MOVE YOUR ENVIRONMENT FORWARD

SITE CHARACTERIZATION WORK PLAN

Off-Site Properties - Site # C224229A
215 North 10th Street
Brooklyn, New York 11211

Prepared For:

Contract# D009808, Work Assignment No. 14
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7012

Prepared By:

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065

HRP #: DEC1014.P3

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1.0 INTRODUCTION

On September 17, 2020, HRP Associates, Inc. (HRP) was authorized to proceed with this New York State Department of Environmental Conservation (NYSDEC) Work Assignment (WA) No. 14 (D009808-14) for Site Characterization (SC) of off-site properties, located in the vicinity of 215 North 10th Street, Brooklyn (Kings County), New York. The scope of work for the SC portion of the Work Assignment, discussed herein, was developed based on HRP's review of information provided by the NYSDEC on subsurface investigations completed at the property between 2018 and 2019, as well as discussions and planning with NYSDEC staff.

1.1 Purpose and Objectives

This site-specific Site Characterization (SC) Work Plan describes the details of the scope of work, including all proposed field activities, laboratory analyses, and data QA/QC evaluation that will be associated with the SC at the off-site properties in the vicinity of 215 North 10th Street. This document is intended to supplement information provided in the NYSDEC-approved *Generic Field Activities Plan for Work Assignments*, completed by HRP on August 8, 2019 and provided in **Appendix A** of this Work Plan.

The purpose of the SC is to characterize off-site environmental media and work to define the nature and extent of the suspected off-site source of groundwater contamination associated with the Site. In accordance with DER-10 *Technical Guidance for Site Investigation and Remediation (May 2010),* the primary objectives of the SC scope of work are to:

- Investigate potential off-site impacts to groundwater and soil vapor emanating from 215 North 10th Street;
- Evaluate the hydrogeology, including depth to groundwater and groundwater flow gradients;
- Identify actual or potential receptors of contaminants through air and groundwater, without regard to property boundaries;
- Collect and evaluate all data necessary to evaluate the actual and potential threats to public health and the environment; and
- Collect the data necessary to evaluate any release to groundwater resultant in impacts to indoor air quality and develop remedial alternative(s) to address off-site groundwater impacts and mitigate vapor intrusion.

The SC will be completed in two phases. The initial focus of the SC will be to access indoor air quality at up to twenty-eight (28) properties, depending on the ability to obtain access agreements coordinated by the NYSDEC with the targeted property owners. The second phase of the SC will be completed to characterize and further delineate the volatile organic compound (VOC) groundwater plume previously identified to be migrating off-site.

1.2 Site Description and Background Information

The focus of this investigation includes up to twenty-eight neighboring properties and the extent of a VOC groundwater plume emanating from 215 North 10th Street, Brooklyn (Kings County), New

York (herein referred to as the Site). The Site location is depicted on **Figure 1**. The Site is approximately 0.41 acres in size, according to the New York City online GIS map viewer. The parcel was formerly developed with two single story buildings that were demolished in May 2018. Surrounding land in the area of the Site is mixed commercial and residential properties. The following areas are being investigated under this work scope and are collectively referred to as the "Study Area":

- Groundwater both up-gradient and down-gradient of the Site,
- 214 North 11th Street, Brooklyn, NY
- 202 North 10th Street, Brooklyn, NY
- 220 North 10th Street, Brooklyn, NY
- 475 Driggs Avenue, Brooklyn, NY
- 5 Roebling Street, Brooklyn, NY
- 15 Roebling Street, Brooklyn, NY

Historical Site operations consisted of manufacturing and industrial operations which included dry color and paint storage, a varnish research facility, and chemical warehouse. According to a 1942 Sanborn map, one benzene and two gasoline underground storage tanks (USTs) were used at the Site. Identified releases of chlorinated solvents on the Site have been associated with the former varnish research operations and former USTs.

Previous environmental investigations performed at the Site identified a historical release of trichloroethylene (TCE) and associated breakdown products (i.e., cis-1,2-dichloroethene (DCE) and vinyl chloride), lead, mercury, arsenic, and semi-volatile organic compounds (SVOCs) including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene. These primary constituents have impacted the soil vapor and groundwater at the Site. Data from these investigations indicated that these substances are present at elevated levels in groundwater collected from on-site monitoring wells and potentially migrating off-site. On-site soil vapor data indicated high concentrations of TCE (243,000 µg/m^3) and PCE (7,730 µg/m^3) and elevated concentrations of carbon tetrachloride and 1,1,1-trichloroethane (TCA). Previous sampling of off-site soil vapor concentrations indicated that additional soil vapor investigations on nearby properties were warranted.

