Supplemental Remedial Investigation Work Plan & Remedial Action Work Plan

70 Nardozzi Place
New Rochelle, NY 10805
NYSDEC Site Number: C360159

Prepared for:

70 Nardozzi LLC c/o Simone Development Companies
211 East 43rd Street
New York, New York, 10017

October 2021

JMS Project # 2015.191

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CERTIFICATIONS

Remedial Investigation Workplan

I, Alison Kokorsky, *certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).*

Alison Kokorsky, Senior Project Manager, JM Sorge, Inc.

Remedial Action Workplan

I Frederick Wilcox Worstell certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and *that this Remedial Design, Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER- 10).*

Frederick Wilcox Worstell, NYS Professional Engineer #080140-01, WGV Engineering, Surveying and Landscape Architecture, DPC doing business as Dresdner Robin – New York

PE Stamp

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Abbreviations and Acronyms List

+15 – Library search for 15 highest TICs
AMSL – above mean sea level
AOC – Area of Concern

AWQSG - Ambient Water Quality Standards & Guidance Values
ASTM – American Society of Testing and Materials
bgs – below ground surface
BCA – Brownfields Cleanup Agreement
BCP – Brownfields Cleanup Program
BEEI – Bureau of Environmental Exposure Investigation BNA - Base Neutral organic compounds and acid extractables COC – Chain of Custody
CVOC – Chlorinated Volatile Organic Compound
cy – cubic yards
DUSR – Data Usability Summary Report
DNAPL – Dense Non-Aqueous Phase Liquid
EDD – Electronic Data Deliverables
EPH – Extractable Petroleum Hydrocarbons
DGA - dense-graded aggregate
FER – Final Engineering Report
El. – elevation
ft – feet
GPR – Ground Penetrating Radar
HASP – Health and Safety Plan
HSA – Hollow Stem Augers
IEC – Immediate Environmental Concern
IA – Indoor Air
In. wc. – Inches of Water
ISRA – Industrial Site Recovery Act
JMS – JM Sorge, Inc.
LNAPL – Light Non-Aqueous Phase Liquid
LSRP – Licensed Site Remediation Professional
MDL – Method Detection Limit
mg/kg – milligrams per kilogram
mg/L – milligrams per liter (mg/L)
MNA – Monitored Natural Attenuation
NAD83 – North American Datum of 1983
NYSDEC – New York State Department of Environmental Conservation
NYSDOH – New York State Department of Health
NADVD88 – North American Vertical Datum of 1988
NFA – No Further Action
OPRA – Open Public Records Act
ORP – Oxidation-reduction potential
PAHs – Polycyclic Aromatic Hydrocarbons
Pa - Pascal
PCBs – Polychlorinated Biphenyls

PID – Photoionization Detector
PFAS – Per- and Polyfluorinated Alkyl Substances

PPE – personal protective equipment
ppm – parts per million
ppb – parts per billion
ppt – parts per trillion
PSV – perimeter soil vapor
PVC – polyvinyl chloride
RAWP – Remedial Action Workplan
RCRA – Resource Conservation and Recovery Act
RE – Receptor Evaluation
REC – Recognized Environmental Condition
RIWP – Remedial Investigation Work Plan
RIR – Remedial Investigation Report
RP – Responsible Party
SI – Site Investigation
SOP – Standard Operating Procedure
SPLP – Synthetic Precipitation Leachate Procedure
Spill Act – Spill Compensation and Control
SRRA – Site Remediation and Reform Act
SMP – Site Management Plan
SSVS – Sub-Slab Venting System
SRS – Soil Remediation Standard
SSIGWSRS – Site Specific Impact to Groundwater Soil Remediation Standard
SVOCs – Semi-Volatile Organic Compounds
TAL – Target Analyte List
TCL – Target Compound List
TCLP – Toxicity Characteristic Leachate Procedure
TICs – Tentatively Identified Compounds
TPH – Total Petroleum Hydrocarbons
QA – Quality Assurance
QAPP – Quality Assurance Protection Plan
QEP – Qualified Environmental Professional
QC – Quality Control
ug/L - micrograms per liter (aka µg/L)
ug/m3 - micrograms per cubic meter of air
USEPA – United States Environmental Protection Agency
USDA - United States Department of Agriculture
USGS – United States Geological Survey
UST – Underground Storage Tank
VC – Vapor Concern
VI – Vapor Intrusion
VOCs – Volatile Organic Compounds

1 INTRODUCTION

This Supplemental Remedial Investigation Work Plan (RIWP) and Remedial Action Work Plan (RAWP) was prepared on behalf of 70 Nardozzi LLC for the Site located at 70 Nardozzi Place located in New Rochelle, New York herein referenced to as “Site”. The Site is in the Brownfields Cleanup Program (BCP) under New York State Department of Environmental Conservation (NYSDEC) site number C360159. The Site location is shown in Figure 1.

Site characterization and a Remedial Investigation (RI) were conducted from 2004 through 2018. Remedial action in the form of an Institutional Control (IC) and an Engineering Control (EC) was proposed in the 2017 RAWP submitted to the NYSDEC as part of the BCP application. The BCP application, including the RAWP, was approved in 2018. Remedial activities conducted from 2019-2021 included regrading the site and building construction to act as the cap/engineering control. A sub-slab venting system (SSVS) was also constructed as part of the engineering control due to the potential for Vapor Intrusion (VI) concerns. The Final Engineering Report (FER) and Site Management Plan (SMP) were submitted and approved by the NYSDEC in December 2020.

Based on post-construction testing, and additional RI requirements from New York State Department of Health (NYSDOH), in accordance with the SMP, this report includes a Supplemental RIWP to conduct additional RI activities related to indoor air (IA) and perimeter soil vapor (PSV) as well as a Supplemental RAWP to install upgrades to the SSVS.

Activities proposed in the RIWP and RAWP below, will be completed upon approval by NYSDEC and NYSDOH. This document incorporates comments in the August 27, 2021 correspondence from NYSDEC as well as results of interim inspections and current site conditions.

2 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located at 70 Nardozzi Place in New Rochelle, New York. A Site location map is attached as Figure 1 and a general Site plan is included as Figure 2. The Site is identified on Section 2 of the New Rochelle Tax Map as Block 564, Lot 2. The Site is approximately 3.46 acres in size and is currently developed with a public works office, storage, and maintenance yard on the lower-level, additional public works offices in the mezzanine, and retail with associated parking on the upper-level.

The Site is bounded by Industrial Lane to the north, Pelham Country Club to the south, Costco to the east, and Ashley Home Store to the west. Site usage in the immediate area consists of commercial and residential properties.

2.2 Physical Setting

2.2.1 Topography

The majority of the site was regraded as part of the remedial actions and the current Site has a grade elevation of approximately 39 feet above mean sea level (ASML). The Site is generally flat in the northern and central part of the Site with a steep slope in the southern part of the Site. A copy of a portion of the USGS topographic map is provided as Figure 1.

2.2.2 Soil and Geology

SOIL

The soils on-site consist of fill underlain by meadow mat and gray sand based on soil borings completed during preliminary investigations and on observations during site redevelopment. The fill consists of clayey and sandy silt with gravel, and limited amounts of wood, glass, ash, brick, concrete, and other material. According to the United States Department of Agriculture (USDA) database, the soil beneath the Site is classified as Udorthents, smoothed (Ub). This soil consists of gravelly loam with 0 to 8 percent slopes. The soil is described as moderately well drained.

GEOLOGY

The Site is located within the Hartland Formation, part of an Allochthonous Sequence, and is comprised of basal amphibolite overlain by pelitic schist metamorphic deposits. Bedrock in this formation has sequences up to 8,000 feet in thickness and is Ordovician in age (480 million years old). Bedrock was not encountered during the site investigation activities. After regrading during site remediation and development, the depth to bedrock at the site is approximately 60 feet below current grade.

2.2.3 Hydrology

The depth to groundwater prior to site redevelopment varied from 2 to 8 feet below grade. Groundwater flow is parallel to the length of the Site towards the southwest based on groundwater elevation data collected from monitoring wells during site groundwater investigation activities. The Long Island Sound and its inlets and perennial creeks lie within a half-mile of the site.

After regrading during site remediation and redevelopment, the grade across the developed area of the site has been raised by approximately 10 feet. Therefore, depth to groundwater is currently approximately 15-20 feet below grade.

2.3 Investigation and Remedial History

The Site is adjacent to a former municipal solid waste incinerator that was operational from the 1920s to the 1970s; the site was impacted by the operation of the incinerator and disposal of ash generated by the incinerator. The Site has been predominantly vacant until remediation/development activities were conducted in 2019-2021.

Site characterization investigations were conducted at the site from 2004 through 2018. Investigation activities included the installation of test pits, soil borings, groundwater sampling, and soil gas sampling. The investigation results confirmed that the fill material underlying the Site was contaminated predominantly with Polynuclear Aromatic Hydrocarbons (PAH) and metals at concentrations exceeding 6 NYCRR 375-6.8(b) Restricted Use Soil Cleanup Objectives (SCO) Commercial and/or Industrial standards. Groundwater sampling identified metals, PAHs and Per- and Polyfluorinated Alkyl Substance (PFAS) compounds remain at concentrations in exceedance of the New York Ambient Water Quality Standards & Guidance Values (AWQSG) and NYSDEC Guidelines for Sampling and Analysis of PFAS Values. Soil gas sampling identified limited low concentrations of chlorinated volatile organic compounds (CVOCs), hydrogen sulfide, and methane.

In February 2018, 70 Nardozzi LLC entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC to remediate the site. After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as “remaining contamination”. ICs and ECs have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. The site remedy included the installation of a passive Sub Slab Vapor System (SSVS) and a concrete cap over a large portion of the site. A FER was submitted to NYSDEC in December 2020 summarizing the remedial activities. Long-term management of these ECs/ICs and residual contamination will be performed under the SMP approved by the NYSDEC in December 2020.

Due to the potential for a vapor intrusion risk, a site monitoring plan was developed as discussed in Section 4 of the December 2020 SMP. The SMP outlined sampling procedures, sampling frequency, and monitoring parameters for the SSVS risers and the sub-slab monitoring ports.

The RIWP (Section 3 of this report) was developed to provide an Indoor Air Sampling Plan and a Perimeter Soil Vapor Sampling Plan, for NYSDEC/NYSDOH review and approval.

Final testing of the SSVS was conducted upon installation. Based on the results of the sub-slab pressure testing detailed in the FER, the negative pressure to confirm the system was operating adequately as a passive system, could not be confirmed. Therefore, an assessment of the system was conducted and a RAWP is included in this report as Section 4, which will detail the proposed installation of fans to the to convert to an active system.

2.4 Remedial Action Objective

The soil vapor remedial action objective as stated in Section 2.4 in the SMP is to mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the site.

2.5 Site Contacts

A list of site contacts is attached as Attachment 1.

3 REMEDIAL INVESTIGATION WORKPLAN

The Sampling Plans proposed in this section describe the methods to be used for the sampling and analysis of perimeter soil vapor, and indoor air including:

- Sampling locations, protocol, and frequency;
- Analytical sampling program requirements;
- Applicable NYSDEC standards, criteria and guidance (SCGs); and
- Reporting requirements

These additional remedial investigations will be conducted to further determine if soil gas or vapor intrusion impacts to building interiors are present, and if present, if there is the potential for off-site migration. The proposed investigations will be conducted under the oversight of a Qualified Environmental Professional (QEP), in accordance with The New York State Department of Environmental Conservation DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

3.1 Background

A Remedial Investigation Report (RIR) was submitted to NYSDEC in 2018 which identified limited low concentrations of CVOCs, hydrogen sulfide, and methane in soil gas samples collected in 2016. ICs and ECs have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. The site remedy currently includes a passive SSVS (which will be converted to an active system - see Section 4) and a concrete cap over a large portion of the site. A three-story commercial building was constructed in the northern portion of the site. The lower-level of the building is designed for use as office space and public works maintenance and storage yard. The mezzanine is designed for use as office space. The upper-level of the building is designed for a gym, retail, and additional parking.

3.2 Indoor Air Sampling Plan

The majority of the facility's partially enclosed ground floor is operated as a municipal Department of Public Works facility with loading, vehicle storage, and vehicle repair areas. Vehicular access to the southern outdoor portion of the site is through the center of this area. No IA sampling will be conducted in these areas.

A 9,000 square foot area in the northeastern portion of the ground floor (as shown on Figure 2) is an enclosed occupied space with offices, storage, and workshop areas. The interior building layout and sampling locations are illustrated in Figure 3. The locations of utility penetrations (and other potential migration pathways) are illustrated in Figure 4.

A minimum of three (3) IA samples are proposed to be collected in this indoor area. All IA samples will be collected on the first floor of the building at breathing level, 3-5 feet above the floor. The specific sample locations will be based on an evaluation of potential preferential pathways, interior features dividing the building into separate rooms or occupancy spaces, usage of the rooms, ventilation, and potential indoor sources of contamination, as determined by a pre-sampling building inspection. Sample locations and frequency may be modified if conditions warrant, as identified during the walk-through pre-sampling inspection.

The inspection will confirm the locations of foundation perforations for subsurface features (e.g., electrical, gas, sewer or water utility pipes, sumps, and drains), which may serve as a preferential pathway for vapor intrusion. The inspection will note the presence of any potential background sources of IA contamination such as outdoor air pollution from the underground garage, fuel-burning combustion appliances, chemical storage areas, new building materials, furnishings, etc. An Indoor Air Quality Questionnaire and Building Characteristics Form and Product Inventory Form will be filled out. Forms are located in Attachment 2.

Two (2) ambient (outdoor) samples per sampling event will be collected concurrently with the IA samples to assist in evaluating background contaminant levels. One (1) ambient sample will be placed outside of the garage area to evaluate the potential influence of outdoor air on indoor air quality. The second ambient air sample will be placed inside the garage space.

All IA samples and the exterior ambient air sample will be analyzed for methane, carbon disulfide, hydrogen sulfide, and VOCs as discussed in the SMP. The garage ambient air sample will only be analyzed for methane and hydrogen sulfide in accordance with the August DEC correspondence. IA samples are typically collected during the heating season (November 15th through March 31st) because soil vapor intrusion is more likely to occur when a building's heating system is in operation and doors and windows are closed. IA sampling will be conducted concurrent with sub-slab soil gas sampling, discussed in the SMP.

3.2.1 Indoor Air Sampling Procedure

In accordance with the NYSDOH's Indoor Air Sampling & Analysis Guidance (February 2005) a pre-sampling inspection will be conducted at the building prior to sampling, as discussed above, and sample locations will be determined. Unnecessary building ventilation will be avoided, and heating systems will be operated under normal conditions for at least 24 hours prior to and during the scheduled sampling time.

VOC and methane samples will be collected using a 6-liter laboratory cleaned and certified Summa canister and a sampling period of 24 hours. Hydrogen Sulfide samples will be collected using a 5-liter Tedlar bag and a low flow rate pump.

For Summa canister sampling, the investigator will verify the vacuum in the stainless-steel canister before and after the sample collection. The initial vacuum of the canister should be greater than 25 inches of mercury (in Hg). A residual vacuum of up to 5 in Hg should exist in the canister upon completion of the sampling event. Summa canister sampling procedures can be found in Attachment 3.

For Tedlar bag sampling, the Tedlar bag should not be filled more than 2/3 full. Ideally, the flow rate should be equal to or less than 0.2 liters per minute flow rate. Tedlar bags should not be chilled. Tedlar bag sampling procedures can be found in Attachment 3.

3.2.2 Data Analysis

The following table provides a summary of the proposed sampling plan.

Analytical Parameter	Matrix	No. of Samples	QA/QC Blanks	Method	Preservation	Sample Bottle	Sample Holding Time	Laboratory Package Deliverables
VOCs (includes carbon disulfide)	3 Indoor Air 2 Ambient Air	5	NA	EPA Compendium Method TO-15	NA	6 L Summa Canister	30 days	NYASP Cat B

Methane	3 Indoor Air 2 Ambient Air	5	NA	EPA Method 3C	NA	6 L Summa Canister	30 days	NYASP Cat B
Hydrogen Sulfide	3 Indoor Air 2 Ambient Air	5	NA	Modified EPA Method TO-15	NA	5 L Tedlar Bag	2 days	NYASP Cat B

All samples will be analyzed by Accutest Laboratories, a New York State Department of Health Environmental Laboratory Approval Program certified laboratory (Lab No. 10983). The laboratory will provide the results in NYASP Category B format. A QA/QC review of the data will be completed to confirm that samples were analyzed within appropriate holding times, laboratory control samples were within acceptable limits and that the data is usable. The analytical results will be summarized and reviewed by the QEP. No duplicate samples will be collected. A site-specific Quality Assurance Project Plan (QAPP) is provided in Appendix H of the SMP.

