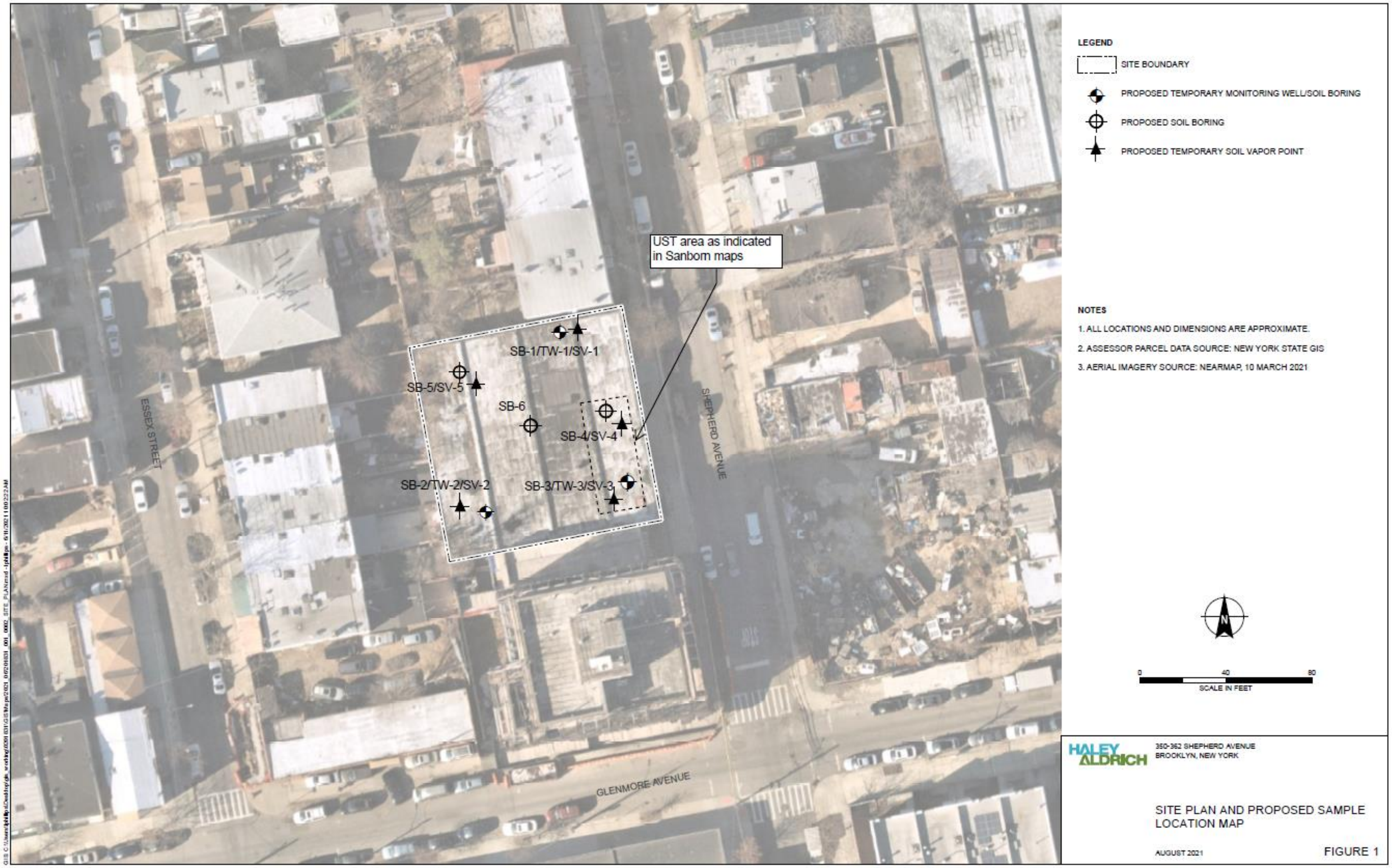
Is a site plan or sketch available? Yes

Work Areas

List and identify each specific work areas(s) on the job site and indicate its location(s) on the site plan:

The work area consists of the entire property within the one-story commercia/garage building encompassing the entire lot.

Site Plan


UST area as indicated in Sanborn maps
SB-1/TW-1/SV-1
SB-5/SV-5
SB-6
SB-4/SV-4
SB-2/TW-2/SV-2
SB-3/TW-3/SV-3
ESSEX STREET
SHEPHERD AVENUE
GLENMORE AVENUE
LEGEND
SITE BOUNDARY
PROPOSED TEMPORARY MONITORING WELL/SOIL BORING
PROPOSED SOIL BORING
PROPOSED TEMPORARY SOIL VAPOR POINT
NOTES
1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. ASSESSOR PARCEL DATA SOURCE: NEW YORK STATE GIS
3. AERIAL IMAGERY SOURCE: NEARMAP, 10 MARCH 2021
N
0
40
80
SCALE IN FEET
HALEY ALDRICH
350-362 SHEPHERD AVENUE
BROOKLYN, NEW YORK
SITE PLAN AND PROPOSED SAMPLE LOCATION MAP
AUGUST 2021
FIGURE 1

HAZARD ASSESSMENT

Indicate all hazards that may be present at the site and for each task. If any of these potential hazards are checked, it is the Project Manager's responsibility to determine how to eliminate / minimize the hazard to protect onsite personnel.

Site Chemical Hazards

Is this Site impacted with chemical contamination? Unknown

Source of information about contaminants: Previous Investigation

Contaminant of Concern	Location/Media	Concentration	Units
BTEX/VOCs	**Soil**	**Unknown**	**ug/kg**

BTEX/VOCs: BTEX is an acronym for benzene, toluene, ethylbenzene, and xylenes. These compounds are VOCs, are common in petroleum-related products (e.g., oil, gasoline, coal-tar DNAPL, etc.), and frequently co-occur at hazardous waste sites. Benzene, toluene, ethylbenzene, and xylenes have acute and chronic harmful effects on the central nervous system. Benzene is classified as a carcinogen. Short-term health effects of low-level BTEX exposure include drowsiness, dizziness, accelerated heart rate, headaches, tremors, confusion, and unconsciousness.