1.3 Site Geology and Hydrogeology

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, 100% of the Site and Study Area are mapped as Urban Land, tidal marsh substratum, with 0 to 3 percent slopes. Subsurface materials are characterized historic fill in the upper 4 feet below ground surface (bgs), underlain by brown sand, red to brown clay, black gravel, and black to brown silt underlying a layer of that fill materials comprised of sand and gravel with varying amounts of ash, coal, glass, and brick to depths of 2 to 4 feet below ground surface (bgs) are present on the Sit.

Shallow groundwater in the overburden aquifer was encountered at depths ranging from 6 to 7 feet bgs and was inferred to flow to the west. The Site and Study Area are located within a high-risk flood area (AE zone).

1.4 Environmental Impacts

According to previous environmental investigations, impacts to soil, groundwater and air were identified at the Site. The contaminants identified in on-site soil and groundwater have been associated with the former varnish research operations and former USTs. Identified constituents of concern (COCs) include VOCs, semi-volatile organic compounds (SVOCs) and metals. Analytical data suggested that the identified groundwater plume is potentially migrating off-site. Concentrations of VOCs in soil vapor were observed to be elevated in samples collected off-site.

In addition to the observed COCs at the site, preliminary investigations included analysis for polychlorinated biphenyls (PCBs) and pesticides, neither of which were observed in exceedance of applicable standards. During previous investigations metals (lead, arsenic, and mercury) were identified in shallow and deep soils across the Site at concentrations exceeding the soil cleanup objective (SCO) for unrestricted use (UUSCO) and restricted residential use (RRUSCO). Concentrations of SVOCs (primarily polycyclic aromatic hydrocarbons (PAHs) were found in shallow soils throughout the Site and in one deeper interval located on the northern portion of the Site. Concentrations of VOCs (predominately chlorinated VOCs) have been reported in shallow soils on the northern portion of the Site. TCE (30 parts per million [ppm]) and vinyl chloride (1.6 parts per billion [ppb]) were in exceedance of the UUSCO and RUSCO. Concentrations of TCE (21 ppm) and DCE (40 ppb) were observed in groundwater collected from the central and southern portions of the Site. SVOCs were observed in all samples collected from on-site monitoring wells. The highest concentrations were observed on the eastern portion of the Site and potentially migrating off-site. Metals (arsenic, mercury, lead, nickel and zinc) were detected in groundwater samples collected across the Site in exceedance of groundwater standards. Maximum concentrations of VOCs in soil gas samples collected from 6 feet beneath the side walk grade included TCE (243,000 micrograms per cubic meter [µg/m^3]), PCE (7,730 µg/m^3), carbon tetrachloride (6,350 µg/m^3), and TCA (6,000 µg/m^3). Soil gas sampling conducted at off-site locations indicated that additional sampling of nearby properties is necessary.

The focus of the SC will be to better define the degree and extent of the overall plume by performing soil vapor intrusion investigation and groundwater investigation in the Study Area. Characterization of the extent of groundwater and vapor intrusion is warranted in order to determine if any potential risk exists to nearby human receptors. Up to twenty-eight off-site properties are targeted as part of an indoor air quality assessment which will include installation of soil vapor points and/or indoor air monitoring. Samples collected from air sampling will be submitted for analysis for VOCs. Seven paired temporary wells will be installed off-site; locations include four downgradient and two upgradient locations relative to the Site. Groundwater samples collected from the newly installed Study Area temporary monitoring wells will be analyzed for the following parameters: VOCs, SVOCs, metals, PCBs, chlorinated pesticides, PFASs and 1,4-dioxane. **Table 1** provides a summary of the sampling plan.

2.0 SITE CHARACTERIZATION (SC) SCOPE OF WORK

This scope of work has been designed to gather data to evaluate each project objective listed in **Section 1.1**. The following sections provide specifics regarding the scope of work developed under this NYSDEC-approved Work Assignment (D009808-14) in support of a Site Characterization at off-site properties in the vicinity of 215 North 10th Street (#C224229A).