3.2.3 Indoor Air Data Evaluation and Reporting

Initial samples will be collected on the ground floor. Data from the indoor air samples, the background ambient air samples, as well as other available data such as building perimeter soil gas samples and/or sub-slab soil gas samples will be reviewed by the QEP. If the initial results indicate potential concerns associated with contaminant migration from the sub-slab, additional sampling may be recommended.

A summary report will be prepared for review by the DEC, outlining the investigation and the analytical results, and will include all tables, maps with sample locations, and copies of the laboratory analytical reports. This report will include a Data Usability Summary Report (DUSR) and Electronic Data Deliverables (EDD) submission. The report will provide conclusions regarding the level of contamination present within the 70 Nardozzi site and provide recommendations regarding the need for sampling parameter adjustments.

3.3 Perimeter Soil Vapor Investigation

All surrounding properties are zoned for commercial usage. No sensitive receptors such as childcare facilities, hospitals, residential properties, etc are located on adjacent properties. However, due to the potential risk for vapor intrusion migration, perimeter sampling will be conducted. A perimeter soil vapor investigation will be conducted on-site (or on adjacent properties) in conjunction with IA and sub-slab vapor investigations.

Soil-gas samples will be collected from around the perimeter of the Site targeting potential adjacent receptors in a manner that will be representative of the soil gas conditions entering and/or exiting the Site. DER-10 section 3.6 subsection 5(i)(3), suggests when collecting soil vapor samples around a building with no surrounding surface or confining layer (e.g., pavement or sidewalk), samples should be located in native or undisturbed soils away from fill material surrounding the building (approximately 10 feet away from the building) to avoid sampling in an area that may be influenced by the building's operations. The site is newly developed; therefore, most on-site soil is either recently disturbed or not native. Based on this information, sample locations may be outside the property boundary.

Access and underground utilities will dictate final sample locations. The proposed perimeter sample locations are illustrated on Figure 5.

- SOUTH - No perimeter samples will be collected along the southern border since there are no receptors adjacent to this location (golf course).
- WEST – From the western edge of the site slab, there are approximately 100 feet to the nearest adjacent occupied structure (Ashley Furniture). There is no on-site access west of the slab due to the presence of the French drain and steel retaining wall. As shown on the utility map (Figure 4), numerous subsurface utilities, including concrete bioretention basins, stormwater detention piping, and a series of stormwater drywells, are present on the adjacent property and the roadway to the west of the site. These features prevent access to drilling for the northern 60% of the western perimeter area. Section 2.6.1.a(3) NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York recommends that soil gas samples should be collected at a depth comparable to the depth of foundation footings. Due to the elevation difference between the adjacent western property and the site and the retaining wall constructed as part of the site remedy, samples would need to be collected at greater than 30 feet below grade. A cross-section illustrating existing site conditions (from top to bottom) is presented in Figure 6. The presence of the retaining wall to a depth of 10 feet below the site slab acts as a physical barrier preventing horizontal migration of vapors. Therefore, no perimeter samples will be collected along the western perimeter of the site.
- NORTH – From the northern edge of the site slab, there is greater than 200 feet to the nearest adjacent occupied structure (Home Depot). The on-site building slab extends to the northern property boundary. As shown on the utility map (Figure 4), numerous above and below-grade utilities, including stormwater piping, transformers, underground electric lines and overhead wires, are present between the slab and Industrial Lane. These features prevent safe drilling access. Electric, water, and natural gas lines are present beneath Industrial Lane. Stormwater and sanitary lines are present beneath the parking area south of the Home Depot building, further limiting accessible locations for drilling.

  As illustrated on Figure 5, one suitable location for a soil gas sample is potentially accessible to the north. Further evaluation of the Home Depot underground utilities and legal access to the Home Depot property will be needed to install a sample at this location. An attempt will be made to access this location for sampling. However, due to the distance to the nearest building (>200') and no sensitive receptors using the facility, there is a reduced likelihood of vapor migration in the northerly direction. Additionally, there is a significant potential for background conditions, as discussed below, to be present on adjacent sites which were also historically related to the incinerator operations.

Distinguishing between the source of any impacts, if found, may require further investigations. Upon further evaluation of site access conditions, 70 Nardozzi, LLC, will work with NYSDEC and NYSDOH to determine if/where a soil gas sample can be collected to the North.

- EAST - From the southeastern edge of the site slab, there is approximately 60 feet to the nearest adjacent occupied structure (CostCo). Due to underground utilities, limited safe locations are available for drilling, particularly between the site slab and the CostCo building. As shown on the utility map (Figure 4), numerous above and below-grade utilities, including sanitary lines, storm drain lines, water lines, telephone lines, a gabion wall, a chain-link fence, and a guard rail are present between or on the adjacent property. These features restrict access to drilling for the entire eastern perimeter.

Four (4) locations in the CostCo parking lot, as illustrated in Figure 5, may be suitable locations for soil gas sampling to the east. Further evaluation of the CostCo underground utilities and legal access to the CostCo property will be needed to collect samples at these locations. Upon further evaluation of site conditions, 70 Nardozzi, LLC, will work with NYSDEC and NYSDOH to determine appropriate soil gas sample locations to the East.

3.3.1 Perimeter Soil Vapor Sampling Procedure

Soil vapor samples are collected to determine whether this environmental medium is contaminated, characterize the nature and extent of contamination, and identify possible sources of the contamination. In accordance with the NYSDOH's Guidance for Evaluating Soil Vapor Intrusion (October 2006) soil vapor samples can be collected any time during the year and should be taken at a depth greater than 5-feet and at least 10-feet away from any building. Flow rates for purging and collecting should not exceed 0.2-L per minute to minimize outdoor air infiltration during sampling. VOC and methane samples will be collected using a 1-liter laboratory cleaned and certified Summa canister and a sampling period of 5 minutes. Hydrogen Sulfide samples will be collected using a 5-liter Tedlar bag and a low flow rate pump.

Prior to drilling, a One Call will be placed to various utility firms to confirm the presence and mark any underground utilities (electrical, sewer, etc) within the Right of Way. A geophysical investigation will be conducted to determine any subsurface utilities or anomalies within the proposed boring locations in addition to the One Call. Soil gas borings will be installed using a direct-push method. A sampling probe will be advanced approximately 5 ft below grade surface or to the depth of on-site footings. If groundwater is encountered in the upper 5 feet, a new shallower boring will be installed adjacent to the original boring location. The sampling probe will then be pulled back approximately 1 foot to create a void. The sampling probe and tubing will be purged of at least two (2) volumes of atmospheric air. After purging, the tube will be sealed off to prevent atmosphere air from re-entering the system. A bentonite-water mixture will be used to seal off the augured hole to ensure that an adequate surface seal is created to prevent surface air infiltration during sampling. A tracer gas will be used at every sampling location as per Section 2.7.1 of the DOH Guidance for Evaluating Soil Vapor Intrusion. Before sampling, a helium leak test will be performed to ensure the system can hold a vacuum seal. Full operating procedures for soil gas sampling with a driven probe rod can be found in Attachment 3.

For Summa canister sampling, the investigator will verify the vacuum in the stainless-steel canister before and after the sample collection. The initial vacuum of the canister should be greater than 25 in Hg. A residual vacuum of up to 5 in Hg should exist in the canister upon completion of the sampling event. Summa canister sampling procedures can be found in Attachment 3.

For Tedlar bag sampling, the Tedlar bag should not be filled more than 2/3 full. Ideally, the flow rate should be equal to or less than 0.2 liters per minute flow rate. Tedlar bags should not be chilled. Tedlar bag sampling procedures can be found in Attachment 3.

3.3.2 Data Analysis

The following table provides a summary of the proposed sampling plan.

Analytical Parameter	Matrix	No. of Samples	QA/QC Blanks	Method	Preservation	Sample Bottle	Sample Holding Time	Laboratory Package Deliverables
VOCs (includes carbon disulfide)	Soil Vapor	5	NA	EPA Compendium Method TO-15	NA	1 L Summa Canister	30 days	NYASP Cat B
Methane	Soil Vapor	5	NA	EPA Method 3C	NA	1 L Summa Canister	30 days	NYASP Cat B
Hydrogen Sulfide	Soil Vapor	5	NA	Modified EPA Method TO-15	NA	5 L Tedlar Bag	2 days	NYASP Cat B

All samples will be analyzed by Accutest Laboratories, a New York State Department of Health Environmental Laboratory Approval Program certified laboratory (Lab No. 10983). The laboratory will provide the results in NYASP Category B format. A QA/QC review of the data will be completed to confirm that samples were analyzed within appropriate holding times, laboratory control samples were within acceptable limits and that the data is usable. The analytical results will be summarized and reviewed by the QEP. No duplicate samples will be collected. A site-specific Quality Assurance Project Plan (QAPP) is provided in Appendix H of the SMP.

3.3.3 Perimeter Soil Vapor Reporting

Initial perimeter soil vapor sampling will likely be limited due to access issues with adjacent properties, physical site constraints, and the lack of sensitive receptors within the immediate area. The QEP will review data from the perimeter soil gas samples as well as the indoor air samples, the background ambient sample, and sub-slab soil gas samples. If the initial results indicate potential concerns associated with contaminant migration from the sub-slab, additional sampling may be recommended.

A summary report will be prepared for review by the DEC, outlining the investigation and the analytical results, and will include all tables, maps with sample locations, and copies of the laboratory analytical reports. This report will include a Data Usability Summary Report (DUSR) and Electronic Data Deliverables (EDD) submission. The report will provide conclusions and recommendations regarding the level of contamination present within the 70 Nardozzi site.

Based on the Weyman Avenue Urban Renewal Project Conceptual Closure Plan (June 1994), historic aerial photographs, and site observations, the former landfill and incinerator site and associated soil gas concerns spans a large area which includes the areas where Costco and Home Depot are located. Therefore, it should be noted that adjacent sites are likely to have similar site conditions as 70 Nardozzi. Soil gas sampling on adjacent lots will not necessarily be reflective of the soil gas coming from 70 Nardozzi but rather a pre-existing local soil gas issue. The Periodic Review Report (PRR) will use the perimeter soil data in conjunction with sub slab, IA, and ambient air to evaluate mitigation risk and determine if additional sampling is warranted.

4 REMEDIAL ACTION WORKPLAN

The following supplemental RAWP has been prepared in accordance with DER-10 Technical Guidance for Site Investigation and Remediation.

A passive SSVS was installed under the building slab as detailed in Section 4 of the December 2020 FER. In summary, the system consists of perforated PVC piping that connects to PVC risers designed to passively vent any vapors that accumulated under the building slab. A detailed description of the SSVS components and specifications are included in the December 2020 FER.

All perforated piping was installed within a layer of certified clean crushed stone below the concrete floor slab. This layer is a minimum of 8-inch deep. A 20-mil Vapor Barrier was installed above the layer of crushed stone prior to the installation of the slab. The perforated piping system connects to twenty-three (23) risers and each riser was installed with a sampling port, and U-tube manometer. Five (5) pressure monitoring ports were installed into the gravel venting layer to monitor the sub-slab pressure. The monitoring ports were installed in locations farthest from horizontal vent piping where low-pressure differentials are considered a potential concern.

The initial results of the sub-slab pressure testing are detailed below. A negative pressure could not be confirmed therefore the system was not operating adequately.

The passive system was designed and constructed such that it could be converted to an active system, if required. The venting system is detailed in Section 4 of the FER and Appendix G of the SMP. A schematic of the SSVS system can be found in Figure 7A and 7B.

4.1 POST INSTALLATION TESTING INVESTIGATION SUMMARY

In December 2020, the SSVS was initially inspected and tested. Each U-tube manometer was visually inspected, and negative pressure was observed at all risers. Sub-slab pressure readings were obtained at the five (5) pressure monitoring ports. Pressure port locations are illustrated in

Figure 7.

Pressure Monitoring Port #	Pressure Reading (in-H_20)	Pass/Fail
Pressure Port #1	0.00	Fail
Pressure Port #2	-0.001	Fail
Pressure Port #3	Not Collected	--
Pressure Port #4	-0.002	Pass
Pressure Port #5	-0.002	Pass
Minimum negative pressure required	-0.002	

As indicated above, the sub-slab pressure readings at two of the five monitoring points did not meet the minimum -0.002 in-H_20 testing requirement and one port was inaccessible.

As discussed in Section 4.2 below, exhaust fans were installed to convert the SSVS to an active operation. During and after the installation process, additional sub-slab monitoring port readings were obtained. All pressure readings events are summarized below in the table.

	12/1/2020		9/28/2021		10/13/2021		12/17/2021	
Pressure Monitoring Port #	Avg. Pressure Reading (in-H_20)	Pass/Fail	Avg. Pressure Reading (in-H_20)	Pass/Fail	Avg. Pressure Reading (in-H_20)	Pass/Fail	Avg. Pressure Reading (in-H_20)	Pass/Fail
Pressure Port #1	0	Fail	-0.0015	Fail	0[2]	Fail	-0.034	Pass
Pressure Port #2	-0.001	Fail	-0.004	Pass	-0.036	Pass	-0.06	Pass
Pressure Port #3	NA[1]	--	NA[1]	--	-0.052	Pass	-0.052	Pass
Pressure Port #4	-0.002	Pass	-0.0045	Pass	-0.072	Pass	-0.07	Pass
Pressure Port #5	-0.002	Pass	-0.005	Pass	-0.048	Pass	-0.053	Pass

[1] Pressure port inaccessible at time of gauging.
[2] Pressure port blocked or poor seal. Fixed on 12/17/2021
Minimum negative pressure required = -0.002 (in-H20)

4.2 REMEDIAL ACTION

Based upon the initial subsurface pressure readings, the SSVS has been converted from a passive to an active venting operation through the addition of venting fans on the riser stacks. The vapor mitigation fans (VMF) were individually sized for each riser to induce a negative pressure within the system of a minimum of -0.002-inches-of-H_2O beneath all areas of the slab. The design factors were determined by Consulting Engineering Services, a professional certified mechanical engineer.

There are 23 risers, some of which converge for a total of 20 riser stacks protruding to the exterior of the building. The locations of the risers are illustrated in Figure 7A and 7B. VMFs are attached either securely attached to the wall near the ceiling or attached to the top of the stack on the roof. Currently, twenty (20) fans are installed and are operating. The sub-slab pressure ports were re-inspected to confirm a negative pressure below the slab, as summarized in Section 4.1, above.

The installation of the fans did not disturb the existing engineering control (i.e., concrete cap, sub-slab piping, vapor barrier, etc.). No exposure to remaining sub-slab contamination was encountered during the system upgrade/fan installation activities.

The design, installation, and testing results will be provided to NYSDEC in the first Periodic Review Report (PRR) due in April 2022. Interim status reports will be provided to the NYSDEC case manager, upon request.

Monitoring and maintenance requirements per the SMP will continue as required during this supplemental RAWP. Conditions to be monitored include visually inspecting the condition of all risers, pressure ports, and U-tube manometers. Documenting a negative pressure within the system by recording pressure readings from the U-tube manometers, and the five (5) pressure port locations using a portable differential pressure monitor. System maintenance to include the replacement of cracked or deteriorating PVC piping and upkeep related to sustaining a continuous negative pressure at all pressure ports and risers (i.e., re-inspecting piping for cracks, periodically gauging the pressure of the SSVS system, confirming exhaust fans are operating appropriately, and clearing piping of blockages). System maintenance and monitoring procedures are summarized in the Operations, Maintenance and Monitoring Manual located in Appendix G of the SMP.

VMF design specifications and manuals will be added to the SMP and the OMM to reflect the system upgrades.

5 Quality Assurance Project Plan

As previously discussed above in Section 3.3.3, a Quality Assurance Project Plan (QAPP) was prepared for investigation activities for this Site. The QAPP follows guidelines in accordance with both The New York State Department of Environmental Conservation DER-10 Technical Guidance for Site Investigation and Remediation (May 2010), and the US EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5) (March 2001). A site-specific QAPP is provided in Appendix H of the SMP.

6 Health and Safety Plan

A Health and Safety Plan (HASP) was prepared and is included as Appendix F of the SMP. The

HASP will be reviewed periodically, as needed, to address any changes in known contaminant levels or other potential hazards.

7 Schedule

The following is a summary of the proposed remedial schedule. The schedule to complete the fan installation was delayed due to supply issues. Note: the following schedule may be modified based on-site access restrictions and/or weather conditions.