Site Hazards Checklist

Weather

Hot Temperatures	Lightning Storms		

Hot Temperatures

Heat stress may occur at any time work is being performed at elevated ambient temperatures. Because heat stress is one of the most common and potentially serious illnesses associated with outdoor work during hot seasons, regular monitoring and other preventative measures are vital. Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventative heat stress management.

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working when there are hot temperatures or a high heat index. Refer OP1015-Heat Stress for a discussion on hot weather hazards.

Lightning Storms

Where the threat of electrical storms and the hazard of lightning exist staff shall ensure site procedures exist to: (1) detect when lightning is in the near vicinity and when there is a potential for lightning and (2) to notify appropriate site personnel of these conditions and (3) implement protocols to stop work and seek shelter.

The 30-30 Rule states that if time between seeing the lightning and hearing the thunder is less than 30 seconds, you are in danger and must seek shelter. You must also stay indoors for more than 30 minutes after hearing the last clap of thunder.

Location/Terrain

Slip/Trip/Falls	Economically Depressed		

Slips, Trips & Falls

Slip and trip injuries are the most frequent injuries to workers. Statistics show most falls happen on the same level resulting from slips and trips. Both slips and trips result from unintended or unexpected change in the contact between the feet and the ground or walking surface. Good housekeeping, quality of walking surfaces (flooring), awareness of surroundings, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents.

Site workers will be walking on a variety of irregular surfaces, that may affect their balance. Extra care must be taken to walk cautiously near rivers because the bottom of the riverbed maybe slick and may not be visible. Rocks, gradient changes, sandy bottoms, and debris may be present but not observable.

Take your time and pay attention to where you are going. Adjust your stride to a pace that is suitable for the walking surface and the tasks you are doing. Check the work area to identify hazards - beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain. Establish and utilize a pathway free of slip and trip hazards. Choose a safer walking route. Carry loads you can see over. Keep work areas clean and free of clutter. Communicate hazards to on-site personnel and remove hazards as appropriate.

Economically Depressed Areas

Economically depressed areas may have high crime rates. Projects involving work in, and around inactive industrial sites may bring staff into contact with indigent and homeless persons. Staff could be subjected to crime that includes but may not be limited to thievery, vandalism, and violence. Prior to the start of work staff need to understand the work locations and the potential for exposure to low level crime.

Staff members should never work alone in these areas. A buddy system is required. Conduct during daylight hours. Secure equipment and vehicles. If warranted, contact the local police department for a security detail. Leave the work area immediately and contact the local authorities if staff members feel threatened or are threatened.

Task Hazard Summary

Task 1 – Drilling

Drilling is conducted for a range of services that can include but are not limited to: soil characterization, environmental investigation, well installation, and ore exploration. Familiarity with basic drilling safety is an essential component of all drilling projects. Potential hazards related to drilling operations include but are not limited to encountering underground or overhead utilities, traffic, and heavy equipment, hoisting heavy tools, steel impacts, open rotation entanglement, and the planned or unexpected encountering of toxic or hazardous substances. While staff members do not operate drilling equipment, they may work in close proximity to operating drilling equipment and may be exposed to many of the same hazards as the drilling subcontractor. It is imperative that staff are aware of emergency stops and establish communication protocols with the drillers prior to the start of work.

See OP 1002 Drilling Safety for more information.

Task 2 – Soil Sampling

Soil sampling by H&A staff on active construction sites can be conducted in conjunction with a wide range activity such as building construction, earthwork, and soil management related activities. These activities can include but are not limited to: drill spoil characterization and management during building foundation element installation, characterization of excavated soils for management/disposal/reuse during earthwork activities, and as part of environmental remedial activities such as delineation and confirmation sampling. Familiarity with basic heavy construction safety, site conditions (geotechnical and environmental), and potential soil contaminants are essential components of soil sampling performed on active sites. Potential hazards related to soil sampling at construction sites include but are not limited to: encountering site vehicle traffic and heavy equipment operations, manual lifting, generated waste, contact or exposure to impacted soil, and encountering unknown toxic or hazardous substances. Although soil sampling is commonly performed within active excavations, from stockpiles, or within trench excavations, sampling locations and situations will vary depending on site conditions. Care should be taken while entering and exiting excavations or trenches, and when accessing (climbing up or down) soil stockpiles, ensuring that the sampling area is not being actively accessed by construction equipment. Care should also be taken with handling of potentially environmentally impacted soil during sampling, with appropriate PPE identified and used. At no time during classification activities are personnel to reach for debris near machinery that is in operation, place any samples in their mouth, or come in contact with the soils without the use of gloves. Staff will have to carry and use a variety of sampling tools, equipment, containers, and potentially heavy sample bags. It is imperative that staff are aware of emergency / communication protocols with the Contractor prior to the start of work.

Task 2 – Soil Vapor

Soil gas sampling is employed as an indirect indicator of contamination in soil or groundwater particularly over and around landfill waste sites, or groundwater plumes. Soil gas sampling points can be installed manually using a slam bar or power-driven mechanical devices (e.g., demolition hammer or Geoprobe) may be used based on site conditions (i.e., pavement, frozen ground, very dense clays, etc.). Soil gas samples can be drawn through the probe itself, or through Teflon tubing inserted through the probe and attached to the probe point. Samples are collected and analyzed as described below. Other field air monitoring devices, such as the Combustible Gas Indicator (CGI) and the Organic Vapor Analyzer (OVA), can also be used, depending on specific site conditions.

Because the sample is being drawn from underground, and no contamination is introduced into the breathing zone, soil gas sampling usually occurs in Level D. Nevertheless, ambient air should be constantly monitored to obtain background and breathing zone readings during the sampling procedure in the event the seal around the sampling point is breached. As long as the levels in ambient air do not rise above background, no upgrade of the level of protection is needed. Also, an underground utility search must be performed prior to sampling.