2.1 Preliminary Activities

As part of the scope of work, the following documents have been prepared under this Work Assignment:

- Project-specific Work Plan (this document) to accompany the generic Field Activities Plan (FAP) (included as Appendix A of this Work Plan).
- Site-specific Health and Safety Plan (HASP) (included as **Appendix B** of this Work Plan).
- Generic Quality Assurance Project Plan (QAPP) (included as **Appendix C** of this Work Plan).

These NYSDEC-approved generic FAP, HASP, and QAPP are on file with the NYSDEC. The site-specific elements are provided below.

2.1.1 Work Plan

This SC Work Plan has been prepared for use in performing the Site Characterization, and will serve as the "site-specific FAP". This SC Work Plan identifies the components of the Site Characterization and a description of the tasks to be performed including the specific methods or procedures that will be used to conduct the field sampling. A proposed project schedule is included in **Section 4.1** of this SC Work Plan.

2.1.2 Health and Safety Plan

A site-specific Health and Safety Plan (HASP) (included as **Appendix B** of this Work Plan). The site-specific HASP provides guidance to maximize health and safety of on-site workers during SC - specific tasks including installation of soil vapor points, installation of wells, and sampling activities. Included in the site-specific HASP is a Community Air Monitoring Plan (CAMP) that details procedures for air monitoring during intrusive activities. The CAMP will be implemented during intrusive activities, described in **Section 2.2.2** of this Work Plan. The generic HASP has guidelines for health and safety supervision, air monitoring, medical monitoring, personal protective equipment, site controls, safe work practices and decontamination, etc.

2.1.3 Quality Assurance Project Plan

A site-specific Quality Assurance Project Plan (QAPP) has been prepared and is included in **Section 3** of this SC Work Plan. The site-specific QAPP was prepared as a supplement to the Generic QAPP with necessary site-specific information. Deviations from the protocols specified in the QAPP will be subject to the NYSDEC approval.

The Generic QAPP provides general information related to QA/QC procedures associated with the collection and analysis of samples of environmental media and includes specific representative standard operating procedures (SOPs) applicable to sample handling and field instrumentation use. Information provided in the Generic QAPP includes definitions and generic goals for data quality and required types and quantities of QA/QC samples. The procedures address field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA/QC reporting specific to the analyses performed by the laboratories that are used for analysis of environmental media collected under Standby Contract No. D009808.

All laboratory analytical work will be performed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) approved laboratory certified in all categories of Contract Laboratory Protocol (CLP) and Solid and Hazardous Waste analytical testing. A Data Usability Summary Report (DUSR) will be included in the Site Characterization Report (SCR) for each round of analytical work. Category B deliverables will be retained in the project files and available for full data validation by a qualified, independent third party.

2.2 Investigation, Environmental Sampling, and Implementation

The SC will include the components described below and will consist of subsurface/intrusive characterization. The SC will consist of sampling soil gas, and groundwater to meet project objectives. The number and type of samples to be collected is discussed below and summarized on **Table 1**. The field investigation tasks for the off-site properties are listed below in the order that they will be completed:

1. Underground Utility Identification, Clearance and, Location using Ground-Penetrating Radar (GPR)
2. Off-site Soil Vapor Intrusion Investigation (air and soil vapor sampling)
3. Groundwater Characterization (well installation and sampling)
4. Analytical Data Quality Evaluation

2.2.1 Underground Utility Clearance and Ground Penetrating Radar (GPR)

Prior to implementing any intrusive activities, a utility clearance will be conducted. HRP will rely upon multiple lines of evidence to ensure to the maximum extent practicable that subsurface features are identified prior to commencement of intrusive work.

HRP will mark sampling locations prior to installation and contact public utility clearance services to mark out the utilities prior to the survey. The drilling contractor, or HRP, will request utility mark outs through NYS Code Rule 753/Dig Safe System. The dig safe system is limited to public right-of ways and will only identify utilities entering private property rather than utilities present on-site.

HRP will utilize a qualified subcontractor to conduct a survey to attempt to locate possible piping and utilities prior to drilling in any areas that are suspect. In order to identify the potential for buried

piping, a GPR survey will be completed at each proposed monitoring well located in the Study Area. Proposed monitoring well locations are depicted on **Figure 2**.

The upper five feet at all boring locations will be cleared of any underground utilities by air knifing.