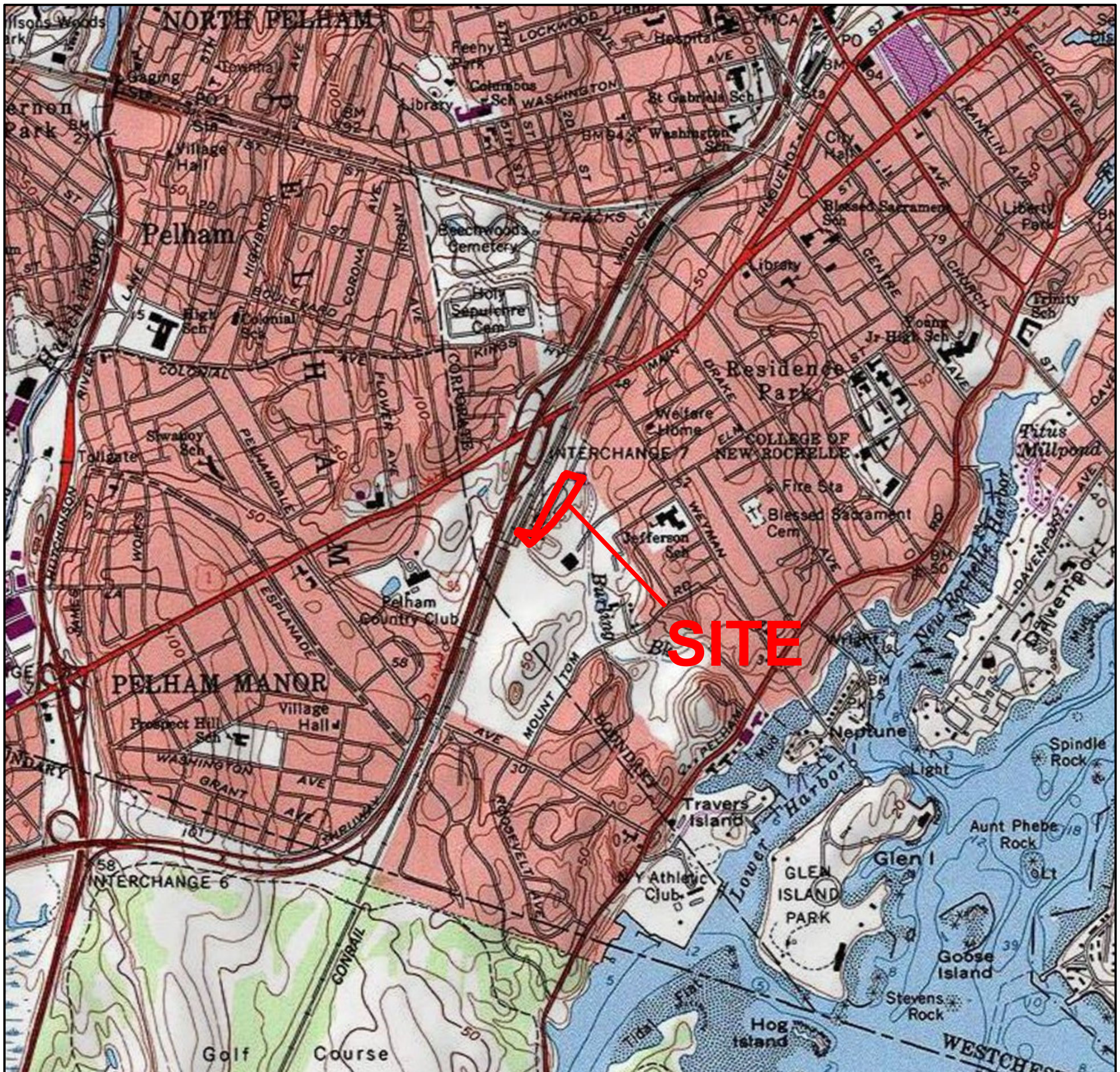
Task	Schedule	Revised Schedule
Convert SSVS from passive to active and confirm negative pressure	Completed	
Riser, pressure port, IA, and perimeter sampling*	12/31/2021	2/31/2022
Submit Periodic Review Report	4/30/2022	4/30/2022

*Perimeter soil gas sampling schedule is dependent upon acquisition of legal access to adjacent properties.

8 CONCLUSIONS

This Supplemental RIWP and RAWP were prepared to detail the remedial activities proposed for the potential sub-slab soil gas impacts from the historic fill and includes indoor air sampling, sub-slab sampling, perimeter sampling, and converting the SSVS to an active system. Following the conversion of the passive SSVS system to an active SSVS, the sampling will be conducted to confirm vapor intrusion is not a risk to onsite and off-site occupants.

FIGURES



1 0.5 0 1

Miles

1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

Feet

1 0 1 2

Kilometers

N

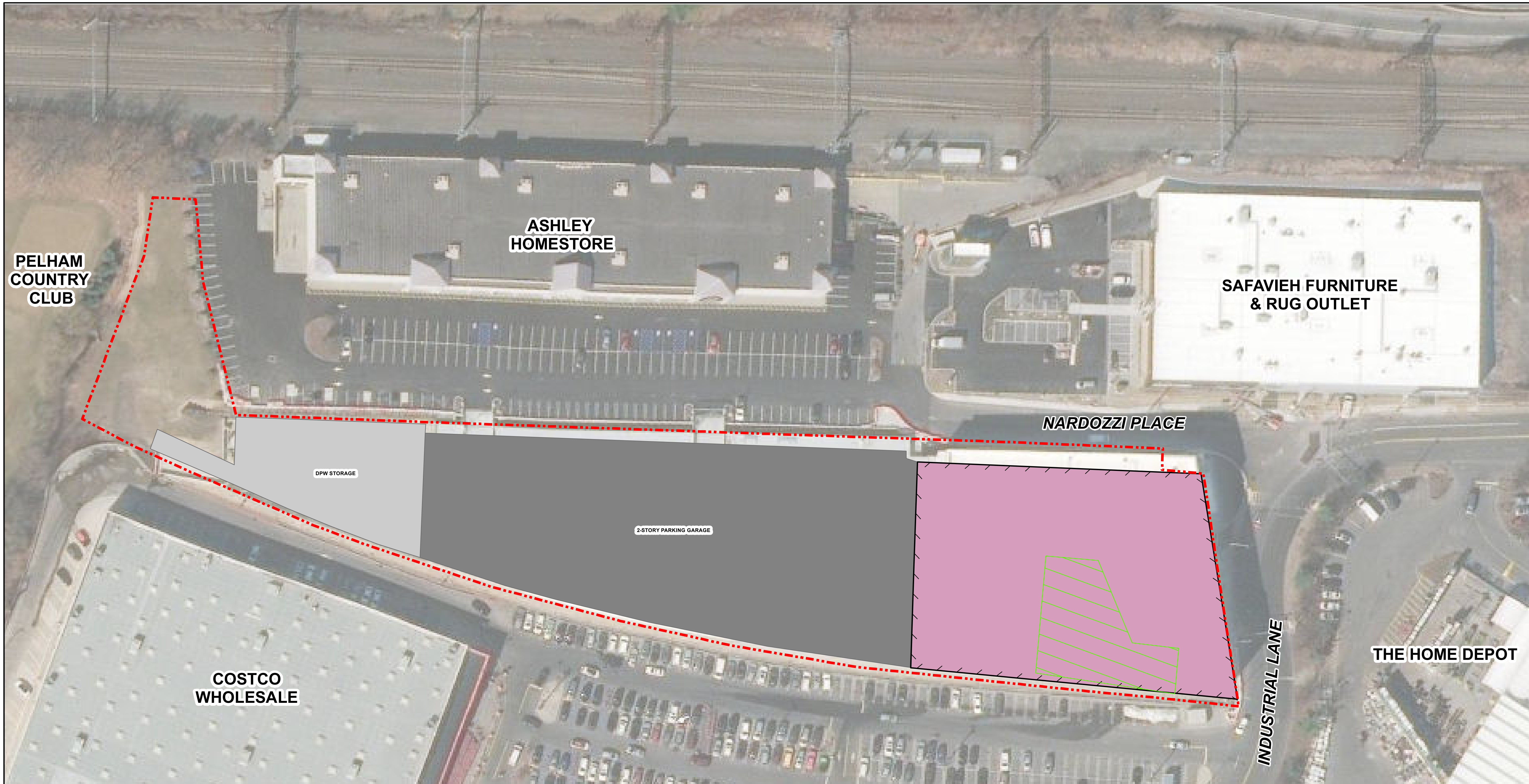
1:24,000

SITE LOCATION MAP

70 NARDOZZI PLACE
BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

PREPARED FOR
70 NARDOZZI LLC

Date: 9/10/2020	JMS #2015.191.001
JM SORGE, INC.	FIGURE 1



Legend

- Property Boundary
- 2-Story Parking Garage
- DPW Storage

Building Footprint

- Lower-Level Footprint
- Upper-Level Footprint

N

0 40 80 160 Feet

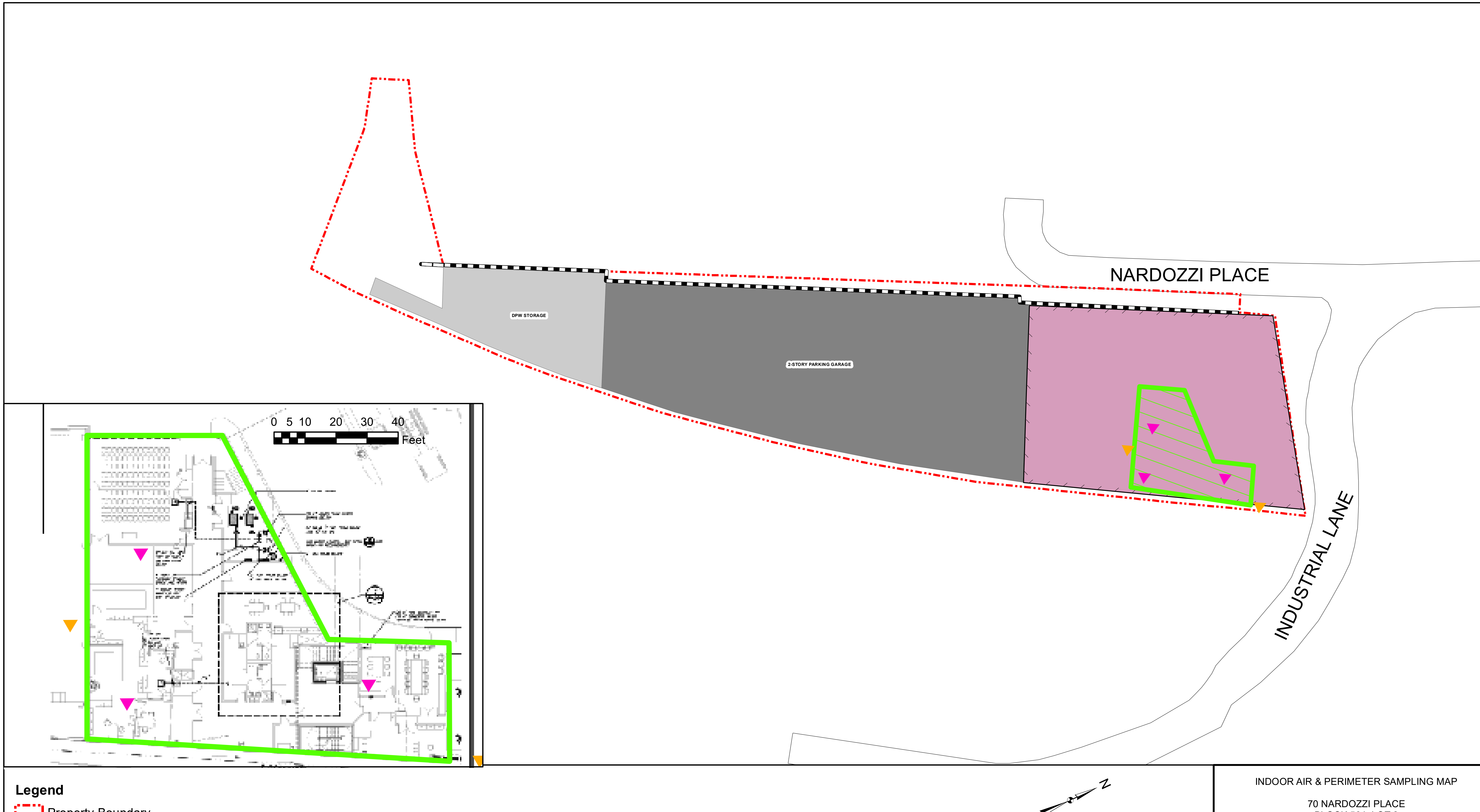
NOTES:
1. Property Boundaries are approximate.
2. Source - Based on Site Layout Plan Map dated July 14, 2015 prepared by JMC

SITE MAP

70 NARDOZZI PLACE
BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

PREPARED FOR
70 NARDOZZI LLC

Date: 10/6/2021	JMS # 2015.191.004
JM SORGE, INC.	FIGURE 2



Legend

- Property Boundary
- Steel Sheet Pile Wall
- Building Footprint
- Lower-Level Office Space
- Indoor Air Sampling Locations
- Ambient Air Sampling Location

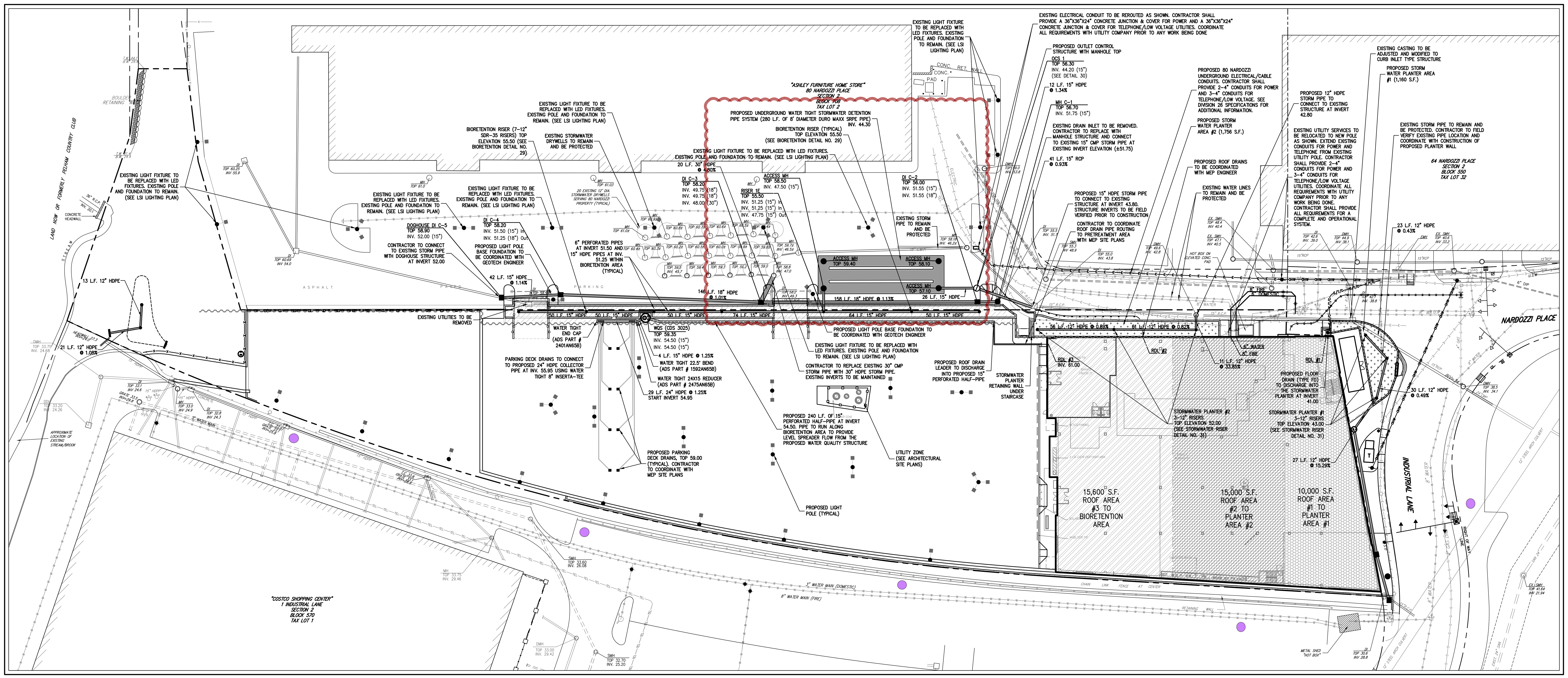
NOTES:
1. Property Boundaries are approximate.
2. Source - Based on Site Layout Plan Map dated July 14, 2015 prepared by JMC