Task 2 – Water Sampling

Environmental water sampling could include activities such as groundwater sampling from permanent or temporary wells, or surface water sampling from streams, rivers, lakes, ponds, lagoons, and surface impoundments.

Sampling tasks could involve uncapping, purging (pumping water out of the well), and sampling, and/or monitoring, new or existing monitoring wells. A mechanical pump may be used to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the collection methods and procedures used.

When sampling bodies of water containing known or suspected hazardous substances, adequate precautions must be taken to ensure the safety of sampling personnel. The sampling team member collecting the sample should not get too close to the edge, where ground failure or slips, trips or falls may cause him/her to lose his/her balance. The person performing the sampling should have fall restraint or protection for the task. When conducting sampling from a boat in an impoundment or flowing waters, appropriate vessel safety procedures should be followed. Avoid lifting heavy coolers with back muscles; instead, use ergonomic lifting techniques, team lift or mechanical lifts. Wear proper gloves, such as when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

Inhalation and absorption of COCs are the primary routes of entry associated with water sampling, due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different groundwater sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains or sprains from hand bailing, and potential eye hazards. Exposure to water containing COCs is also possible. All tools and equipment that will be used at the site must be intrinsically safe (electronics and electrical equipment) and non-sparking or explosion-proof (hand tools).

Task Physical Hazards Checklist			
Potential Task Hazards	**Task 1** **Drilling**	**Task 2** **Soil, Soil Vapor, & Groundwater Sampling**	**Task 3** **Geophysical Survey**
Ergonomics	☒	☒	☐
Congested Area	☒	☒	☐
Generated Wastes	☒	☒	☐
Ground Disturbance	☒	☐	☐
Heavy Equipment	☒	☐	☒
Line of Fire	☒	☒	☐
Noise	☒	☐	☐
Manual Lifting	☒	☒	☐
Sharp Objects	☒	☒	☐
Slippery Surfaces	☒	☒	☐
Underground Utilities	☒	☐	☐

Summary of Physical Hazards & Controls

Ergonomics

Most Work-related Musculoskeletal Disorders (WMSDs) are caused by Ergonomic Stressors. Ergonomic Stressors are caused by poor workplace practices and/or insufficient design, which may present ergonomic risk factors. These stressors include, but not limited to, repetition, force, extreme postures, static postures, quick motions, contact pressure, vibration, and cold temperatures.

WMSDs are injuries to the musculoskeletal system, which involves bones, muscles, tendons, ligaments, and other tissues in the system. Symptoms may include numbness, tightness, tingling, swelling, pain, stiffness, fatigue, and/or redness. WMSD are usually caused by one or more Ergonomic Stressors. There may be individual differences in susceptibility and symptoms among employees performing similar tasks. Any symptoms are to be taken seriously and reported immediately.

See OP1053 Ergonomics for more information.

Controls

- Ensure workstations are ergonomically correct so bad posture is not required to complete tasks.
- Take periodic breaks over the course of the day.
- Stretch during break times.
- Break up tasks that require repetitive motion.
- Contact Corporate H&S with any ergonomic concerns

Congested Areas

Working in congested areas can expose both workers and the public to a wide range of hazards depending upon the specific activities taking place. Staff Members need to understand the work scope, work areas, equipment on-site, and internal traffic patterns to minimize or eliminate exposure potential.

Controls

- Provide barricades, fencing, warning signs/signals and adequate lighting to protect people while working in or around congested areas.
- Vehicles and heavy equipment with restricted views to the rear should have functioning back-up alarms that are audible above the surrounding noise levels. Whenever possible, use a signaler to assist heavy equipment operators and/or drivers in backing up or maneuvering in congested areas.
- Lay out traffic control patterns to eliminate excessive congestion.
- Workers in congested areas should always wear high visibility clothing.
- Be aware of Line of Fire hazards when performing work activities in congested areas.
- Hazards associated with SIMOPs should be discussed daily at Tailgate Safety Meetings.

Generated Waste

Activities on environmental sites may generate waste that requires regulated handling and disposal. Excess sample solids, decontamination materials, poly sheeting, used PPE, etc. that are determined to be free of contamination through field or laboratory screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off-site disposal.

Controls

- Manage waste properly through good work practices.
- Collect, store, containerize waste, and dispose of it properly.
- All wastes generated shall be containerized in an appropriate container (i.e. open or closed top 55-gallon drum, roll-off container, poly tote, cardboard box, etc.) as directed by the PM.
- Containers should be inspected for damages or defects
- Waste containers should be appropriately labeled indicating the contents, date the container was filled, owner of the material (including address) and any unique identification number, if necessary.

- Upon completion of filling the waste container, the container should be inspected for leaks and an appropriate seal.

Ground Disturbance

Ground disturbance is defined as any activity disturbing the ground. Ground disturbance activities include, but are not limited to, excavating, trenching, drilling (either mechanically or by hand), digging, plowing, grading, tunneling, and pounding posts or stakes.

Because of the potential hazards associated with striking an underground utility or structure, the operating procedure for underground utility clearance shall be followed prior to performing any ground disturbance activities.

See OP1020 Working Near Utilities

Controls

Prior to performing ground disturbance activities, the following requirements should be applied:

- Confirm all approvals and agreements (as applicable) either verbal or written have been obtained.
- Request for line location has been registered with the applicable One-Call or Dial Before You Dig organization, when applicable.
    - Whenever possible, ground disturbance areas should be adequately marked or staked prior to the utility locators site visit.
- Notification to underground facility operator/owner(s) that may not be associated with any known public notification systems such as the One-Call Program regarding the intent to cause ground disturbance within the search zone.
- Notifications to landowners and/or tenant, where deemed reasonable and practicable.
- Proximity and Common Right of Way Agreements shall be checked if the line locator information is inconclusive.