2.2.2 Groundwater Characterization

For the purpose of evaluating groundwater quality and to obtain groundwater flow information, a total of fourteen (14) overburden groundwater monitoring wells are proposed for installation as part of the SC. The wells will be installed in nested pairs at seven locations. The proposed locations were selected based on a previously reported westerly overburden groundwater flow direction. The proposed locations of each well are presented on **Figure 2**. Groundwater samples will be collected following a minimum of one week of stabilization after the well development has been completed.

2.2.2.1. Monitoring Well Installation

Temporary monitoring wells will be installed at seven locations, including: two up-gradient and five down-gradient of 215 North 10th Street. Prior to installation each location will be pre-cleared by the drilling contractor using vacuum methods (air knifing). At each location a hollow-stem auger drilling rig will be advanced through the overburden materials and used to set shallow overburden monitoring wells, which are anticipated to be completed to a depth no greater than 20 feet below grade. The wells will ultimately be designed and installed such that each nested pair will represent two groundwater intervals. One well screen will be installed just below the encountered water table and one well screen will be installed at the bottom of the borehole. The ultimate depth and construction of these wells will be dependent on the subsurface conditions encountered in the field.

Unless significantly elevated VOC concentrations are observed indicating that alternative materials such as stainless steel be used, six nested monitoring well locations are to be constructed of PVC solid well pipe riser and a five-foot PVC 10-slot screen. One well within each paired location will be positioned just below the encountered water table and a second well will be screened at the bottom of the borehole. Wells will be finished with a flush mounted protective cover. All equipment will be appropriately decontaminated between sampling locations, as described in **Section 2.2.3**. Soil cuttings will be containerized as discussed in **Section 2.2.4**.

2.2.2.2. Well Development

Each newly-installed well will be developed a minimum of 24 hours after completion by pumping and surging for 2 hours or until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability of less. The field parameters include: temperature, pH and specific conductance. In addition, the turbidity of the groundwater must achieve a reading of 50 Nephelometric Turbidity Units (NTUs) or less during the field parameter readings.

All purge water obtained during well development and sampling will be containerized and disposed of in accordance to NYSDEC DER-10. If impacts are observed, the contaminated groundwater will be segregated and handled as described in **Section 2.2.5**. All sampling equipment will be appropriately decontaminated between sampling locations or disposed of after a one time use.

2.2.2.3. Sampling of Monitoring Wells

Depth to water measurements will be collected from all monitoring wells to the nearest 0.01 foot from the surveyed points prior to sampling activities and the data will be used to construct a groundwater contour map to determine the direction of groundwater flow and the hydraulic gradient on the site. Until deemed unnecessary, in addition to measuring the water level, the wells will be checked for both light and dense non-aqueous phase liquids (LNAPLs and DNAPLs) using an interface probe.

Groundwater samples will be collected from the newly installed wells a minimum of ten days after well development has been completed. All groundwater samples will be collected in accordance with low-flow groundwater sampling procedures and will be submitted to Eurofins Test America, and New York State Department of Health (NYSDOH) ELAP-certified laboratory for analysis. Two duplicate samples and two trip blanks will be collected and submitted to the laboratory for analysis. All samples will be submitted for laboratory analysis of the following parameters:

- VOCs by EPA Method 8260
- PAHs by EPA Method 8270
- 8 RCRA metals plus nickel and zinc by EPA Method 6010B
- Total mercury by EPA Method 7471A
- PCBs by EPA Method 8082
- Pesticides by EPA Method 8081B
- PFAS Analyte list compounds by modified EPA Method 537
- 1,4-dioxane by EPA Method 8270

Groundwater samples collected for metals analysis will be filtered in the field with single-use 0.5 micron filters.

2.2.3 Decontamination Procedures

Non-dedicated sampling equipment (i.e., submersible pumps, water level indicators, etc.) will be subject to decontamination procedures prior to each sample collected to reduce the potential for cross-contamination, as described in the Generic Field Activities Plan (FAP) (included as **Appendix A** of this Work Plan). The decontamination procedures will include the use of a scrub wash with a solution consisting of Alconox® detergent and potable water followed by a rinse with DI water. Liquinox® will not be used if samples are to be collected for 1,4-dioxane analysis, since Liquinox® may contain a small amount of 1,4-dioxane. The decontaminated equipment will be stored in clean environments (i.e., the manufacturer's storage case). Decontamination fluids will be properly labeled and securely stored in the designated waste-container staging area.