INDOOR AIR & PERIMETER SAMPLING MAP

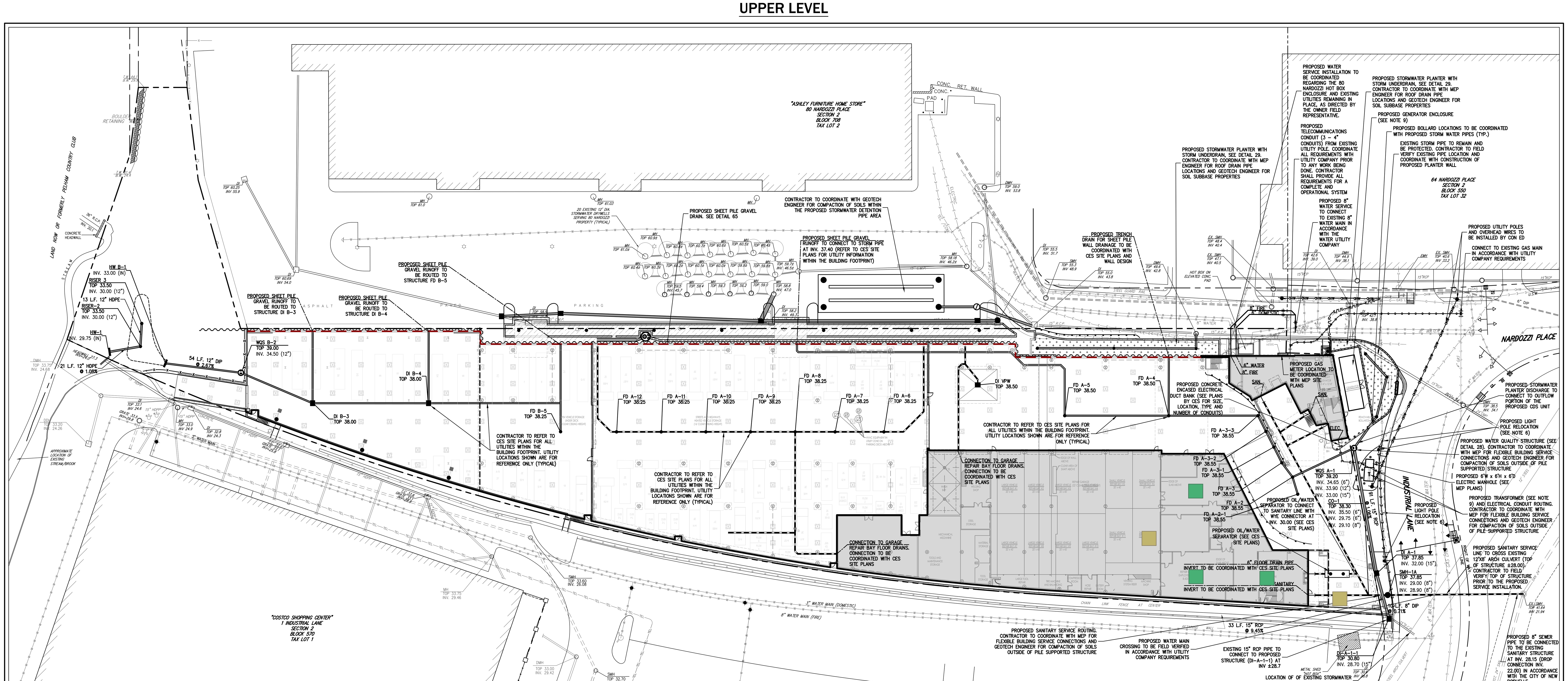
70 NARDOZZI PLACE
BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

PREPARED FOR
70 NARDOZZI LLC

Date: 10/6/2021	JMS # 2015.191.029B
JM SORGE, INC.	FIGURE 3



UPPER LEVEL



LOWER LEVEL

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING EASEMENT LINE
- EXISTING BUILDING LINE
- EXISTING PAVEMENT EDGE
- EXISTING CURB LINE
- EXISTING RETAINING WALL
- EXISTING GUIDE RAIL
- EXISTING FENCE
- EXISTING STORM DRAIN LINE AND SIZE
- EXISTING SANITARY LINE AND SIZE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING OVERHEAD WIRES
- EXISTING DRAIN INLET
- EXISTING MANHOLE
- EXISTING FIRE HYDRANT
- EXISTING GAS VALVE
- EXISTING WATER VALVE
- EXISTING UTILITY POLE
- EXISTING LIGHT POLE
- EXISTING SIGN
- EXISTING STORMWATER DRYWELL SYSTEM
- PROPOSED BUILDING LINE
- PROPOSED ROOF AREA #3
- PROPOSED ROOF AREA #2
- PROPOSED ROOF AREA #1
- PROPOSED CONCRETE CURB
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED STORM DRAIN MANHOLE
- PROPOSED TYPE DI DRAIN INLET
- PROPOSED BIORETENTION
- PROPOSED STORMWATER PLANTER
- PROPOSED STORM DRAIN LINE & SIZE
- PROPOSED SANITARY SEWER LINE & SIZE
- PROPOSED WATER LINE & SIZE
- PROPOSED GAS LINE
- PROPOSED ELECTRIC
- PROPOSED RETAINING WALL (DESIGN BY OTHERS)
- PROPOSED SHEET PILE RETAINING WALL
- PROJECTED SHEET PILE RETAINING WALL
- PROPOSED RELOCATED LIGHT POLE
- PROPOSED PARKING DECK LIGHT FIXTURE

NOTES:

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN HAVE BEEN TAKEN FROM SURVEY TITLED, "SURVEY OF PROPERTY," PREPARED BY LINK LAND SURVEYORS P.C., DATED 06-29-2015.
2. UNLESS OTHERWISE SPECIFIED, PIPE FOR STORM DRAINS SHALL BE HIGH DENSITY POLYETHYLENE PIPE (HDPE) WITH A SMOOTH INTERIOR AND ANNULAR EXTERIOR CORRUGATIONS IN ACCORDANCE WITH ASTM F-2648. JOINTS SHALL BE WATERTIGHT IN ACCORDANCE WITH ASTM D-3212.
3. UNLESS OTHERWISE SPECIFIED, PIPE FOR SANITARY SEWER GRAVITY LINES SHALL BE DUCTILE IRON PIPE EPOXY COATED CLASS 56, WITH PUSH-ON JOINTS IN ACCORDANCE WITH ASTM D-3034 AND D-3212.
4. UNLESS OTHERWISE SPECIFIED, PIPE FOR WATER LINES SHALL BE DOUBLE CEMENT-LINED DUCTILE IRON PIPE (DIP), CLASS 52, WITH MECHANICAL JOINTS IN ACCORDANCE WITH AWWA C-150, C-151, C-104 AND C-111.
5. ELECTRIC, TELEPHONE, FIRE ALARM AND CABLE TELEVISION LINES SHALL BE INSTALLED UNDERGROUND IN CONDUIT IN ACCORDANCE WITH THE REQUIREMENTS OF THE UTILITY COMPANY HAVING JURISDICTION.
6. EXISTING LIGHT POLES ALONG INDUSTRIAL LANE RIGHT-OF-WAY TO BE RELOCATED AS SHOWN. CONTRACTOR TO COORDINATE WITH THE CITY OF NEW ROCHELLE AND UTILITY COMPANY REQUIREMENTS FOR PROPOSED LIGHT POLE BASES AND UNDERGROUND ELECTRICAL SERVICE.
7. REFER TO GEOTECH ENGINEER FOR COMPACTION REQUIREMENTS AND STRUCTURAL PIPE SUPPORTS FOR ALL PIPES/STRUCTURES OUTSIDE OF AND WITHIN PILE SUPPORTED STRUCTURE.
8. FOR ALL FLEXIBLE BUILDING SERVICE CONNECTIONS, REFER TO MEP ENGINEER AND GEOTECH ENGINEER FOR SOIL COMPACTION.
9. GENERATOR, TRANSFORMER, AND RELATED PADS & BOLLARDS ARE NOT PART OF THE CORE AND SHELL CONTRACT. SEE TENANT FIT-OUT DRAWINGS.

- Proposed Perimeter Sampling Locations
- Proposed Indoor Air Sampling Locations
- Proposed Outdoor Air Sampling Locations

No.	Revision	Date	By
6.	ISSUED FOR COORDINATION	11/15/2017	BMS
7.	REVISED PER CITY SUBMISSION	01/12/2018	BMS
8.	BUILDING PERMIT SET	04/17/2018	BMS
9.	SWPPP SUBMISSION	05/11/2018	BMS
10.	BUILDING DEPT. COMMENTS (ADDENDUM #2) 2	06/08/2018	BMS
11.	ISSUE FOR FOUNDATION AND SITE WORK	07/20/2018	BMS
12.	CONFORMANCE SET	08/06/2018	BMS
13.	TENANT COORDINATION SET	12/10/2018	BMS
14.	ISSUED FOR FINAL BUILDING DEPARTMENT SET 1	02/27/2019	BMS
15.	RFI #52 52	08/27/2019	BMS

Previous Editions Obsolete

APPLICANT/OWNER:
PVE Co & PVE Li
1250 WATERS PLACE, PH1
BRONX, NY, 10461

ARCHITECT:
DESIGN DEVELOPMENT, PLLC
237 MAMARONECK AVENUE, FL. 4
WHITE PLAINS, NY, 10605

JMC Planning, Engineering, Landscape Architecture & Land Surveying, PLLC
JMC Site Development Consultants, LLC
John Meyer Consulting, Inc.
120 BEDFORD ROAD • ARMONK, NY 10504
voice 914.273.5225 • fax 914.273.2102
www.jmcpllc.com

JMC

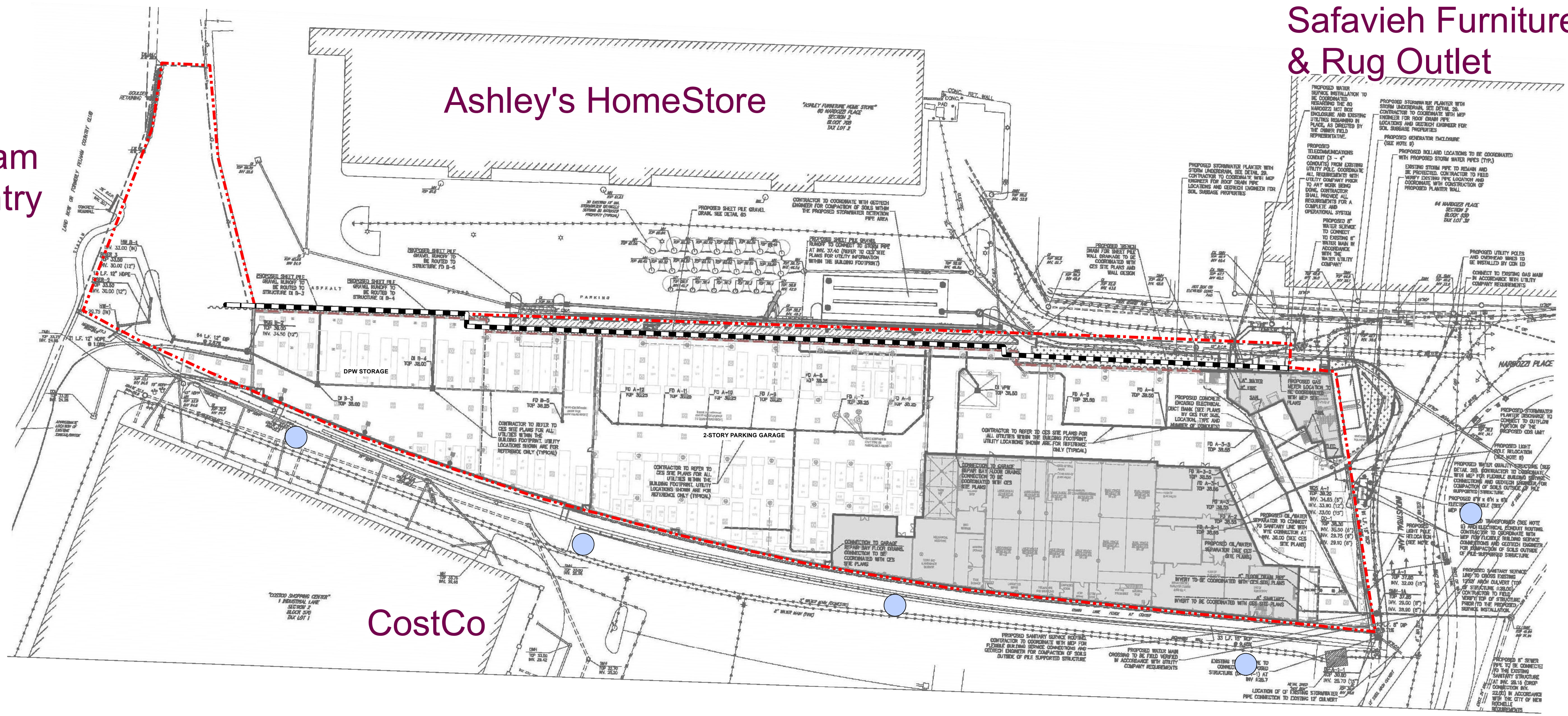
SITE UTILITIES PLAN

70 NARDOZZI PLACE
70 NARDOZZI PLACE
CITY OF NEW ROCHELLE, NEW YORK

ANY ALTERATION OF PLANS, SPECIFICATIONS, PLATS AND REPORTS BEARING THE SEAL OF A LICENSED PROFESSIONAL ENGINEER OR LICENSED LAND SURVEYOR IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, EXCEPT AS PROVIDED FOR BY SECTION 7209, SUBSECTION 2.

Drawn: BMS Approved: RJP
Scale: 1" = 30'
Date: 07/14/2015
Project No: 14170
14170-SITE SP-5 UTIL UTIL.scr
Drawing No: SP-5

NOT FOR CONSTRUCTION



Legend

- Property Boundary
- Steel Sheet Pile Wall
- Perimeter Sample Locations

0 40 80 160 Feet

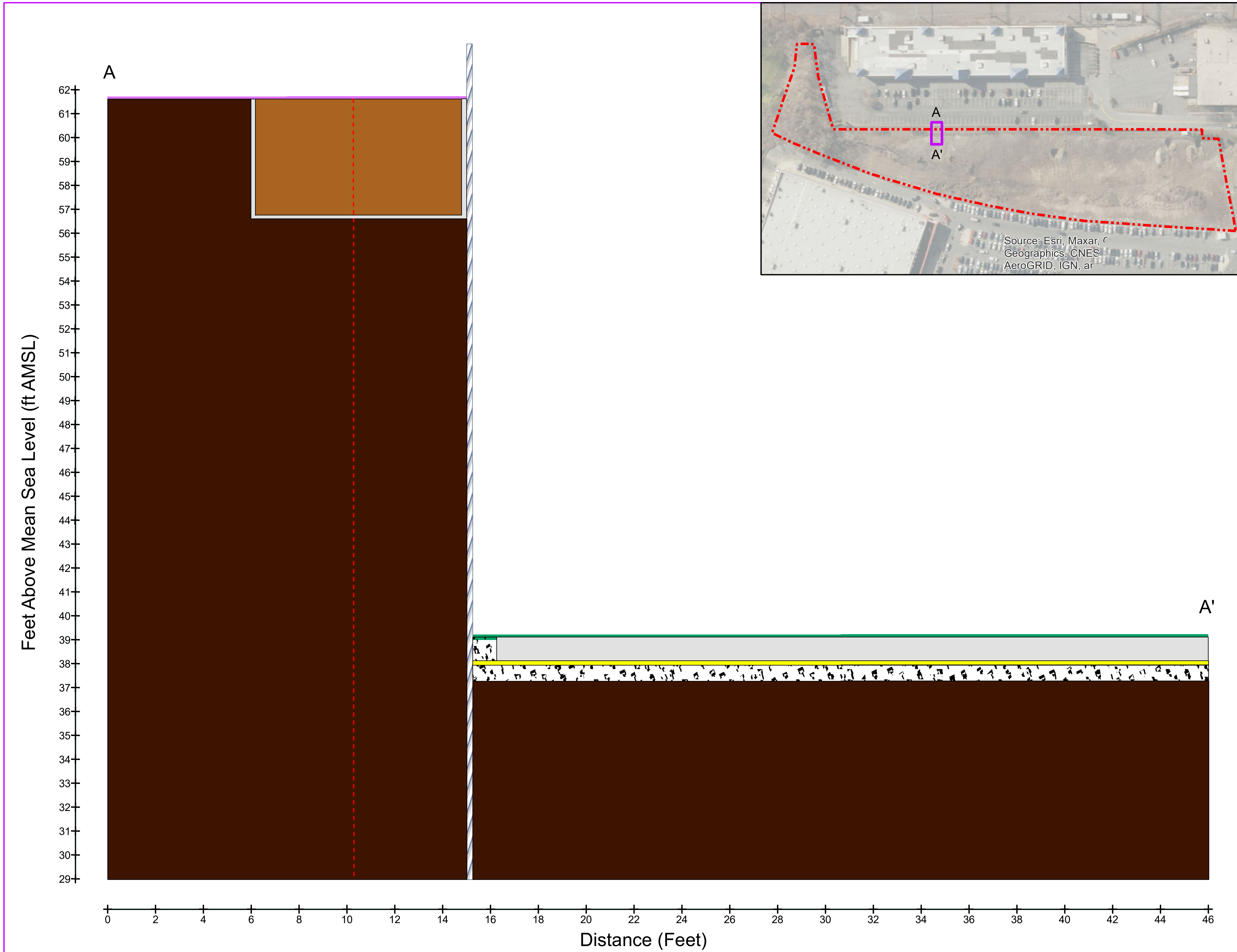
NOTES:
1. Property Boundaries are approximate.
2. Source - Based on Site Layout Plan Map dated July 14, 2015 prepared by JMC