Heavy Equipment

Staff must be careful and alert when working around heavy equipment, failure or breakage and limited visibility can lead to accidents and worker injury. Heavy equipment such as cranes, drills, haul trucks, or other can fail during operation increasing chances of worker injury. Equipment of this nature shall be visually inspected and checked for proper working order prior to commencement of field work. Those operating heavy equipment must meet all requirements to operate the equipment. Haley & Aldrich, Inc. staff that supervise projects or are associated with high-risk projects that involve digging or drilling should use due diligence when working with a construction firm.

See OP1052 Heavy Equipment for additional information.

Controls

- Only approach equipment once you have confirmed contact with the operator (e.g., operator places the bucket on the ground).
- Always maintain visual contact with operators and keep out of the strike zone whenever possible.
- Always be alert to the position of the equipment around you.
- Always approach heavy equipment with an awareness of the swing radius and traffic routes of all equipment and never go beneath a hoisted load.
- Avoid fumes created by heavy equipment exhaust.

Line of Fire

Line of fire refers to the path an object will travel. Examples of line of fire situations typically observed on project sites include lifting/hoisting, lines under tension, objects that can fall or roll, pressurized objects or lines, springs, or stored energy, work overhead, vehicles and heavy equipment.

Controls

- Never walk under a suspended load.
- Be aware and stay clear of tensioned lines such as cable, chain, and rope.
- Be cautious of torque stresses that drilling equipment and truck augers can generate. Equipment can rotate unexpectedly long after applied torque force has been stopped.
- Springs and other items can release tremendous energy if compressed and suddenly released
- Items under tension and pressure can release tremendous energy if it is suddenly released.
- Not all objects may be overhead; be especially mindful of top-heavy items and items being transported by forklift or flatbed.
- Secure objects that can roll such as tools, cylinders, and pipes.
- Stay clear of soil cuttings or soil stockpiles generated during drilling operations and excavations, be aware that chunks of soil, rocks, and debris can fall or roll.

Noise

Working around heavy equipment (drill rigs, excavators, etc.) often creates excessive noise. The effects of noise include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities. Noise monitoring data that indicates that working within 25 feet of operating heavy equipment result in exposure to hazardous levels of noise (levels greater than 85 dBA).

See OP 1031 Hearing Conservation for additional information.

Controls

- Personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of heavy equipment.
- Limit the amount of time spent at a noise source.
- Move to a quiet area to gain relief from hazardous noise sources.
- Increase the distance from the noise source to reduce exposure.

Underground Utilities

Various forms of underground/overhead utility lines or conveyance pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SHSO, Project Manager, and Regional H&S Manager shall be notified immediately. Work will be suspended until the client and applicable utility agency is contacted and the appropriate actions for the situation can be addressed.

See OP1020 Work Near Utilities for complete information.

Controls

- Obtain as-built drawings for the areas being investigated from the property owner;
- Visually review each proposed soil boring locations with the property owner or knowledgeable site representative;
- Perform a geophysical survey to locate utilities;
- Hire a private line locating firm to determine location of utility lines that are present at the property;
- Identifying a no-drill or dig zone;
- Hand dig or use vacuum excavation in the proposed ground disturbance locations if insufficient data is unavailable to accurately determine the location of the utility lines.

Manual Lifting/Moving

Most materials associated with investigation, remedial, or construction-related activities are moved by hand. The human body is subject to damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process.

Controls

- Under no circumstances should any one person lift more than 49 pounds unassisted.
- Always push, not pull, the object when possible.
- Size up the load before lifting. If it is heavy or clumsy, get a mechanical aid or help from a worker.
- Bend the knees; it is the single most important aspect of lifting.
- When performing the lift:
    - Place your feet close to the object and center yourself over the load.
    - Get a good handhold.
    - Lift straight up, smoothly and let your legs do the work, not your back!
    - Avoid overreaching or stretching to pick up or set down a load.
    - Do not twist or turn your body once you have made the lift.
    - Make sure beforehand that you have a clear path to carry the load.
    - Set the load down properly.

Sharp Objects

Workers who handle sharp edged objects like sheets of steel or glass are at risk of cuts. Workers who handle sharp edged objects are also at risk of cuts. Injuries may occur to hands, fingers, or legs when they are in the way of the blade, when the blade slips, or if an open blade is handled unexpectedly. Other hazards at job sites include stepping on sharp objects (e.g. wooden boards with protruding nails, sharp work-tools, chisels, etc.) and colliding with sharp and/or protruding objects.

Controls

Always be alert when handling sharps. Never look away or become distracted while handling sharp objects. Use caution when working with tools; use right tool for the job. Keep tools sharp, dull blades are a safety hazard, requiring more force to make cuts which can lead to tool slippage. Wear appropriate PPE and do not handle sharp objects (i.e., broken glass) with bare hands. Use mechanical devices, when possible. Stay away from building debris; avoid handling site debris or placing your hand where you cannot see. Watch out for barbed wire and electrical fences; cover with a car mat or equivalent to cross or walk around; use the buddy system to avoid entanglement; wear gloves. Do not leave unprotected sharps unattended. Use protective shields, cases, styrofoam blocks, etc. Pass a sharp by handing it over carefully by the handle with the blade down or retracted. Fixed open blades are prohibited. Always cut away from the body, making several passes when cutting thicker materials. Make sure blades are fitted properly into the knife. Never cut items with a blade or other sharp object on your lap. Never try to catch a blade or cutting tool that is falling.

Slippery Surfaces

Both slips and trips result from unintended or unexpected change in the contact between the feet and ground or walking surface. Good housekeeping, quality of walking surfaces, selection of proper footwear, and appropriate pace of walking are critical for preventing fall accidents. Slips happen where there is too little friction or traction between the footwear and walking surface.

Common causes of slips are wet or oily surfaces, spills, weather hazards, loose unanchored rugs or mats and flooring or other walking surfaces that do not have same degree of traction in all areas.