2.2.4 Disposal of Investigation Derived Waste

Derived waste (DW) that is generated from the installation and the development of monitoring wells shall be handled in accordance with NYSDEC DER-10. HRP will be responsible for supplying the equipment and materials necessary for the proper handling and storage of the DW, such as DOT-approved 55-gallon drums, roll-off containers and/or holding tanks. All containers will be labeled and transported off-site as hazardous waste. The presumed hazardous characterization of investigated DW will allow for same day transport off-site, as a temporary storage area is not available for the off-site locations targeted in this investigation.

2.2.5 Study Area Soil Vapor Intrusion Investigation

In an effort to assess the migration of gaseous vadose zone contamination and verify previous data, a soil vapor intrusion investigation and indoor air assessment will be performed in the Study Area, which includes up to twenty-eight nearby properties depicted on **Figure 2**. The vapor intrusion investigation will consist of one (1) sub-slab soil gas and/or one (1) indoor air sample (depending on location) collected during the heating season.

The soil gas will be sampled in accordance with the New York State Department of Health's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006. The general proposed locations of the sampling points are provided on **Figure 2**. Specific locations will be chosen with consultation with the NYSDEC and NYSDOH, and as field conditions allow. HRP will install a new sub-slab access point in an adequate location beneath the concrete slab per the manufacturer's (Vapor Pin™) standard operating procedure (SOP), and using leak detection testing to confirm the competency of the vapor point. Prior to soil vapor sampling, the integrity of the seal will be evaluated using a helium tracer gas. In the event that the probe fails the tightness test, the subsurface probe seal will be modified and the integrity testing repeated.

Indoor air samples will be collected from the lowest level living space within each targeted property. Where possible, sample canisters will be centrally placed at a height corresponding to the average breathing level at night (i.e. approximately three feet above the ground surface). Samples will be collected at a flow rate of 0.2 liters/minute, the sampling duration will be at least 24- hours. Soil gas and air samples will be collected in Summa canisters, and analyzed using USEPA Method TO-15. Samples will be submitted to Eurofins Test America an ELAP-approved laboratory. In addition, a chemical inventory of the rooms where any samples will be collected will be completed prior to sampling. An outdoor air sample will be collected at each building location during the sampling event, if possible. An indoor air trip blank and a soil vapor trip blank will be collected at a rate of 1 per sampling event.

The following is a table of all targeted properties for the indoor air quality assessment:

Property Address	Block #	Lot #	Sample Type
214 North 11th Street	2299	1001 - Unit 1A	IA

Property Address	Block #	Lot #	Sample Type
		1002 - Unit 1B	IA
		1003 - Unit 1C	IA
		1004 - Unit 1D	IA
		1005 - Unit 1E	IA
		1006 - Unit 1F	IA
		1007 - Unit 1G	IA
		1008 - Unit 1H	IA
		1009 - Unit 1J	IA
		1010 - Unit 1L	IA
		1011 - Unit 1M	IA
		1012 - Unit 1N	IA
		1013 - Unit 1P	IA
		1014 - Unit 1Q	IA
		1015 - Unit 1R	IA
		1016 - Unit 1S	IA
		1017 - Unit 1T	IA
		1018 - Unit 1U	IA
		1019 - Unit 1V	IA
		1021 - Unit 1X	IA
475 Driggs Avenue	2299	1301 - Unit 1	SV
		1302 - Unit 2	SV
15 Roebling St	2300	1011 - Unit 1A	SV
		1012 - Unit 1B	SV
5 Roebling St	2300	1001 - Unit 1A	SV
		1002 - Unit 1B	SV
220 North 10th St	2306	15	SV
202 North 10th St	2306	9	IA
Notes IA = Indoor Air SV = Soil Vapor			

The proposed vapor intrusion investigation area may be expanded should it be determined necessary in order to further evaluate potential exposure risks. Expansion of the vapor intrusion investigation may include additional rounds of sampling at the pre-determined targeted properties to evaluate seasonal trends and/or investigation of additional properties outside of the original proposed investigation area. If further canvassing of buildings in the area is unsuccessful, additional soil vapor sampling of down-gradient readily accessible exterior areas (i.e. sidewalks) may be considered. If analytical data indicates that the indoor air quality is in exceedance of NYSDOH indoor air threshold concentrations mitigation strategies may be designed and implemented under the direction of the NYSDEC and NYSDOH. Mitigation strategies may include the following:

- Evaluation of the HVAC systems;

- Evaluation of preferential migration pathways;
- Minimizing preferential vapor intrusion points (i.e., sealing of foundation cracks, sumps, exposure routes to sub-slab soils.