INDOOR AIR & PERIMETER SAMPLING MAP

70 NARDOZZI PLACE
BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

PREPARED FOR
70 NARDOZZI LLC

Date: 3/15/2021	JMS # 2015.191.004
JM SORGE, INC.	FIGURE 5



Legend

- Property Boundary
- Retaining Wall

Elevation

- Site Grade On East Side of Wall (Mean 41 ft AMSL)
- Site Grade On West Side of Wall (Mean 60 ft AMSL)

Site Details Cross Section

- BioSoil
- Concrete
- Brownish Black Fill Material
- Gravel/Vent Piping
- Vapor Barrier

NOTES:
1. This cross-section is an interpretation of information

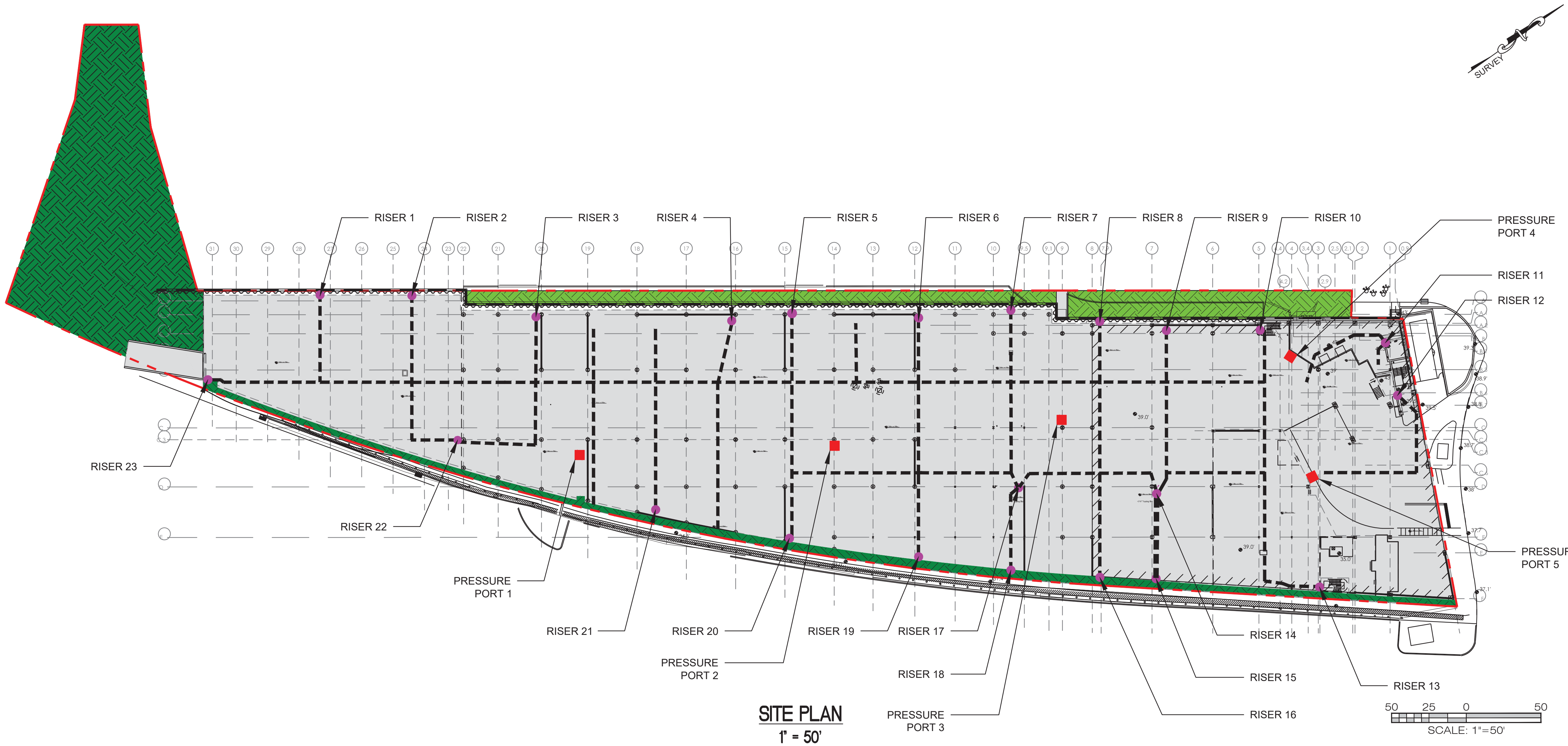
N

WALL AREA CROSS SECTION MAP

70 NARDOZZI PLACE
BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

PREPARED FOR:
70 NARDOZZI LLC

Date: 3/23/2021	JMS # 2015.191.030
JM SORGE, INC.	FIGURE 6



SITE PLAN
1" = 50'

LEGENDS

- SSVS RISERS
- PRESSURE PORT
- SUB-SLAB VENTILATION SYSTEM

NOTES

1. PROPERTY BOUNDARY AND EXISTING TOPOGRAPHIC INFORMATION IS BASED ON A CERTAIN DRAWING TITLED "SURVEY OF PROPERTY SITUATE IN THE CITY OF NEW ROCHELLE WESTCHESTER COUNTY" PREPARED BY LINK LAND SURVEYORS P.C. (DATED JULY 22, 2020).
2. SEE ARCHITECTURAL PLANS FOR INTERIOR IMPROVEMENTS.

DRESDNER ROBIN
DRESDNER ROBIN - NEW YORK
1 EVERTRUST PLAZA, SUITE 901, JERSEY CITY, NJ 07302
TEL: 201.217.9200 FAX: 201.217.9607
JERSEY CITY • FAIRFIELD • ASBURY PARK • CHERRY HILL

Nº	DATE	DESCRIPTION	BY

REVISIONS:

ENVIRONMENTAL CONSULTANT:
JM SORGE, INC.
ENVIRONMENTAL CONSULTANTS
57 FOURTH STREET
SOMERVILLE, NJ 08876
908.218.0066

Joe Mele 12/29/2020
JOSEPH MELE
PROFESSIONAL ENGINEER
NY LICENSE NUMBER 083364-1

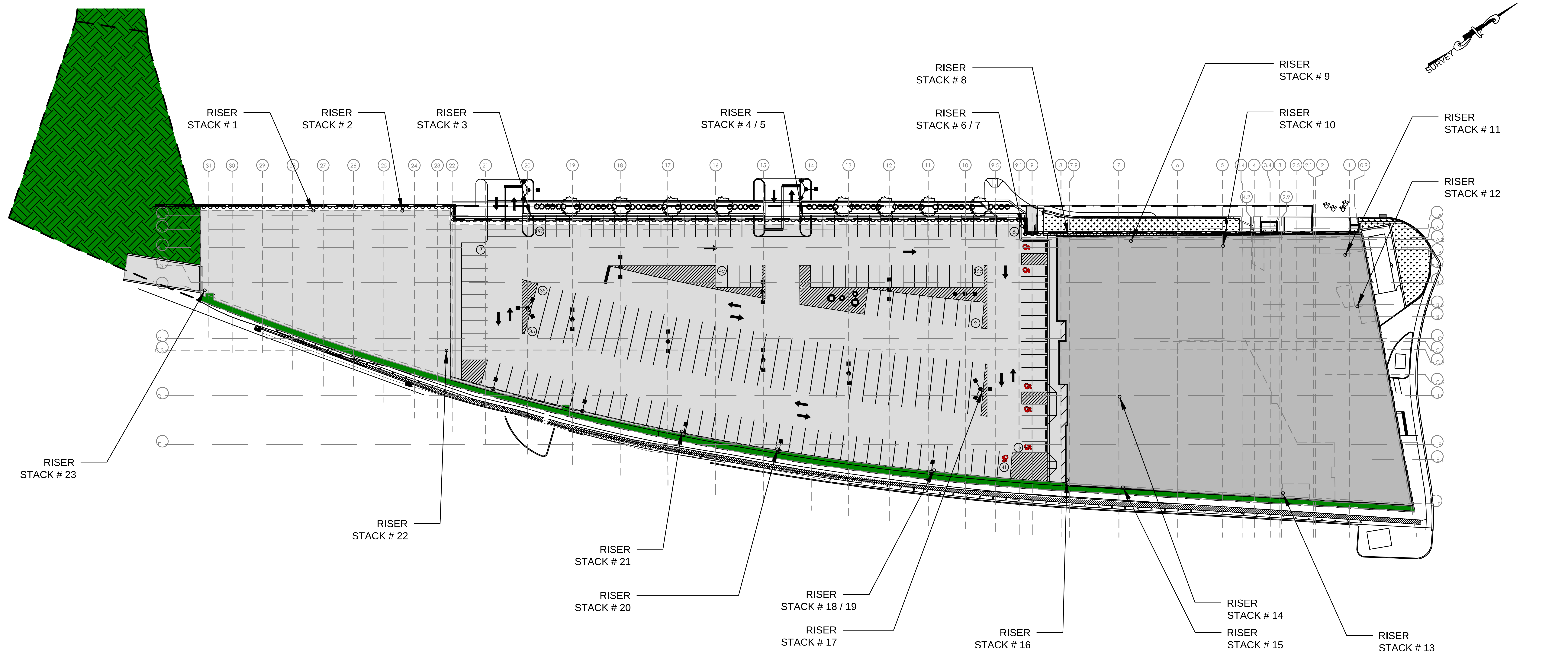
APPLICANT: G & S INVESTORS

PROJECT: 70 NARDOZZI PLACE

LOCATION: 70 NARDOZZI PLACE, SECTION 2, BLOCK 564, LOT 2, NEW ROCHELLE, NEW YORK

DRAWING NAME: SSVS SCHEMATIC & MONITORING LOCATION MAP

DRWN BY: JCQ | CHKD BY: JM | DRWG Nº: FIGURE 7A
SCALE: 1" = 50' | DATE: 12.28.2020
JOB No: 00785-008 | SHEET 02 OF 02

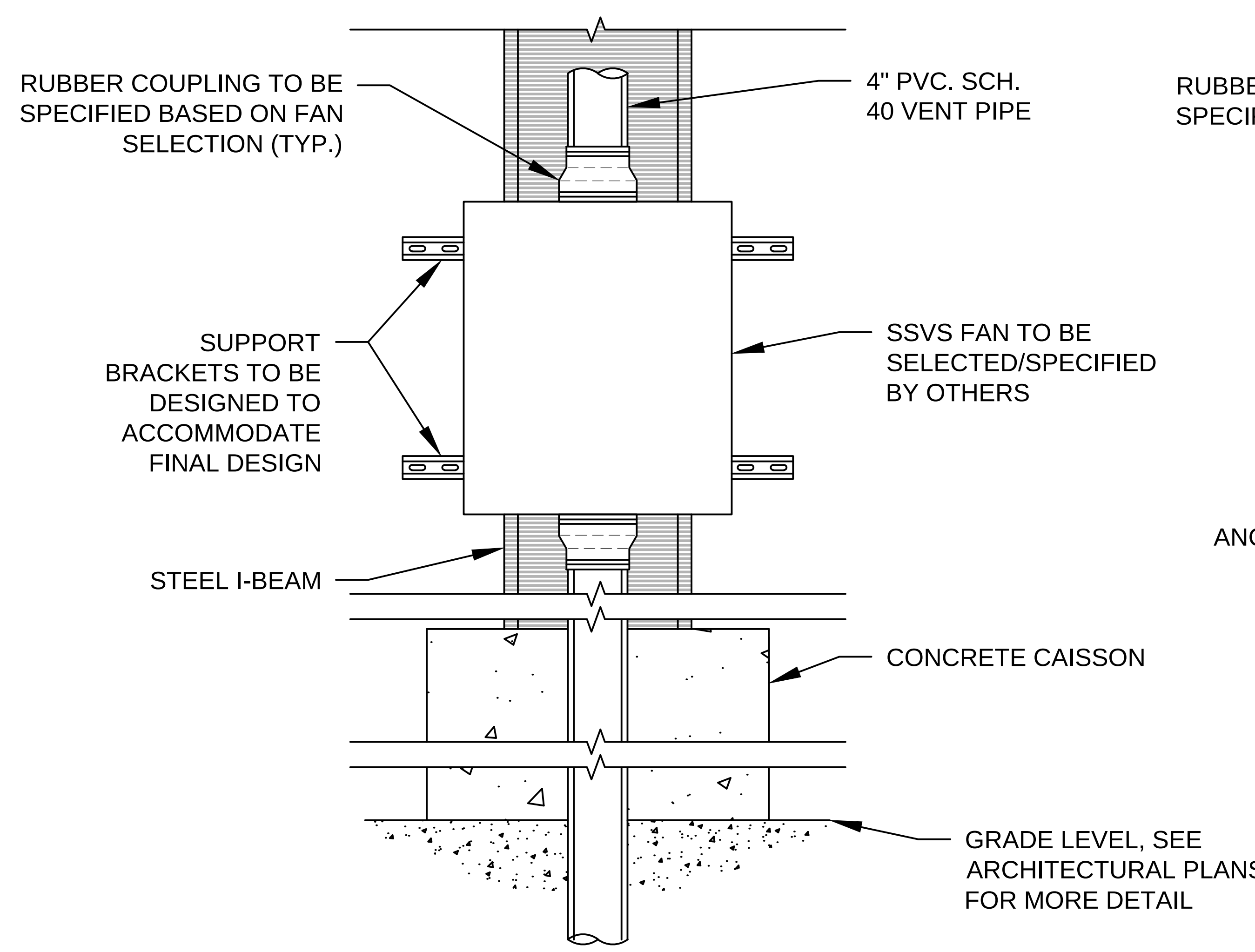


SITE PLAN

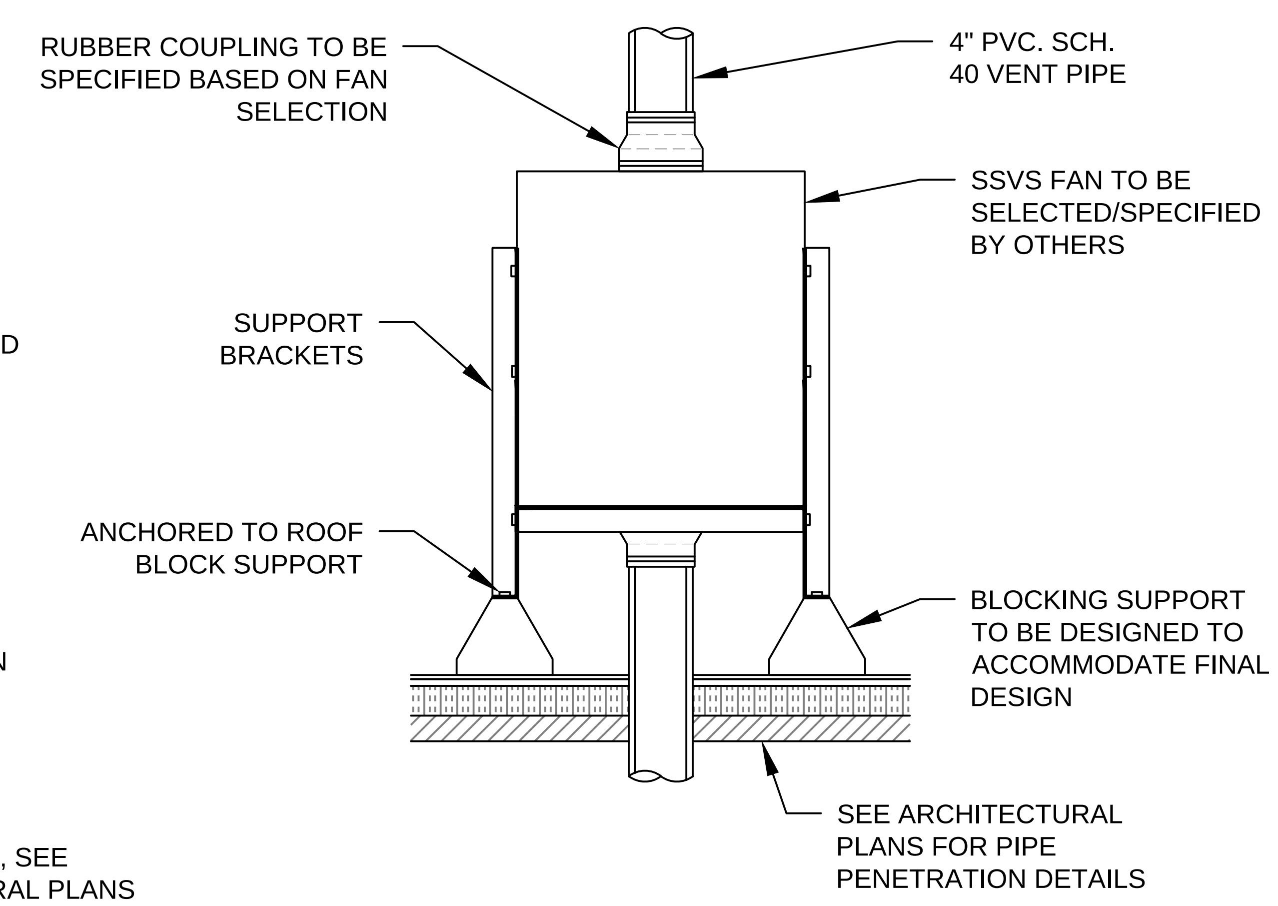
1" = 50'