Weather-related slips and falls become a serious hazard as winter conditions often make for wet or icy surfaces outdoors. Even wet organic material or mud can create hazardous walking conditions. Spills and leaks can also lead to slips and falls.

Controls

- Evaluate the work area to identify any conditions that may pose a slip hazard.
- Address any spills, drips or leaks immediately.
- Mark areas where slippery conditions exist.
- Select proper footwear or enhance traction with additional PPE.
- Where conditions are uncertain or environmental conditions result in slippery surfaces walk slowly, take small steps, and slide feet on wet or slippery surfaces.

Choose a building block.

PROTECTIVE MEASURES

The personal protective equipment and safety equipment (if listed) is specific to the associated task. The required PPE and equipment listed must be onsite during the task being performed. Work shall not commence unless the required PPE or Safety Equipment is present.

Required Safety & Personal Protective Equipment

Required Personal Protective Equipment (PPE)	**Task 1**	**Task 2**	**Task 3**	**Task 4**
	Drilling	Soil, Soil Vapor, & Groundwater Sampling	Geophysical Survey	Enter task description.
Hard hat	☒	☒	☒	☐
Safety Glasses	☒	☒	☒	☐
Safety Toed Shoes	☒	☒	☒	☐
Class 2 Safety Vest	☒	☒	☒	☐
Hearing Protection	☒	☒	☒	☐
Nitrile Gloves	☒	☒	☒	☐
Level of protection required	D	D	D	Select
Required Safety Equipment				
First Aid Kit	☒	☒	☒	☐

TRAINING REQUIREMENTS

The table below lists the training requirements staff must have respective to their assigned tasks and that are required to access the Site.

Site Specific Training Requirements

HAZWOPER - 40 Hour (Initial)
HAZWOPER - 8 Hour (Annual Refresher)
Site Specific Orientation

Task Specific Training Requirements

Required Training Type	**Task 1**	**Task 2**	**Task 3**
	Drilling	Soil, Soil Vapor, & Groundwater Sampling	Geophysical Survey
HAZWOPER- 40 Hour (Initial), HAZWOPER- 8 Hour (Annual Refresher), & Site-Specific Orientation	X	X	X

AIR MONITORING PLAN AND EQUIPMENT

Exposures to airborne substances shall be fully characterized throughout project operations to ensure that exposure controls are effectively selected and modified as needed.

Is air/exposure monitoring required at this work site for personal protection? No

Is perimeter monitoring required for community protection? No

Air monitoring plan not applicable Yes

DECONTAMINATION & DISPOSAL METHODS

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials.)

Personal Hygiene Safeguards

The following minimum personal hygiene safeguards shall be adhered to:

1. No smoking or tobacco products in any project work areas.
2. No eating or drinking in the exclusion zone.
3. It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.

It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Decontamination Supplies

All decontamination should be conducted at the project site in designated zones or as dictated by Client requirements. Decontamination should not be performed on Haley & Aldrich owned or leased premises.

☐ Acetone	☐ Distilled Water	☐ Polyethylene Sheeting
☒ Alconox Soap	☐ Drums	☐ Pressure/Steam Cleaner
☒ Brushes	☐ Hexane	☒ Tap Water
☒ Disposal Bags	☐ Methanol	☐ Wash tubs
☒ 5 Gallon Buckets	☒ Paper Towels	☐ Other: Specify

Location of Decontamination Station

Decontamination will take place prior to leaving the site at the exit.

Standard Personal Decontamination Procedures

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site contact the Project Manager and Field Safety Manager to discuss proper decontamination procedures.

The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots (if applicable)
6. Remove outer gloves (if applicable)
7. Remove Tyvek coverall (if applicable)
8. Remove respirator, wipe clean and store (if applicable)
9. Remove inner gloves (if outer gloves were used)

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles.

Small Equipment Decontamination

Pretreatment of heavily contaminated equipment may be conducted as necessary:

1. Remove gross contamination using a brush or wiping with a paper towel
2. Soak in a solution of Alconox and water (if possible)
3. Wipe off excess contamination with a paper towel

Standard decontamination procedure:

4. Wash using a solution of Alconox and water
5. Rinse with potable water
6. Rinse with methanol (or equivalent)
7. Rinse with distilled/deionized water

Inspect the equipment for any remaining contamination and repeat as necessary.

Disposal Methods

Procedures for disposal of contaminated materials, decontamination waste, and single use personal protective equipment shall meet applicable client, locate, State, and Federal requirements.

Disposal of Single Use Personal Protective Equipment

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles. PPE that is grossly contaminated must be bagged (sealed and field personnel should communicate with the Project Manager to determine proper disposal.

Disposal Method for Contaminated Soil

- Contaminated soil cuttings and spoils must be containerized for disposal off-site unless otherwise specifically directed.
- Soil cuttings and spoils determined to be free of contamination through field screening can usually be returned to the boreholes or excavations from which they came.

SITE CONTROL

The overall purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. The degree of site control necessary depends on site characteristics, site size, and the surrounding community. The following information identifies the elements used to control the activities and movements of people and equipment at the project site.

Communication

Internal
Haley & Aldrich site personnel will communicate with other Haley & Aldrich staff member and/or subcontractors or contractors with:

Face to Face Communication

External
H&S site personnel will use the following means to communicate with off-site personnel or emergency services.

Cellular Phones

Visitors

Project Site
Will visitors be required to check-in prior to accessing the project site?

Yes

Visitor Access
Authorized visitors that require access to the project site need to be provided with known information with respect to the site operations and hazards as applicable to the purpose of their site visit. Authorized visitors must have the required PPE and appropriate training to access the project site.

Sarah Commisso is responsible for facilitating authorized visitor access.

Zoning

Work Zone

The work zone will be clearly delineated to ensure that the general public or unauthorized worker access is prevented. The following will be used:

Cones

SITE SPECIFIC EMERGENCY RESPONSE PLAN

The Emergency Response Plan addresses potential emergencies at this site, procedures for responding to these emergencies, roles, responsibilities during emergency response, and training. This section also describes the provisions this project has made to coordinate its emergency response with other contractors onsite and with offsite emergency response organizations (as applicable).