An expansion of the above investigation scope and/or mitigation strategies would be detailed under a supplemental Site Characterization Work Plan.

2.2.6 Analytical Data Quality Evaluation

This Work Plan and the associated site-specific QAPP Section detail the data quality objectives and analytical requirements needed for this WA. All quality assurance protocols will be provided in the Generic QAPP.

During the final Work Plan review period, the site-specific QAPP Section and Work Plan will be reviewed and modified according to NYSDEC requirements and comments. Once the plans are finalized, deviations, if required, from protocols specified in the plans will be approved in advance by NYSDEC. As required, the selected analytical laboratory will maintain NYSDOH ELAP certification in all categories of CLP and Solid and Hazardous Waste analytical testing for the duration of the project.

The selected laboratory will supply all required data deliverables (USEPA CLP and NYSDEC ASP deliverable format) to enable the data to be validated. All environmental data will be submitted electronically in a specified format named 'NYSDEC' in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

Upon receipt of the sample data, the validation contractor will quantitatively and qualitatively validate the laboratory data. The validation of the analytical data will be performed according to the protocols and QC requirements of the analytical methods, the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review (February 1994), the USEPA Region II CLP Data Review SOP, and the reviewer's professional judgment.

2.2.7 Base Map Development and Monitoring Well Survey

Upon completion of the temporary well installation, the wells will be surveyed and gauged. The elevations of all monitoring well casings will be established to within an accuracy of plus or minus 0.01 feet based on an arbitrary local vertical benchmark selected in the field. Subsequently, a base map of the Site will be developed using Computer Aided-Design (CAD) software that will be utilized to place all sampling locations in the Study Area. The sample locations will be placed on the base map and will include all monitoring wells and soil gas points. Groundwater flow direction will be determined using relative groundwater elevations based on depth to water measurements and elevation data.

2.3 Site Characterization Report

2.3.1 Electronic Data Delivery

In addition to appropriate data summary tables and boring logs included in the report, all environmental data will be submitted electronically in a specified Electronic Data Deliverable (EDD) format named in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

2.3.2 Site Characterization Report

The Site Characterization Report (SCR) will be prepared as part of this work assignment following completion of the field activities. The SCR will provide a description of the field activities, present data collected during field characterization of the Study Area groundwater and indoor air quality, and provide an analysis and interpretation of the available data in the context of existing conditions in the Study Area. The report will include tabulated laboratory analytical results, Site maps and a discussion of contaminant concentrations, including a comparison to NYSDEC Standards, Criteria and Guidelines as described in Section 3.14 of DER-10 and in accordance with New York State Department of Health guidelines for human health exposure assessment as described in Appendix 3B of DER-10 to support each conclusion of the SC.

The SCR prepared as part of this assignment will also provide a data validation/usability evaluation, identification and location of contaminants, assessment of potential contaminant migration pathways, impact on human receptors, and conclusions regarding the significance of the findings. The proposed work will provide delineation and extent of contamination, in the area of the Site. The results of the SC will be used to evaluate remedial alternatives, as necessary.

The submitted report will include the report text, appropriate tables, figures, photographs, data summary tables, and boring logs in a PDF format on a compact disc. The electronic file will contain 'bookmarks'. In addition, one hard copy of the report will be sent.

3.0 SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

This site-specific Quality Assurance Project Plan (QAPP) has been prepared as a companion Section to accompany the Generic QAPP for the standby subcontract prepared by HRP for the New York State Department of Conservation (NYSDEC) under Standby Contract No. D009808. The purpose of the QAPP is to specify QA/QC procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible.