RISER STACK #	LOCATION OF BLOWER	MOUNT
1	Exterior	ON BASE
2	Exterior	ON BASE
3	Exterior	ON BASE
4	Parking Level	ON BASE
5	Parking Level	ON BASE
6	Parking Level	ON BASE
7	Roof	ON BASE
8	Roof	ON BASE
9	Roof	ON BASE
10	Roof	ON BASE
11	Roof	ON BASE
12	Roof	ON BASE
13	Roof	ON BASE
14	Roof	ON BASE
15	Roof	ON BASE
16	Parking Level	ON BASE
17	Parking Level	ON BASE
18	Parking Level	ON BASE
19	Parking Level	ON BASE
20	Exterior	BEAM-MOUNTED

RISER STACK SCHEDULE



BEAM-MOUNTED RISER BLOWER



BASE MOUNTED RISER BLOWER

NOTES

1. PROPERTY BOUNDARY AND EXISTING TOPOGRAPHIC INFORMATION IS BASED ON A CERTAIN DRAWING TITLED "SURVEY OF PROPERTY SITUATE IN THE CITY OF NEW ROCHELLE WESTCHESTER COUNTY" PREPARED BY LINK LAND SURVEYORS P.C. (DATED JULY 22, 2020).
2. SEE ARCHITECTURAL PLANS FOR INTERIOR IMPROVEMENTS.
3. BLOWERS TO BE DESIGNED BY A LICENSED MECHANICAL ENGINEER OR LICENSES MASTER PLUMBER.
4. BLOWERS SHALL PROVIDE A CONSTANT NEGATIVE PRESSURE OF 0.002 WC.
5. BLOWER ENCLOSURE SHALL CONTAIN VISUAL AND AUDIO ALARM TO GO OFF IF THE SYSTEM IS NOT OPERATIONAL.

TYPICAL BASE MOUNTED RISER LOCATION

DRESDNER ROBIN

DRESDNER ROBIN - NEW YORK
1 EVERTRUST PLAZA, SUITE 901, JERSEY CITY, NJ 07302
TEL: 201.217.9200 FAX: 201.217.9607

JERSEY CITY ▪ FAIRFIELD ▪ ASBURY PARK ▪ CHERRY HILL

Nº	DATE	DESCRIPTION	BY

REVISIONS:

ENVIRONMENTAL CONSULTANT:
JM SORGE, INC.
ENVIRONMENTAL CONSULTANTS
57 FOURTH STREET
SOMERVILLE, NJ 08876
908.218.0066

APPLICANT:
G & S INVESTORS

PROJECT:
70 NARDOZZI PLACE

LOCATION:
70 NARDOZZI PLACE
SECTION 2, BLOCK 564, LOT 2
NEW ROCHELLE, NEW YORK

DRAWING NAME:
LOCATION OF RISER STACKS

DRWN BY: JCQ
CHKD BY: JM
DRWG Nº: CSK-01
SCALE: 1" = 50'
DATE: 12.28.2020
JOB No: 00785-008

ATTACHMENT 1

APPENDIX B– LIST OF SITE CONTACTS

Entity: P.V.E. Co. LLC / P.V.E. II Co., LLC
Contact Person: Vincent Rusciano
Affiliation: Site Owner
Address: 1 Radisson Place, Suite 1002, New Rochelle, NY 10801
Phone Number: (203)-253-9115
Email: vincent@ruscianoassociatesinc.com

Entity: 70 Nardozzi LLC
Contact Person: Greg Wasser
Affiliation: Remedial Party
Address: 211 East 43rd Street, 25th Floor, New York, NY 10017
Phone Number: (212)-286-3300 & (201)-217-9200
Email: gwasser@gsinvestors.com

Entity: JM Sorge, Inc.
Contact Person: Alison Kokorsky
Affiliation: Qualified Environmental Professional
Address: 57 Fourth Street, Somerville, NJ 08876
Phone Number: (908)-218-0066 ext 119
Email: akokorsky@jmsorge.com

Entity: Dresdner Robin
Contact Person: Michael Irving
Affiliation: Engineering Consultant
Address: 1 Evertrust Plaza – Suite 901, Jersey City, NJ 07302
Phone Number: (201)-266-5583
Email: MIrving@DresdnerRobin.com

Entity: WGV Engineering Surveying and Landscape Architecture, DPC;
doing business as Dresdner Robin – New York.
Contact Person: Frederick Wilcox Worstell
Affiliation: Professional Engineer
Address: 1 Evertrust Plaza – Suite 901, Jersey City, NJ 07302
Phone Number: (201)-266-5583
Email: FWorstell@DresdnerRobin.com

Entity: New York State Department of Environmental Conservation – Department of Environmental Remediation
Contact Person: Michael Kilmer
Affiliation: NYSDEC DER Project Manager
Address: 21 S Putt Corners Rd, New Paltz, NY 12561
Phone Number: (845)-633-5463
Email: michael.kilmer@dec.ny.gov

Entity: New York State Department of Health
Contact Person: Kristin Kulow
Affiliation: NYSDOH Project Manager
Address: Corning Tower, Empire State Plaza, Albany, NY 12237
Phone Number: (607) 353-4335
Email: kristin.kulow@health.ny.gov
Entity: New York State Department of Environmental Conservation
Contact Person: Daniel Bendell
Affiliation: NYSDEC Regional HW Engineer
Address: 21 S Putt Corners Rd, New Paltz, NY 12561
Phone Number: 845-256-3151
Email: daniel.bendell@dec.ny.gov

Entity: New York State Department of Environmental Conservation
Contact Person: Kelly Lewandowski
Affiliation: NYSDEC Site Control
Address: 625 Broadway, Albany, NY 12233
Phone Number: 518-402-9553
Email: kelly.lewandowski@dec.ny.gov

Entity: DelBello Donnellan Weingarten Wise & Wiederkehr, LLP
Contact Person: Mark P. Weingarten
Affiliation: Remedial Party Attorney
Address: 1 N Lexington Ave #11, White Plains, NY 10601
Phone Number: (646)-378-7228 & +1 (914) 681-0200
Email: MPW@ddw-law.com

Entity: City of New Rochelle – Department of Public Works
Contact Person: James Moran
Affiliation: Site Occupant/Tenant/Operator
Address: 70 Nardozzi Place, New Rochelle, NY 10805
Phone Number: (914) 654-2134
Email: jmoran@newrochelleny.com

Entity: LA Fitness
Contact Person: James O'Sullivan
Affiliation: Site Occupant/Tenant/Operator
Address: 70 Nardozzi Place, New Rochelle, NY 10805
Phone Number: 516-301-9020
Email: josullivan@fitnessINTL.com

Adjacent Property – Access for Maintenance of Engineering Controls
Site Address: 1 Industrial Lane, New Rochelle, NY 10805
Entity: Costco Wholesale Corporation,
Contact Person: Margaret McCulla
Affiliation: Owner of adjacent property
Address: 99 Lake Drive, Issaquah, WA 98027
Phone Number: (425) 313-8100
Email: mmcculla@costco.com

ATTACHMENT 2

Soil Vapor Intrusion - Structure Sampling Building Questionnaire

Structure ID : ______________

Site No. : ______________________ **Site Name** : ____

Date: ______________________ **Time:** ____

Structure Address : ____

Preparer's Name & Affiliation : ____

Residential ? ☐ **Yes** ☐ **No** **Owner Occupied ?** ☐ **Yes** ☐ **No** **Owner Interviewed ?** ☐ **Yes** ☐ **No**

Commercial ? ☐ **Yes** ☐ **No** **Industrial ?** ☐ **Yes** ☐ **No** **Mixed Uses ?** ☐ **Yes** ☐ **No**

Identify all non-residential use(s) : ____

Owner Name : ____ **Owner Phone** : ( ) __________ - __________

Secondary Owner Phone : ( ) __________ - __________

Owner Address (if different) : ____

Occupant Name : ______________________________________ **Occupant Phone** : ( ) __________ - __________

Secondary Occupant Phone : ( ) __________ - __________

Number & Age of All Persons Residing at this Location : ____

Additional Owner/Occupant Information : ____

Describe Structure (style, number floors, size) : ____

____

Approximate **Year Built** : ______________________ Is the building **Insulated**? ☐ Yes ☐ No

Lowest level : ☐ Slab-on-grade ☐ Basement ☐ Crawlspace

Describe Lowest Level (finishing, use, time spent in space) : ____

____

Floor Type: ☐ Concrete Slab ☐ Dirt ☐ Mixed : ____

Floor Condition : ☐ Good (few or no cracks) ☐ Average (some cracks) ☐ Poor (broken concrete or dirt)

Sumps/Drains? ☐ Yes ☐ No Describe : ____

Identify other floor penetrations & details : ____

____

Wall Construction : ☐ Concrete Block ☐ Poured Concrete ☐ Laid-Up Stone

Identify any wall penetrations : ____

____

Identify water, moisture, or seepage: location & severity (sump, cracks, stains, etc) : ______________________________

____

Heating Fuel : ☐ Oil ☐ Gas ☐ Wood ☐ Electric ☐ Other : ____________________________

Heating System : ☐ Forced Air ☐ Hot Water ☐ Other : ____

Hot Water System : ☐ Combustion ☐ Electric ☐ Boilermate ☐ Other: ____________________________

Clothes Dryer : ☐ Electric ☐ Gas Where is dryer **vented** to? ____________________________

If combustion occurs, describe where air is drawn from (cold air return, basement, external air, etc.) : __________________

____

Fans & Vents (identify where fans/vents pull air from and where they vent/exhaust to) : ______________________________

____

Describe factors that may affect indoor air quality (chemical use/storage, unvented heaters, smoking, workshop):

Attached garage ? ☐ Yes ☐ No Air fresheners ? ☐ Yes ☐ No

New carpet or furniture ? ☐ Yes ☐ No What/Where ? ____________________

Recent **painting** or **staining** ? ☐ Yes ☐ No Where ? : ____________________

Any **solvent** or **chemical-like** odors ? ☐ Yes ☐ No Describe : ____________________

Last time **Dry Cleaned** fabrics brought in ? __________________ What / Where ? ____________________

Do any building occupants use solvents at work ? ☐ Yes ☐ No Describe : ____________________

Any testing for Radon ? ☐ Yes ☐ No Results : ____________________

Radon System/Soil Vapor Intrusion Mitigation System present ? ☐ Yes ☐ No If yes, describe below

Lowest Building Level Layout Sketch

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sketch.
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	######	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab vapor samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling - Product Inventory

Homeowner Name & Address: ______________________________ **Date:** __________

Samplers & Company: ______________________________ **Structure ID:** __________

Site Number & Name: ______________________________ **Phone Number:** __________

Make & Model of PID: ______________________ **Date of PID Calibration:** __________

Identify any Changes from Original Building Questionnaire : ______________________________

Product Name/Description	Quantity	Chemical Ingredients	PID Reading	Location

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name ______________________________________ Date/Time Prepared _______________

Preparer's Affiliation __________________________________ Phone No.________________________

Purpose of Investigation____

1. OCCUPANT:

Interviewed: Y / N

Last Name: ___________________________ First Name: ___________________________

Address: ____

County: __________________

Home Phone: _____________________ Office Phone: _____________________

Number of Occupants/persons at this location _______ Age of Occupants _______________________

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: ___________________________ First Name: ___________________________

Address: ____

County: __________________

Home Phone: _____________________ Office Phone: _____________________

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: __________________

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_______________

If multiple units, how many? ________

If the property is commercial, type?

Business Type(s) _______________________________________

Does it include residences (i.e., multi-use)? Y / N If yes, how many? ______

Other characteristics:

Number of floors______ Building age______

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

____
____
____

Airflow near source

____
____
____

Outdoor air infiltration

____
____
____

Infiltration into air ducts

____
____
____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other ________
c. Basement floor:	concrete	dirt	stone	other ________
d. Basement floor:	uncovered	covered	covered with _______________	
e. Concrete floor:	unsealed	sealed	sealed with ________________	
f. Foundation walls:	poured	block	stone	other ________
g. Foundation walls:	unsealed	sealed	sealed with ________________	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: ________(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

____

____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other ___________

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: ____________________________

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other___________
Air conditioning:	Central Air	Window units	Open Windows	None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

____

____

____

____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	______________________________
1st Floor	______________________________
2nd Floor	______________________________
3rd Floor	______________________________
4th Floor	______________________________

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA
Please specify____________________

d. Has the building ever had a fire? Y / N When?__________________

e. Is a kerosene or unvented gas space heater present? Y / N Where? _________________

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _________________

g. Is there smoking in the building? Y / N How frequently? ________________

h. Have cleaning products been used recently? Y / N When & Type? _________________

i. Have cosmetic products been used recently? Y / N When & Type? _________________

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _______________

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _______________

l. Have air fresheners been used recently? Y / N When & Type? ________________

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?____________

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?____________

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_________________

Are there odors in the building? Y / N
If yes, please describe: ____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? ____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: ____________
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _______
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _______

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____________________________________

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: ______________________________________

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Indoor Air Pre-Sampling Procedure for Building Occupants

70 Nardozzi Place, New Rochelle, New York

FOR 24 HOURS PRIOR TO SAMPLING, ALL REASONABLE MEASURES SHOULD BE TAKEN TO AVOID:

- Opening any windows, fireplace dampers, openings, or vents
- Operating ventilation fans unless special arrangements are made
- Smoking in the house
- Painting
- Using wood stoves, fireplaces, or other auxiliary heating equipment (e.g., kerosene heaters)
- Operating or storing automobiles in an attached garage
- Allowing containers of gasoline or oil to remain within the house, except for fuel oil tanks
- Cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products
- Using air fresheners or odor eliminators
- Engaging in any hobbies that use materials containing volatile organic chemicals
- Using cosmetics, including hairspray, nail polish, nail polish removers, perfume/cologne, etc.
- Applying pesticides

Sub Slab Ventilation System Monitoring and Inspection Form

70 Nardozzi Place, New Rochelle, New York

Date: ____________________________

Weather: ____________________________

Inspector/Company: ____________________________

Equipment: ____________________________

Location	Measurement (in WC*)
Pressure Port 1	
Pressure Port 2	
Pressure Port 3	
Pressure Port 4	
Pressure Port 5	

*in WC – inches of Water Column

Minimum acceptable pressure is -0.002 in WC

Location	Pressure (+ or -)	Location	Pressure (+ or -)
Riser 1		Riser 13	
Riser 2		Riser 14	
Riser 3		Riser 15	
Riser 4		Riser 16	
Riser 5		Riser 17	
Riser 6		Riser 18	
Riser 7		Riser 19	
Riser 8		Riser 20	
Riser 9		Riser 21	
Riser 10		Riser 22	
Riser 11		Riser 23	
Riser 12			

Odors noted: ____

Condition of risers:

____

____

____

____

Condition of pressure ports:

____

____

Condition of cap:

____

____

____

____

Describe any reports or evidence of alterations, improvements, disturbances and/or repairs observed:

____

____

____

Describe any alterations, improvements, disturbances and/or repairs likely to be necessary in the future:

____

____

____

Additional Notes:

ATTACHMENT 3

AIR ANALYSIS

CHAIN OF CUSTODY

PAGE_______ OF _______

ALPHA ANALYTICAL
320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information

Client:

Address:

Phone:

Fax:

Email:

❑ These samples have been previously analyzed by Alpha

Project Information

Project Name:

Project Location:

Project #:

Project Manager:

ALPHA Quote #:

Turn-Around Time

❑ Standard ❑ RUSH *(only confirmed if pre-approved!)*

Date Due: Time:

Report Information - Data Deliverables

❑ FAX
❑ ADEx
Criteria Checker: ____________
(Default based on Regulatory Criteria Indicated)
Other Formats: ____________
❑ EMAIL (standard pdf report)
❑ Additional Deliverables:

Report to: (if different than Project Manager)

Billing Information

❑ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	*Program*	*Res / Comm*

Other Project Specific Requirements/Comments:

Project-Specific Target Compound List: ❑

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	COLLECTION End Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	ANALYSIS: TO-15	TO-15 SIM	APH	Subtract Non-petroleum HCs ❑	Fixed Gases	Sulfides & Mercaptans by TO-15		Sample Comments (i.e. PID)