During the development of this emergency response plan, local, state, and federal agency disaster, fire, and emergency response organizations were consulted (if required) to ensure that this plan is compatible and integrated with plans of those organizations. Documentation of the dates of these consultations are the names of individuals contacted is kept on file and available upon request.

The site has been evaluated for potential emergency occurrences, based on site hazards, and the major categories of emergencies that could occur during project work are:

- Fire(s)/Combustion
- Hazardous Material Event
- Medical Emergency
- Natural Disaster

A detailed list of emergency types and response actions are summarized in Table X below. Prior to the start of work, the SSO will update the table with any additional site-specific information regarding evacuations, muster points, or additional emergency procedures. The SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of these routes and assembly areas.

Pre-Emergency Planning

Before the start of field activities, the Project Manager will ensure preparation has been made in anticipation of emergencies. Preparatory actions include the following:

Meeting with the subcontractor/and or client concerning the emergency procedures in the event a person is injured. Appropriate actions for specific scenarios will be reviewed. These scenarios will be discussed, and responses determined before the sampling event commences. A form of emergency communication (i.e.; Cell phone, Air horn, etc.) between the Project Manager and subcontractor and/or client will be agreed on before the work commences.

A training session (i.e., “safety meeting”) given by the Project Manager or their designee informing all field personnel of emergency procedures, locations of emergency equipment and their use, and proper evacuation procedures.

Ensuring field personnel are aware of the existence of the emergency response HASP and ensuring a copy of the HASP accompanies the field team(s).

Onsite Emergency Response Equipment

Emergency procedures may require specialized equipment to facilitate work rescue, contamination control and reduction or post-emergency cleanup. Emergency response equipment stocked

Table 9.1 Emergency Equipment and Emergency PPE			
Emergency Equipment	**Specific Type**	**Quantity Stocked**	**Location Stored**
First Aid Kit	General First Aid Kit	1	With H&A personnel

EVACUATION ALARM
Verbal Communication (Site Personnel are adjacent in work zone)
EVACUATION ROUTES
Will be given a map after site specific training
EVACUATION MUSTER POINT(S)/ SHELTER AREA(S)
Will be given a location after site specific training
EVACUTION RESPONSE DRILLS
The Site relies on outside emergency responders and a drill is not required.

Table 9-2 – Emergency Planning

Emergency Type	Notification	Response Action	Evacuation Plan/Route
Chemical Exposure	Report event to SSO immediately	Refer to Safety Data Sheet for required actions	Remove personnel from work zone
Fire - Small	Notify SSO and contact 911	Use fire extinguisher if safe and qualified to do so	Mobilize to *Muster Point*
Fire – Large/Explosion	Notify SSO and contact 911	Evacuate immediately	Mobilize to *Muster Point*
Hazardous Material – Spill/Release	Notify SSO; SSO will contact PM to determine if additional agency notification is	If practicable don PPE and use spill kit and applicable procedures to contain the release	See Evacuation Map for route, move at least 100 ft upwind of spill location
Medical – Bloodborne Pathogen	Notify SSO	If qualified dispose in container or call client or city to notify for further instruction.	None Anticipated
Medical – First Aid	Notify SSO	If qualified perform first aid duties	None Anticipated
Medical – Trauma	If life threatening or transport is required call 911, immediately	Wait at site entrance for ambulance	Noe Anticipated
Security Threat	Notify SSO who will call 911 as warranted	Keep all valuables out of site and work zones delineated.	None Anticipated
Weather – Earthquake/Tsunami's	STOP WORK and evacuate Site upon any earthquake	Turn off equipment and evacuate as soon as is safe to do so	Mobilize to *Shelter Location*
Weather – Lightning Storm	STOP WORK	Work may resume 30 minutes after the last observed lightning.	None Anticipated
Weather – Tornadoes/Hurricanes	Monitor weather conditions STOP WORK and evacuate the site	Evacuate to shelter location or shelter in place immediately	Mobilize to *Shelter Location*
MUSTER POINT Sidewalk along Shepherd Avenue		*SHELTER LOCATION* Personal vehicle	
In case of site emergencies, site personnel shall be evacuated per this table and will not participate in emergency response activities. Site emergencies shall be reported to local, state, and federal governmental agencies as required.			

HASP ACKNOWLEDGEMENT FORM

All Haley & Aldrich employees onsite must sign this form prior to entering the site.

I hereby acknowledge receipt of, and briefing on, this HASP prior to the start of on-site work. I declare that I understand and agree to follow the provisions, processes, and procedures set forth herein at all times while working on this site.

Printed Name	Signature	Date

ATTACHMENT A
HASP AMENDMENT FORM

HASP AMENDMENT FORM

This form is to be used whenever there is an immediate change in the project scope that will require an amendment to the HASP. For project scope changes associated with "add-on" tasks, the changes must be made in the body of the HASP. Before changes can be made, a review of the potential hazards must be initiated by the Haley & Aldrich Project Manager.

This original form must remain on site with the original HASP. If additional copies of this HASP have been distributed, it is the Project Manager's responsibility to forward a signed copy of this amendment to those who have copies.

Amendment No.	
Site Name	
Work Assignment No.	
Date	
Type of Amendment	
Reason for Amendment	
Alternate Safeguard Procedures	
Required Changes in PPE	

Project Manager Name (Print) Project Manager Signature Date

Health & Safety Approver Name (Print) Health & Safety Approver Signature Date

ATTACHMENT B
TRAINING REQUIREMENTS

TRAINING REQUIREMENTS

Health and Safety Training Requirements

Personnel will not be permitted to supervise or participate in field activities until they have been trained to a level required by their job function and responsibility. Haley & Aldrich staff members, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

The Haley & Aldrich Project Manager/FSM will be responsible for maintaining and providing to the client/site manager documentation of Haley & Aldrich staff members' compliance with required training as requested. Records shall be maintained per OSHA requirements.