3.1 Site Specific Sampling

3.1.1 Sample Handling

Groundwater, soil gas, and air samples will be collected during this SC. Detailed sampling procedures are detailed in Section 4.0 of the Generic QAPP (included as **Appendix C** of this Work Plan). Matrix types, number of samples (including QA/QC) and analytical details are summarized in **Table 1** (follows text). Proposed sample locations are depicted on **Figure 2.**

3.1.1.1. PFAS Sampling

Sampling for PFAS will occur at the Site during the planned activities covered in this Work Plan. Specific requirements for field sampling procedures including precautions to be taken, pump and equipment types, decontamination procedures, and a list of approved materials to be used during sampling for PFAS compounds are included in Section 14.1 of HRP's Generic Field Activities Plan (FAP) (included as **Appendix A** of this Work Plan). Only regular ice will be used in the transport of samples being analyzed for PFAS.

The minimum method achievable Reporting Limits for PFAS will be less than or equal to 2 ng/l (part per trillion [ppt]) for aqueous samples.

* The SOW does not include analysis of solid samples.

The PFAS compounds will be analyzed by methods based on EPA Method 537.1. The laboratory Minimum Detection Limits as provided by Eurofins Test America for the PFAS compounds to be analyzed are as follows:

Analyte Description	MDL	Units	MDL	Units
	Aqueous		Solid	
M2-6:2 FTS		ng/l		µg/kg
M2-8:2 FTS		ng/l		µg/kg
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.50	ng/l	0.0300	µg/kg
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	1.70	ng/l	0.0340	µg/kg
Perfluorobutanesulfonic acid (PFBS)	0.490	ng/l	0.00880	µg/kg
Perfluorobutanoic acid (PFBA)	1.00	ng/l	0.190	µg/kg
Perfluorodecanesulfonic acid (PFDS)	0.900	ng/l	0.0190	µg/kg

Analyte Description	MDL	Units	MDL	Units
	Aqueous		Solid	
Perfluorodecanoic acid (PFDA)	0.770	ng/l	0.0210	µg/kg
Perfluorododecanoic acid (PFDoA)	0.590	ng/l	0.0150	µg/kg
Perfluoroheptanesulfonic acid (PFHpS)	0.950	ng/l	0.0150	µg/kg
Perfluoroheptanoic acid (PFHpA)	0.910	ng/l	0.0230	µg/kg
Perfluorohexanesulfonic acid (PFHxS)	0.800	ng/l	0.0150	µg/kg
Perfluorohexanoic acid (PFHxA)	0.760	ng/l	0.0240	µg/kg
Perfluorononanoic acid (PFNA)	0.270	ng/l	0.0200	µg/kg
Perfluorooctanesulfonamide (PFOSA)	10.0	ng/l	0.00880	µg/kg
Perfluorooctanesulfonic acid (PFOS)	0.610	ng/l	0.0670	µg/kg
Perfluorooctanoic acid (PFOA)	0.810	ng/l	0.0140	µg/kg
Perfluoropentanoic acid (PFPeA)	0.630	ng/l	0.0180	µg/kg
Perfluorotetradecanoic acid (PFTeA)	0.920	ng/l	0.0190	µg/kg
Perfluorotridecanoic acid (PFTriA)	0.600	ng/l	0.0130	µg/kg
Perfluoroundecanoic acid (PFUnA)	0.780	ng/l	0.0240	µg/kg

The laboratory SOP for PFAS analysis is attached (included as **Appendix D** of this Work Plan)**.**

3.1.1.2. 1,4-Dioxane Sampling

Sampling for 1,4-dioxane will occur at the Site during the planned activities covered in this Work Plan. Specific requirements for field sampling procedures include precautions to be taken, pump and equipment types, detailed decontamination procedures, a prohibition on using Liquinox, and approved materials only to be used for 1,4-dioxane are included in Section 14.2 of HRP's Generic Field Activities Plan.

The minimum method achievable Reporting Limits for 1,4-dioxane will be less than or equal to 0.35 µg/l (ppb) for aqueous samples.

Laboratory provided specifics for 1,4-dioxane sampling MDLs and RLs is as follows:

Method	Analyte	Matrix	MDL	RL
8270D SIM	1,4-Dioxane	Water	0.1 µg/l	0.2 µg/l

3.2 Data Quality Assessment and Usability

Data quality objectives for the off-site properties surrounding the Site are focused towards 1) the characterization of releases of hazardous substances impacting groundwater and soil gas downgradient and upgradient to the Site and 2) the evaluation of the requirements and feasibilities of remediation in significantly impacted areas and/or a specific source area, if defined.