*SAMPLE MATRIX CODES
AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

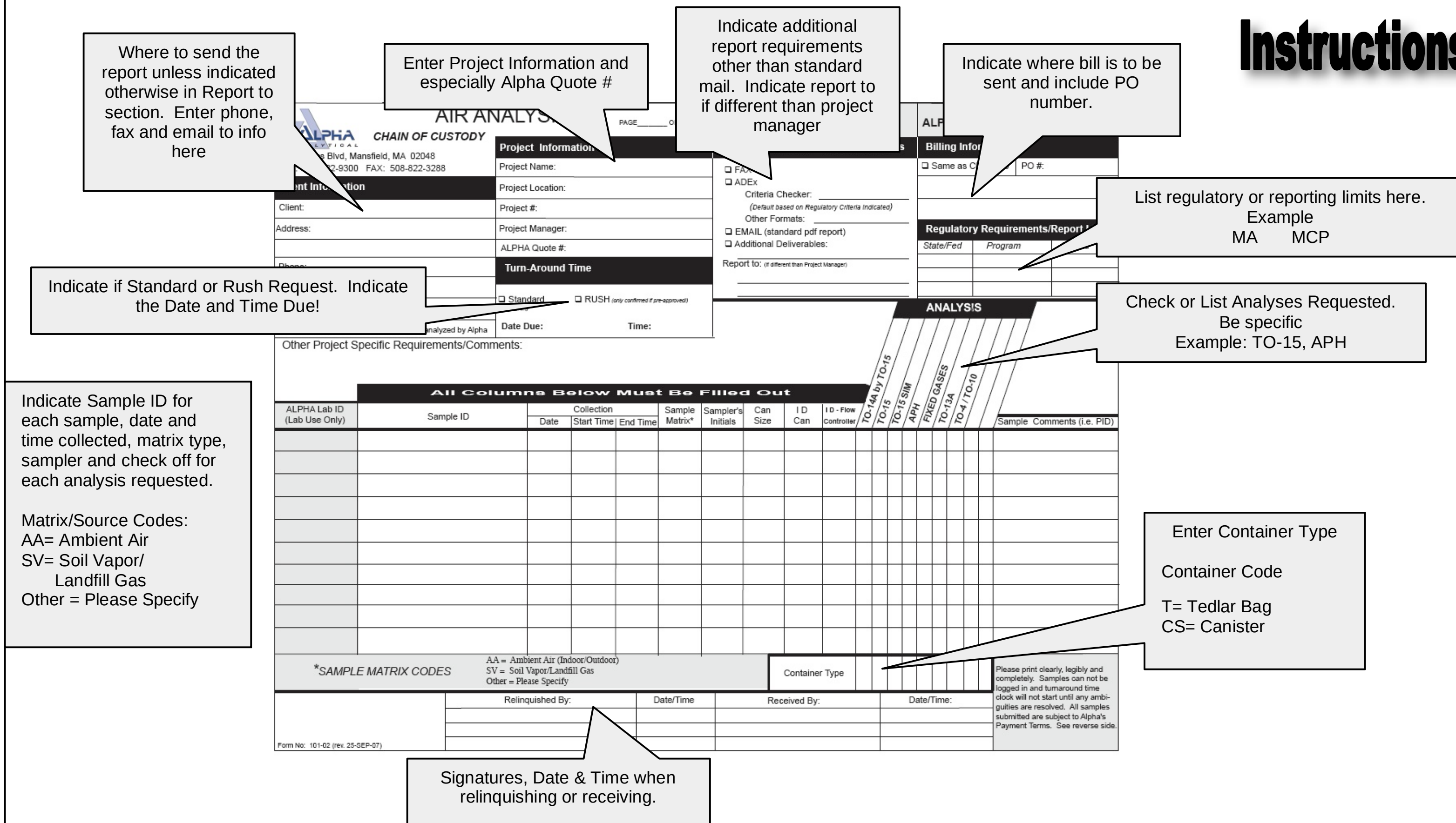
Container Type

Relinquished By:	Date/Time	Received By:	Date/Time:

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions.
See reverse side.

Form No: 101-02 Rev: (25-Sep-15)

Instructions



Terms & Conditions: In the absence of a written agreement to the contrary, this order constitutes an acceptance by the Client of Alpha Analytical, Inc. (ALPHA)'s offer to do business under these Terms and Conditions, and agrees to be bound by these conditions. Any terms and conditions from Client's that do not conform to the terms and conditions contained herein shall be deemed invalid and unenforceable, unless accepted in writing by ALPHA. This order shall not be valid unless it contains sufficient specifications to enable ALPHA to carry out the Client's requirements. Samples must be accompanied by: a) adequate instruction as to the quantity and type of analysis requested, and b) reporting and billing address information. Upon timely delivery of samples, ALPHA will use its best efforts to meet mutually agreed turnaround times, calculated from the point in time when ALPHA has determined that it can proceed with the defined work to be done (Sample Delivery Acceptance). ALPHA reserves the right, to refuse or revoke Sample Delivery Acceptance for any sample which in the sole judgment of ALPHA: a) is unsuitable volume; b) may pose a risk or become unsuitable for handling, transport or processing for any health , safety, environmental or any other reason; c) holding times cannot be met.

Client agrees to pay for all applicable charges to process this order. Payment in advance is required for all Clients except those whose credit has been established with ALPHA. For Clients with approved credit, payment terms are Net 30 days from the date of the invoice by ALPHA. All overdue payments are subject to an interest and service charge of one and one half percent (1.5%) (Or the maximum rate permissible by law, whichever is lesser) per month or portion thereof from the due date until the date of payment. ALPHA may suspend work and withhold delivery of data under this order at any time in the event that the Client fails to make timely payment of its invoices. Client shall be responsible for all costs and expenses of collection including reasonable attorney's fees. Data or information provided to ALPHA or generated by services performed under this agreement shall only become the property of the Client upon receipt in full by ALPHA of payment for the entire Order.

In no event shall ALPHA have any responsibility or liability to the Client for any failure or delay in performance by ALPHA which results, directly or indirectly in whole or in part, from any cause or circumstance beyond the reasonable control of ALPHA.

ALPHA shall dispose of the Client's samples 30 days after the analytical report is issued, unless instructed to store them for an alternate period of time or return such samples to the Client. The return of samples will be at the Client's own expense.

Soil Gas

Vapor Intrusion

Property Redevelopment

Ambient Air Monitoring

Indoor Air Quality

Waste-to-Energy

eurofins | Air Toxics

Guide to Air Sampling

Canisters and Bags

www.AirToxics.com

Always Air. Always Accurate.

Eurofins Air Toxics, Inc.
Guide to Whole Air Sampling – Canisters and Bags

Revision 6/27/14

Contents

Section 1.0 Introduction

Eurofins Air Toxics Inc. presents this guide as a resource for individuals engaged in air sampling. Air sampling can be more involved than water or soil sampling due to the reactivity of chemical compounds in the gas matrix and sample interaction with the equipment and media used. Ensuring that air samples are collected properly is an important step in acquiring meaningful analytical results. This guide is not a substitute for experience and cannot sufficiently address the multitude of field conditions. Note that this guide is intended for projects involving whole air sampling of volatile organic compounds (VOCs) in canisters and Tedlar® bags. Eurofins Air Toxics provides the "Guide to Sorbent-Based Sampling - Volatiles and Semi-Volatiles" for other types of sampling.

1.1 Whole Air Sampling of VOCs

There are three general ways to collect compounds in a gas phase sample. A sampler may collect the gas sample in a container, actively pump the vapor through a sorbent tube, solution or filter, or rely on passive sample collection onto a sorbent bed. This guide focuses on collecting a sample in the most common air sampling containers, Summa canisters and bags. The sample may be collected in the container either passively, relying on an evacuated canister to drive the sample collection, or actively using a pump to fill the container. The container is subsequently sealed and transported to the laboratory for analysis. The sample is referred to as a "whole air sample" and the compounds remain in the gas matrix inside the container.

As a general rule, whole air sampling is appropriate when target compounds are chemically stable and have vapor pressures greater than 0.1 torr at 25°C and 760mm Hg (EPA standard ambient conditions). Performance of a given compound in a whole air sample is dependent upon its chemical properties, the matrix of the sample, and the degree of inertness of the sample container.

1.2 Choosing Between Canisters and Bags

Table 1.2 compares the features and performance of Summa canisters and bags. Summa canisters or similarly treated canisters are rugged containers designed to provide superior inertness and extended sample storage times. Evacuated canisters also do not require a sampling pump for sample collection. By contrast, bags require a sample pump, but can be purchased inexpensively in bulk, require little preparation or cleaning, and take up little space prior to use. Unlike canisters, bags are typically not appropriate for ppbv-level VOC measurements due to their background artifacts and short hold-times. Over time, low molecular weight gases can diffuse through the bag material while chemicals with lower vapor pressures can condense on the bag surface thereby compromising analyte recoveries. Call your Project Manager at 800-985-5955 if you have questions regarding the appropriate sampling media.

Table 1.2 Comparison of Canisters to Bags

	Canisters	Bags
Type of Sampling	Passive (vacuum)	Active (pump required)
Media Hold Time	Up to 30 days recommended	Indefinite
Hold Time to Analysis	Up to 30 days	Up to 3 days
Surface Inertness	Excellent	Fair
Cleanliness	Batch or 100% certified to ppbv/pptv levels	Some VOCs present in the ppbv range
Sampling Application	Ambient air, soil/landfill gas	Soil/landfill gas, stationary sources, SVE systems
Rule of Thumb	"ppbv device"	"ppmv device"
Advantages	Inertness, hold time, ruggedness, no pump	Purchase/shipping cost, availability, convenience

Section 2.0 Canisters and Associated Media

This section provides a description of air sampling canisters, practical considerations for sampling, and step-by-step instructions for collecting grab and integrated samples. Photographs illustrate the correct way to assemble the various sampling components. Tables provide detailed information on many operational factors that ultimately influence the quality of the data obtained from a canister sample.

2.1 Introduction to Canisters

An air sampling canister is a container for collecting a whole air sample. A canister may be spherical or cylindrical and is constructed of specially treated stainless steel. The canister is prepared for sampling by evacuating the contents to a vacuum of approximately 29.9 inches of Mercury (in Hg). Opening the stainless steel bellows valve allows the air sample to enter the canister. Flow controllers can be utilized to restrict the flow and allow for collection at a desired flow rate or over a desired range. When the sample has been collected, the valve is closed and the canister is returned to the laboratory. Canisters range in volume from less than 1 liter (L) to 6 L. In general, 6 L canisters are used to collect ambient air samples and samples requiring time integration greater than 2 hours. One liter canisters are typically used for taking high concentration (i.e., greater than 5 ppbv) samples not requiring time integration such as soil vapor.

2.1.1 Summa Canister

A Summa canister is a stainless steel container that has had the internal surfaces specially passivated using a "Summa" process. This process combines an electropolishing step with a chemical deactivation step to produce a surface that is nearly chemically inert. A Summa surface has the appearance of a mirror: bright, shiny and smooth. The degree of chemical inertness of a whole air sample container is crucial to minimizing reactions with the sample and maximizing recovery of target compounds from the container. Eurofins Air Toxics maintains a large inventory of Summa canisters in 1 and 6 L volumes.

2.1.2 Canister Certification

Eurofins Air Toxics provides two types of canister cleaning certification, batch and 100%, depending upon the requirements of the project. The batch certification process is most appropriate for routine ambient air applications and high concentration applications such as soil vapor and landfill gas monitoring. The batch certification process begins by cleaning a set of canisters using a combination of dilution, heat and high vacuum. The cleaning batch is certified by analyzing a percentage of canisters for approximately 60 VOCs using GC/MS. The batch meets cleaning requirements if the target compound concentrations are below 0.2 ppbv. Alternatively, the 100% certification (i.e., individual certification) process is typically required for ambient and indoor air applications driven by risk assessment or litigation requiring pptv (parts per trillion by volume) sensitivity. If 100% certification is required, canisters are individually certified for a client-specific list of target compounds using GC/MS. When the 100% certified canisters are shipped, the analytical documentation demonstrating that they are free of the target compounds down to the project reporting limits is emailed to the client. When sampling with certified media, it is important to note that all media is certified as a train and must be sampled as such (i.e., a particular flow controller goes with a particular canister and is labeled as such).

Specify whether your project requires batch or 100% canister certification.

2.1.3 Canister Hold Time

Media Hold Time: Unlike water and soil environmental samples, which are collected in single-use, disposable vials and jars, air samples are collected in reusable summa canisters. Eurofins Air Toxics requires that canisters be returned within 15 days of receipt to effectively manage our inventory and to insure canisters meet performance requirements in the field. Evacuated canisters have a finite timeframe before the canisters naturally lose vacuum during storage. Using canisters beyond 15 days increases the risk of having unacceptable initial vacuum at the start of sampling.

Sample Hold Time: EPA Method TO-15 cites a sample hold time of up to 30 days for most VOCs. Several non-routine compounds, such as bis(chloromethyl)ether, degrade quickly and demonstrate low recovery even after 7 days. Reactive sulfur compounds such as hydrogen disulfide and methyl, ethyl, and butyl mercaptan are not amenable to storage in stainless steel summa canister, and either fused silica lined (FSL) canisters or Tedlar bags are required for sample collection.

2.2 Associated Canister Hardware

Associated hardware used with the canister includes the valve, brass cap, particulate filter and vacuum gauge. (Flow controllers are covered in detail in section 3.2.)

2.2.1 Valve

An industry standard 1/4" stainless steel bellows valve is mounted at the top of the canister. The valve maintains the vacuum in the canister prior to sampling and seals the canister once the sample has been collected. No more than a half turn by hand is required to open the valve. Do not over-tighten the valve after sampling or it may become damaged. A damaged valve can leak, possibly compromising the sample. Some canisters have a metal cage near the top to protect the valve.

To protect the valve and provide secure connections in the field, a replaceable fitting is attached to all canisters. As threads wear and require replacement, new fittings can be installed at the laboratory prior to shipping to the field. You will need a 1/2" wrench to secure the fitting while connecting or removing the required equipment to the canister.

2.2.2 Brass Cap

Each canister comes with a brass cap (i.e., Swagelok 1/4" plug) secured to the inlet of the valve assembly. The cap serves two purposes. First, it ensures that there is no loss of vacuum due to a leaky valve or a valve that is accidentally opened during handling. Second, it prevents dust and other particulate matter from damaging the valve. The cap is removed prior to sampling and replaced following sample collection.

Always replace the brass cap following canister sampling.

2.2.3 Particulate Filter

Particulate filters should always be used when sampling with a canister. Separate filters are provided to clients taking a grab sample, and filters are built into the flow controllers for clients taking integrated samples. The 2 micron filter is a fritted stainless steel disk that has been pressed into a conventional Swagelok adapter. This device has a relatively high pressure drop across the fritted disk and restricts the flow into the canister even when sampling without a flow controller. Table 2.2.3 lists the typical fill time for a grab sample using a 2 micron particulate filter.

Table 2.2.3 Grab Sample Fill Times for Canisters

CANISTER VOLUME	2 micron filter
6 L	<5 minutes
1 L	<1 minute

2.2.4 Fittings

All fittings on the sampling hardware are 1/4" Swagelok, and a 9/16" wrench is used to assemble the hardware. A 1/2" wrench is also required to tighten fittings onto a union connector. Compression fittings should be used for all connections. Never use tube-in-tube connections. It is critical to avoid leaks in the sampling train. Leaks of ambient air through fittings between pieces of the sampling train will dilute the sample and cause the canister to fill at a faster rate than desired. Eurofins Air Toxics can provide the necessary fittings and ferrules if requested.

2.2.5 Vacuum Gauge

A vacuum gauge is used to measure the initial vacuum of the canister before sampling, and the final vacuum upon completion. A gauge can also be used to monitor the fill rate of the canister when collecting an integrated sample. Eurofins Air Toxics provides 2 types of gauges. For grab sampling, a test gauge checks initial and final vacuums only and is not to be sampled through. For integrated sampling a gauge is built into the flow controller and may be used for monitoring initial and final vacuums, as well as monitoring the fill rate of the canister. Both gauges are considered to be rough gauges, intended to obtain a relative measure of vacuum change. Accuracy of these field gauges are generally on the order of +/-5 in Hg. Individuals with work plans that outline specific gauge reading requirements are strongly encouraged to purchase and maintain their own gauges in the field. In special cases, a laboratory-grade, NIST-traceable vacuum gauge can be provided upon request.

> The vacuum gauges that are routinely provided are intended as a rough gauge measurement device (+/-5 in Hg accuracy).