40-Hour Health and Safety Training

The 40-Hour Health and Safety Training course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, and supervisors, who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120.

8-hour Annual Refresher Training

Personnel who complete the 40-hour health and safety training are subsequently required to attend an annual 8-hour refresher course to remain current in their training. When required, site personnel must be able to show proof of completion (i.e., certification) at an 8-hour refresher training course within the past 12 months.

8-Hour Supervisor Training

On-site managers and supervisors directly responsible for, or who supervise staff members engaged in hazardous waste operations, should have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. Supervisor Training includes, but is not limited to, accident reporting/investigation, regulatory compliance, work practice observations, auditing, and emergency response procedures.

Additional Training for Specific Projects

Haley & Aldrich personnel will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities including:

- Client specific training or orientation
- Competent person excavations
- Confined space entry (entrant, supervisor, and attendant)
- Heavy equipment including aerial lifts and forklifts
- First aid/ CPR
- Use of fall protection
- Use of nuclear density gauges
- Asbestos awareness

ATTACHMENT C

ROLES AND RESPONSIBILITIES

SITE ROLES AND RESPONSIBILITIES

Haley & Aldrich Personnel

Field Safety Manager (FSM)

The Haley & Aldrich FSM is a full-time Haley & Aldrich staff member, trained as a safety and health professional, who is responsible for the interpretation and approval of this Safety Plan. Modifications to this Safety Plan cannot be undertaken by the PM or the SSO without the approval of the FSM.

Specific duties of the FSM include:

- Approving and amending the Safety Plan for this project
- Advising the PM and SHSOs on matter relating to health and safety
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation
- Maintaining regular contact with the PM and SSO to evaluate the conditions at the property and new information which might require modifications to the HASP and
- Reviewing and approving JSAs developed for the site-specific hazards.

Project Manager (PM)

The Haley & Aldrich PM is responsible for ensuring that the requirements of this HASP are implemented at that project location. Some of the PM´s specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the FSM with updated information regarding environmental conditions at the site and the scope of site work;
- Providing adequate authority and resources to the on-site SHSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SHSO;
- Maintaining regular communications with the SHSO and, if necessary, the FSM;
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project;
- Providing project scheduling and planning activities; and
- Providing guidance to field personnel in the development of appropriate Job Safety Analysis (JSA) relative to the site conditions and hazard assessment.

Site Health & Safety Officer (SHSO)

The SHSO is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SHSO functions may include some or all of the following:

- Act as Haley & Aldrich´s liaison for health and safety issues with client, staff, subcontractors, and agencies.
- Verify that utility clearance has been performed by Haley & Aldrich subcontractors.
- Oversee day-to-day implementation of the Safety Plan by Haley & Aldrich personnel on site.
- Interact with subcontractor project personnel on health and safety matters.

- Verify use of required PPE as outlined in the safety plan.
- Inspect and maintain Haley & Aldrich safety equipment, including calibration of air monitoring instrumentation used by Haley & Aldrich.
- Perform changes to HASP and document in Appendix A of the HASP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents and incidents involving Haley & Aldrich and its subcontractors.
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers).
- Report accidents, injuries, and near misses to the Haley & Aldrich PM and FSM as needed.

The SHSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with Haley & Aldrich employees and Haley & Aldrich subcontractors at regular intervals and in accordance with Haley & Aldrich policy and contractual obligations. The SHSO will track the attendance of site personnel at Haley & Aldrich orientations, toolbox talks, and safety meetings.

Field Personnel

Haley & Aldrich personnel are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed Safety Plan Acceptance Form and documentation of medical surveillance and training to the SHSO prior to the start of work;
- Attending the pre-entry briefing prior to beginning on-site work;
- Bringing forth any questions or concerns regarding the content of the Safety Plan to the PM or the SHSO prior to the start of work;
- Stopping work when it is not believed it can be performed safely;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SHSO;
- Complying with the requirements of this safety plan and the requests of the SHSO; and
- Reviewing the established JSAs for the site-specific hazards on a daily basis and prior to each shift change, if applicable.

Visitors

Authorized visitors (e.g., Client Representatives, Regulators, Haley & Aldrich management staff, etc.) requiring entry to any work location on the site will be briefed by the Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer´s health and safety policies. In addition, this safety plan specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times. Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

SUBCONTRACTOR PERSONNEL

Subcontractor Site Representative

Each contractor and subcontractor shall designate a Contractor Site Representative. The Contractor Site Representative will interface directly with Insert Staff Name Here, the Subcontractor Site Safety Manager, with regards to all areas that relate to this safety plan and safety performance of work conducted by the contractor and/or subcontractor workforce. Contractor Site Representatives for this site are listed in the Contact Summary Table at the beginning of the Safety Plan.

Subcontractor Site Safety Manager

Each contractor / subcontractor will provide a qualified representative who will act as their Site Safety Manager (Sub-SSM). This person will be responsible for the planning, coordination, and safe execution of subcontractor tasks, including preparation of job hazard analyses (JHA), performing daily safety planning, and coordinating directly with the Haley & Aldrich SHSO for other site safety activities. This person will play a lead role in safety planning for Subcontractor tasks, and in ensuring that all their employees and lower tier subcontractors are in adherence with applicable local, state, and/or federal regulations, and/or industry and project specific safety standards or best management practices.

General contractors / subcontractors are responsible for preparing a site-specific HASP and/or other task specific safety documents (e.g., JHAs), which are, at a minimum, in compliance with local, state, and/or federal other regulations, and/or industry and project specific safety standards or best management practices. The contractor(s)/subcontractor(s) safety documentation will be at least as stringent as the health and safety requirements of the Haley & Aldrich Project specific HASP.