To achieve these objectives, QA/QC measures will be implemented throughout the SC investigation to provide input as to the validity and usability of data generated through groundwater, soil gas and indoor air sampling. The procedures for data QA/QC management includes field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting specific to the analyses performed by the laboratory under subcontract to HRP. **Table 2** lists the sample containers, preservation, and holding time requirements for the parameters specific to this Site. These tables will be referenced by field personnel.

For all data generated during the SC, a Category B Data package and DUSR will be prepared to provide a thorough evaluation of analytical data utilizing third-party data validation. Don Anne of Alpha Geosciences will be the third-party data validator for this project. Mr. Anne's qualifications are attached (included as **Appendix E** of this Work Plan).

4.0 PROJECT MANAGEMENT

HRP has the responsibility of the overall management of this project and will respond to any NYSDEC requests. A proposed project schedule, key milestones, key project personnel, and project-specific subcontractors follow.

4.1 Project Schedule and Key Milestones

The proposed project schedule for this work assignment is outlined below. Key milestones are identified to monitor work progress. The following milestones will be applicable for this project:

		Est. Start Date
• Milestone 1:	File Review	Completed
• Milestone 2:	Development of 2.11's	Completed
• Milestone 3:	2.11's submittal and NYSDEC Approval for WA	Submitted
• Milestone 4:	Installation and sampling of Soil Vapor Points and indoor air sampling	Completed
• Milestone 5	Data Validation	Summer 2021 2021
• Milestone 6:	Installation and sampling of monitoring wells	Spring/Summer 2021
• Milestone 7:	SCR	Summer/Fall 2021

The field work associated with soil gas and indoor air sampling (Milestones 4) was conducted during the heating season (November 15 – March 31, 2021). Samples were collected from targeted properties where access was granted, following NYSDEC review and approval of all site-specific plans. Laboratory analysis and data validation (Milestone 5) has been completed for Milestone 4. Installation of monitoring wells (Milestone 6) can begin following approval by the NYSDOH and NYSDEC, a subsequent 30 day public comment period, and applicable permit approvals. Any investigation-derived waste generated from the Site during Milestone 6 will be scheduled to be removed at the time of waste generation. Data validation will begin upon receipt of the first set of laboratory results and will continue to be submitted for validation as the results are received from the laboratory. Data validation is expected within a four week timeframe. Milestone 7 will not be considered complete until data from the off-site soil vapor intrusion investigation and groundwater monitoring has been validated. The SCR (Milestone 8) will be submitted as a draft report within 60 days after HRP receives the last round of analytical data from the laboratory. A second draft SCR will be submitted, if needed, within two weeks after the data validation company has reviewed the final analytical submitted for the investigation. A final version of the SCR will be submitted within two weeks after the DEC Project Manager's comments on both draft reports are received by HRP.

4.2 Key Project Personnel

A list of the project personnel of the prime consultant and subcontractors responsible for performance of the investigation has been submitted to the NYSDEC for approval. Primary project staffs are listed below:

Personnel	Company	Title for this Work Assignment	Responsibility
David Feinson (Project Manager)	HRP Associates, Inc. (Prime Consultant)	Project Manager	Overall management of the WA
Mark Wright PG, CSP (Project Manager)	HRP Associates, Inc.	Office Health & Safety Manager	Approval of HASP and responsible for overall health and safety issues with the WA
Michael Varni (Senior Project Geologist)	HRP Associates, Inc.	Corporate QA/QC Officer	Responsible for QA/QC on the WA
Carrolyn Izzo (Senior Project Geologist)	HRP Associates, Inc.	Field Manager and Site Health & Safety Officer	Responsible for the on-site sampling and investigative tasks
Keith Gandarillas (Senior Field Technician)	HRP Associates, Inc.	Alternate Field Manager and Site Health & Safety Officer	Responsible for the on-site sampling and investigative tasks

Subcontractors for this project will include:

- GPR – Underground Survey
- Drilling – Core Down
- Laboratory – Eurofins Test America to provide all media sample analyses
- Data Validation - Don Anne of Alpha Geosciences
- Disposal Company - Triumvirate

FIGURES

TABLES

APPENDIX A
Generic Field Activities Plan

APPENDIX B
Site-Specific Health and Safety Plan

APPENDIX C
Generic Quality Assurance Project Plan

APPENDIX D

Laboratory PFAS Standard Operating Procedures (SOPs)

APPENDIX E
Resumes of Key Project Personnel