Safety requirements include, but are not limited to: legal requirements, contractual obligations and industry best practices. Contractors/subcontractors will identify a site safety representative during times when contractor/subcontractor personnel are on the Site. All contractor/subcontractor personnel will undergo a field safety orientation conducted by the Haley & Aldrich SHSO and/or PM prior to commencing site work activities. All contractors / subcontractors will participate in Haley & Aldrich site safety meetings and their personnel will be subject to training and monitoring requirements identified in this Safety Plan. If the contractors / subcontractors means and methods deviate from the scope of work described in Section 1 of this Safety Plan, the alternate means and methods must be submitted, reviewed, and approved by the Haley & Aldrich SHSO and/or PM prior to the commencement of the work task. Once approved by the Haley & Aldrich SHSO and/or PM, the alternate means and methods submittal will be attached to this Safety Plan as an Addendum.

ATTACHMENT D
JOB SAFETY ANALYSES

Safety
in everything we do

352-362 SHEPHERD AVENUE

KEY TASK 1,2**:** Drilling, Sampling

Subtask Category	Potential Hazards	Controls
Drilling	Slips, Trips, and Falls	- Keep work area clear
Drilling	Utility locators and underground hazards	- Utility markout
Drilling	Noise reduction	- Wear appropriate noise reducing PPE
Drilling	Heavy equipment	- Avoid line of fire, wear PPE
Sampling	Slips, trips, and falls	- Keep work area clear
Sampling	General site hazards	- Wear PPE
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.
Enter subtask information.	Choose category.	- Enter control(s) for each hazard.

ATTACHMENT E
COVID DOCUMENTS

Safety
in everything we do

COVID-19 Policy
Working Safely on Project Sites

Incorporate the following information to protect field staff, business partners, clients, and the general public at project sites:

All Staff:

- Must follow state/county/local mandates or client requirements, when they are stricter. Where requirements are stricter, they will be included in the Office or Project HASP.
- Must stay home if they are sick.
- Should be “face covering ready” (have a mask readily available). If anyone asks that staff wear a mask in an interaction, Haley & Aldrich staff must don a mask.
- Are encouraged to maintain physical distancing when feasible to ensure highest levels of safety and virtual meetings are encouraged as a best practice to reduce the risk of in-person contact and reduce our environmental footprint.
- Staff may eat together outdoors.
- Are required to review, understand, and communicate the site’s controlling employer’s COVID-19 mitigation plan prior to mobilization. It is your duty to obtain a copy of the site COVID plan.

Fully Vaccinated staff:

- Are those who are at least two weeks past the final shot in the series and their vaccination record is on file with Human Potential.
- Are no longer required to wear masks. Staff are encouraged to wear a mask if conditions warrant as a best practice.
- May continue to work after a known close contact if they are asymptomatic.
- Are no longer required to self-certify via Gensuite each morning.
- May dine together indoors without restriction.

Fully vaccinated staff who experience COVID-19 symptoms must:

- Isolate from others and be clinically evaluated before returning to work. Staff must isolate, go home if symptoms manifest at work.
- Vaccinated staff must email COVIDHelp@haleyaldrich.com if you experience COVID-19 symptoms.
- Please use the CDC’s COVID Symptom Checker or contact your physician if you have questions about your symptoms: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

The risk associated with potential exposure to COVID-19 will be considered as part of the project planning and HASP development cycle.

Have Health & Safety review the HASP.

Business partners for sites managed by Haley & Aldrich (H&A Controlling Employer) will have completed the Self-Declaration Form.

Approved and appropriate Personal Protective Equipment and supplies are used as indicated by the HASP.

HALEY ALDRICH

COVID-19 Policy
Working Safely on Project Sites

COVID-19 PROJECT SPECIFIC INFORMATION

Unvaccinated Staff:

- Are still required to wear a mask at all times in Haley & Aldrich offices or on remote work assignments, unless specifically exempted by Health & Safety or when alone at their workstation.
- Are still required to self-certify through Gensuite each morning prior to entering the work environment (office, field, client site, travel or any other place you are to perform work duties.
  - They must enter a self-certification each time they enter the office, and a separate self-certification for project site work. Staff may list multiple sites in the text field of the form.
- Are still required to stay home and quarantine when sick, experiencing COVID-19 like symptoms, or were in close contact with someone with COVID-19.
- Are still required to isolate from others if they become sick or develop COVID-19 symptoms in the work environment. Immediately report any illness, or close contact to COVIDHelp@haleyaldrich.com. Please refer to the "What to do if you have been exposed" policy for further information.
- Are still required to avoid dining with others in an indoor setting. This includes Haley & Aldrich meetings and client luncheons.

Fit for Duty –

- All subcontractors (if subcontracted to Haley & Aldrich), and visitors (if H&A is Controlling Employer) will complete the Subcontractor Self-Declaration form to affirm staff report fit for duty and symptom free each day.
- All employees working on a site controlled by another employer will follow site expectations for self-certification.
- Sub-contractors who do not show proof of vaccination will be expected to follow the unvaccinated staff requirements.

Things you can do to limit potential exposure (best practices for vaccinated staff/required for unvaccinated staff) –

- Consider job trailers or offices as part of this risk assessment and follow all site requirements.
- Maintain a minimum distance of 6' when feasible If you can maintain greater distances, please do so.
- Avoid eating in groups
- Continue regular handwashing or hand sanitizing. Sanitize surfaces as needed.
- Avoid touching the face area (eyes, nose, mouth).

Does the client or Controlling Employer (if H&A is not controlling employer) have specific requirements related to COVID-19?

If yes, please attach the requirements. Yes No

Do we have the necessary supplies on hand (If needed)? Yes No

(Supplies include masks, disinfectant, hand washing stations or sanitizer, and PPE.)

The following **must** be onsite(☑ to acknowledge):

☐ Has the Tailgate Meeting Form been provided?
☐ Has the What To Do if You Have Been Exposed policy been provided?
☐ Has the mask policy been provided?
☐ Has the Field Office/Trailer been reviewed to ensure it is safe?
☐ Subcontractor Self-Declaration form