Section 3.0 Sampling with Canisters

There are two basic modes of canister sampling: grab and integrated. A grab sample is taken over a short interval (i.e., 1-5 minutes) to provide a point-in-time sample concentration, while an integrated sample is taken over a specified duration or utilizing a specified flow rate. In both modes the canister vacuum is used to draw the sample into the canister. This is commonly referred to as passive canister sampling. Sections 3.1 and 3.2 detail procedures for grab and integrated sampling, and section 3.3 provides procedures specific to soil vapor collection.

Regardless of the type of canister samples collected, the following rules apply:

- DO NOT use canister to collect explosive substances, radiological or biological agents, corrosives, extremely toxic substances or other hazardous materials. It is illegal to ship such substances and you will be liable for damages.
- ALWAYS use a filter when sampling. NEVER allow liquids (including water) or corrosive vapors to enter canister.
- DO NOT attach labels to the surface of the canister or write on the canister; you will be liable for cleaning charges.
- DO NOT over tighten the valve, and remember to replace the brass cap.
- IF the canister is returned in unsatisfactory condition, you will be liable for damages.
- DO NOT make modifications to the equipment connections and/or use Teflon tape unless approved by the laboratory.
- AND, if you have any questions or need any support, our experienced project management team is just a phone call away at 800-985-5955.

Use a 9/16" and 1/2" wrench to tighten Swagelok connections on the canister sampling train.

3.1 Grab Sampling Using Canisters

The most common hardware configuration used to take a grab sample is to simply attach a particulate filter to the canister inlet. A particulate filter is shown in section 2.2.3 and is used to prevent particulate matter from fouling the valve and entering the canister.

3.1.1 Step-By-Step Procedures for Canister Grab Sampling

These procedures are for a typical ambient air sampling application; actual field conditions and procedures may vary.

Before you get to the field:

1. Verify contents of the shipped package (e.g., chain-of-custody, canister, particulate filter, and gauge – if requested).
2. Make sure you include a 9/16" and 1/2" wrench in your field tool kit.
3. Verify the gauge is working properly.
4. Verify the initial vacuum of canister as described in the following section:

- **Verify Initial Vacuum of the Canister**: Prior to shipment, each canister is checked for mechanical integrity. However, it is still important to check the vacuum of the canister prior to use. Eurofins Air Toxics recommends doing this before going to the field if possible. The initial vacuum of the canister should be greater than 25 in Hg. If the canister vacuum is less than 25 in Hg, ambient air may have leaked into the canister during storage or transport and the sample may be compromised. Contact your Project Manager if you have any questions on whether to proceed with sample collection. If sampling at altitude, there are special considerations for gauge readings and sampling (see Section 5.2). The procedure to verify the initial vacuum of a canister is simple but unforgiving.

1. Confirm that valve is closed (knob should already be tightened clockwise).
2. Remove the brass cap.
3. Attach gauge.
4. Attach brass cap to side of gauge tee fitting to ensure a closed train.
5. Open and close valve quickly (a few seconds).
6. Read vacuum on the gauge.
7. Record gauge reading on “Initial Vacuum” column of chain-of-custody.
8. Verify that canister valve is closed and remove gauge.
9. Replace the brass cap.

When ready to sample:

1. Confirm that valve is closed (knob should already be tightened clockwise).
2. Remove brass cap.
3. Attach particulate filter to canister.
4. Open valve 1/2 turn (6 L canister normally takes less than 5 minutes to fill).
5. Close valve by hand tightening knob clockwise.
6. Verify and record final vacuum of canister (repeat steps used to verify initial vacuum). For grab samples, the ending vacuum is typically close to ambient pressure (0 in Hg).
7. Replace brass cap.
8. Fill out canister sample tag (make sure the sample ID and date of collection recorded on the sample tag matches what is recorded on the COC exactly).
9. Return canister in box provided.
10. Return sample media in packaging provided.
11. Fill out chain-of-custody and relinquish samples properly (it is important to note the canister serial numbers on the chain-of-custody).
12. Place chain-of-custody in box and retain pink copy.
13. Tape box shut and affix custody seal (if applicable) across flap.
14. Ship accordingly to meet method holding times.

Return all equipment used or unused to the laboratory. Unreturned canisters and associated hardware will result in additional charges as outlined in the media agreement.

3.2 Integrated Sampling with Canisters and Flow Controllers

As an alternative to an “instantaneous” grab sample, an air sample collected at a controlled rate is referred to as an integrated sample. Flow controllers or flow restrictors are devices which provide sample collection at a desired flow rate and/or sampling interval. By using a flow controller at a specified flow rate, air samples can provide information on average compound concentrations over a defined period. For example, an 8- or 10-hour integrated sample can be used to determine indoor air quality in the workplace. Similarly, a 24-hour integrated sample may be collected to determine residential exposure to indoor or outdoor air sources. In addition to using a flow controller for time-integrated sample collection, a flow controller may be required for soil gas collection to restrict the vacuum applied to the soil and pore water and to collect a representative sample with minimal intrusion of ambient air.

Eurofins Air Toxics provides two general types of flow controllers: mass flow controllers and critical orifice devices. Both devices are driven by differential pressure between ambient conditions and vacuum in the canister.

3.2.1 Mass Flow Controller

A mass flow controller employs a diaphragm that actively compensates to maintain a constant mass flow rate over the desired time period. As the differential pressure decreases, the flow rate decreases and the diaphragm responds by opening up to allow more air to pass through to maintain a stable flow rate. Mass flow controllers are calibrated in the laboratory to provide flow rates suitable for durations up to 24 hours. Durations greater than 24 hours are possible, however, performance of the flow controller is less reliable due to the low flow rates required.

3.2.2 Critical Orifice Devices

Eurofins Air Toxics has two types of critical orifice controllers – "capillary column" and "frit pressed". Both types restrict the flow rate and the canister fill rate decreases as the canister fills to ambient pressure. These controllers are suitable for applications not requiring constant flow rate over the sampling period such as soil vapor collection or at sites in which temporal variability of VOCs is not expected. Critical orifice devices can cover intervals from 0.5 to 12 hours and flow rate from 10 to 250 ml/min. The "capillary column" device (also known as the Blue Body Flow Controller) restricts air flow by forcing the sample to enter a capillary column of minute radius. The flow rate is a function of the length of inert capillary column. The frit pressed device has a critical orifice machined to meet a set flow rate.

3.2.3 Sampling Interval and Flow Controller Setting

When you request canisters and flow controllers from Eurofins Air Toxics, you will be asked for the flow rate (soil vapor) or sampling interval (ambient air), and the flow controllers will be pre-set prior to shipment. The flow rate is set at standard atmospheric conditions (approximately sea level and 25°C). If samples will be collected at elevation or at ambient temperatures significantly different than 25°C, the canister will fill faster or slower depending on sample conditions. If you specify unusual sample conditions at the time of project set-up, we can set the flow controller accordingly. (See Section 5.2 for a discussion of collecting a sample at elevation.) Mass flow controllers should not be utilized for source or process samples in which the collection point is under vacuum or pressure. Please discuss these specific non-standard field conditions with your Project Manager at the time of project set-up.

Table 3.2.3 Flow Rates for Selected Sampling Intervals (mL/min)

Sampling Interval (hrs)	4 min.	0.5	1	2	4	8	12	24
6 L Canister	NA	167	83.3	41.7	20.8	11.5	7.6	3.8
1 L Canister	167	26.6	13.3	6.7	-	-	-	-

Note: Target fill volumes for 6 L and 1 L canisters are 5,000 mL and 800 mL, respectively.

3.2.4 Final Canister Vacuum and Flow Controller Performance

For time-integrated sample collection using a mass flow controller, the final vacuum of a canister should ideally be approximately 5 in Hg or greater. The flow rate will remain constant as the canister fills and will start to decrease as the canister vacuum approaches

5 in Hg. At this point, the differential pressure between the canister and ambient air is not sufficient to maintain the set flow rate. Because of normal fluctuations in the flow rate due to changes in field temperature and pressure, the final vacuum typically ranges between 3 and 10 in Hg.

- **If the residual canister vacuum is greater than 10 in Hg** (i.e., more vacuum), the actual flow rate is lower than the set point and less sample volume is collected. When the canister is pressurized prior to analysis, the pressurization dilution will be greater than normal. This will result in elevated reporting limits.
- **If the residual canister vacuum is near ambient pressure** for a time-integrated sample, the canister filled faster than calibrated. Once the vacuum decreases below 5 in Hg, the flow rate begins to decrease from its set point. This scenario indicates that the sample is weighted toward the first portion of the sampling interval. The sampler cannot be certain the desired sampling interval was achieved before the canister arrived at ambient conditions. Although the actual sampling interval is uncertain, the canister still contains a sample from the site.

Table 3.2.4 Relationship between Final Canister Vacuum, Volume Sampled, and Dilution Factor (6 L Canister)

Final Vacuum (in Hg)	**0**	**2.5**	**5**	**7.5**	**10**	**12.5**	**15**	**17.5**	**20**
Volume Sampled (L)	6	5.5	5.4	5	4	3.5	3	2.5	2
Dilution Factor*	1.34	1.46	1.61	1.79	2.01	2.30	2.68	3.22	4.02

*Canister pressurized to 5 psig for analysis

$$\textbf{Final Reporting Limit} = \text{Method Reporting Limit} \times \text{Dilution Factor (Canister Pressurization)} \times \text{Dilution Factor (Sample Analysis)}$$

$$\textbf{Dilution Factor (Canister Pressurization)} = \frac{\text{Final Pressure}}{\text{Receipt Pressure}} = \frac{14.7\text{ psig} + \text{Final Pressure (psig)}}{14.7\text{ psig}\left[\dfrac{1-\text{Receipt Vacuum (in Hg)}}{29.9\text{ in Hg}}\right]}$$

3.2.5 Considerations for Integrated Sampling with Canisters

Collecting an integrated air sample is more involved than collecting a grab sample. Sampling considerations include verifying that the sampling train is properly configured, monitoring the integrated sampling progress, and avoiding contamination.

- **Avoid Leaks in the Sampling Train**: A leak in any one of these connections means that some air will be pulled in through the leak and not through the flow controller. (Follow the leak check step #4 in 3.2.6).
- **Verify Initial Vacuum of Canister:** See Section 3.1.1 for instructions on verifying initial canister vacuum. A separate gauge is not necessary as both the mass flow controllers and critical orifice flow controllers have built-in rough gauges.
- **Monitor Integrated Sampling Progress**: When feasible, it is a good practice to monitor the progress of the integrated sampling during the sampling interval. The volume of air sampled is a linear function of the canister vacuum. For example, when using a 24-hour mass flow controller, at a quarter of the way (6 hours) into a 24-hour sampling interval, the canister should be a quarter filled (1.25 L) and the gauge should read approximately 6 in Hg lower than

the starting vacuum (~22 in Hg). More vacuum indicates that the canister is filling too slowly; less vacuum means the canister is filling too quickly. If the canister is filling too slowly, a valid sample can still be collected (see Section 3.2.4). If the canister is filling too quickly because of a leak or incorrect flow controller setting, corrective action can be taken. Ensuring all connections are tight may eliminate a leak. It is possible to take an intermittent sample; the time interval need not be continuous.

- **Avoid Contamination**: Flow controllers should be cleaned between uses. This is done by returning them to the laboratory.
- **Caution When Sampling in Extreme Temperatures**: Field temperatures can affect the performance of the mass flow controllers. Laboratory studies have shown that flow rates can increase slightly with decreasing temperatures. A flow rate increase of approximately 10% is expected when sampling at field temperatures of 5 to 10°C.

3.2.6 Step-by-Step Procedures for Integrated Sampling

These procedures are for a typical ambient air sampling application; actual field conditions and procedures may vary.

Before you get to the field:

1. Verify contents of the shipped package (e.g., chain-of-custody, canister, and flow controller)
2. Make sure you include a 9/16" and 1/2" wrench in your field tool kit.
3. Verify the gauge is working properly
4. Verify the initial vacuum of canister (section 3.1.1)

When ready to sample:

1. Confirm that valve is closed (knob should already be tightened clockwise).
2. Remove brass cap from canister.
3. Attach flow controller to canister. The flow controller is securely attached if the flow controller body does not rotate.
4. Place the brass cap at the end of the flow controller creating an air tight train, and quickly open and close the canister valve in order to check for leaks. If the needle on the gauge drops, your train is not airtight. In this case, try refitting your connections and/or tightening them until the needle holds steady.
5. Once the sample train is airtight remove the brass cap from the flow controller and open the canister valve a ½ turn.
6. Monitor integrated sampling progress periodically.
7. Verify and record final vacuum of canister (simply read built-in gauge).
8. When sampling is complete, close valve by hand tightening knob clockwise.
9. Detach flow controller and replace brass cap on canister.
10. Fill out canister sample tag (make sure the sample ID and date of collection recorded on the sample tag matches what is recorded on the COC exactly).
11. Return canisters and associated media in boxes provided. **Failure to return all of the provided equipment will result in a replacement charge as outlined in the media agreement.**
12. Fill out chain-of-custody and relinquish samples properly (it is important to note the canister serial numbers on the chain-of-custody).
13. Place chain-of-custody in box and retain pink copy.
14. Tape box shut and affix custody seal at each opening (if applicable).
15. Ship accordingly to meet method holding times.

3.3 Soil Gas Sample Collection

Canisters can be used for the collection of soil vapor by attaching the sampling train to the soil gas probe. Typically, a critical orifice flow controller is used to minimize the applied vacuum in order to minimize partitioning of VOCs from the soil or pore water to the soil vapor. Additionally, lower flow rates help to minimize the intrusion of ambient air into the soil vapor probe. In general, time-integration is not required for soil gas samples; however, there may be exceptions to this rule of thumb. For example, some regulatory guidance documents recommend concurrent indoor air and sub-slab soil vapor collection over a

24-hour period. This means that a mass flow controller calibrated for a 24-hour sample would be required for the sub-slab as well as the indoor air sample.

3.3.1 Canister to probe connection – Tubing

Collection of a soil gas sample requires the use of tubing to connect the soil gas probe to the sample train. Teflon FEP tubing is recommended based on its low background and its inertness. Alternative tubing can be used if shown to meet data quality objectives. Please note that Low Density Polyethylene or flexible Tygon tubing is not recommended due to VOC adsorption during sample collection. Teflon tubing is provided by the laboratory upon request at the time of order. A charge based on the length will be assessed. It is important to store the tubing away from VOC sources during storage and transport to the site to minimize contamination.

3.3.2 Canister to probe connection –Fittings

To connect the tubing to the canister sampling train, a Swagelok fitting and a pink ferrule are used. The position of the ferrule is key to ensure the fitting is securely connected to the canister. See the figure below for the correct positioning and connection. The pink ferrule is flexible and cannot be over-tightened.

3.3.3 Leak Check Compounds Considerations

To determine whether ambient air is introduced into soil gas sample, a leak check may be used. Leak check compounds may be liquid or gaseous tracers. Liquid compounds are challenging to use effectively in the field and can be introduced into the sample due to improper handling in the field, erroneously indicating a leak in the sampling train. Liquid tracers such as isopropanol should never be directly applied to connections in the sampling train. Rather, the liquid is carefully applied to a cloth and placed near the connection or on the ground next to the probe. Great care must be used in the field to insure the liquid tracer is not handled during sampling train assembly or disassembly. Even a trace amount of a liquid tracer on a glove used to replace a canister brass cap can contaminate the sample. Liquid leak check compounds can interfere with the analytical runs, and even small leaks may result in analytical dilution and raised reporting limits when measuring ppbv target compound levels.

Gaseous tracers such as helium are typically used with shroud placed over the sampling equipment and/or borehole.   To quantify the leak, the concentration of the tracer gas in the shroud should be measured.

Specify the leak check compound planned for your soil gas sampling event and record on the COC.

3.3.4 Step-by-Step Procedures for Soil Vapor Sampling

These procedures are for a typical soil vapor sampling application; actual field conditions and procedures may vary. Please consult your specific regulatory guidance for details.

Before you get to the field:

1. Verify contents of the shipped package (e.g., chain-of-custody, canister, tubing, fittings, and flow controller).
2. Make sure you include a 9/16" and 1/2" wrench in your field tool kit.
3. Verify the gauge is working properly.
4. Verify the initial vacuum of canister.

Prior to vapor collection:

- **Purge tubing adequately**. A long length of tubing has significant volume of "dead air" inside. Without purging, this air will enter the canister and dilute the sample. Consider using a handheld PID/FID to confirm that you have purged the tubing and are drawing sample air through the tubing. A standard rule of thumb is to utilize 3 purge volumes prior to sample collection. However, under certain circumstances, purge volumes of 1 to 10 may be appropriate. Please review your regulatory guidance and your site specific conditions in determining the appropriate purge volumes.
- **Don't sample water**. If moisture is visible in the sample tubing, the soil gas sample may be compromised. Soil gas probes should be at an appropriate depth to avoid reaching the water table. Additionally, subsurface vapor should not be collected immediately after measurable precipitation.

When ready to sample:

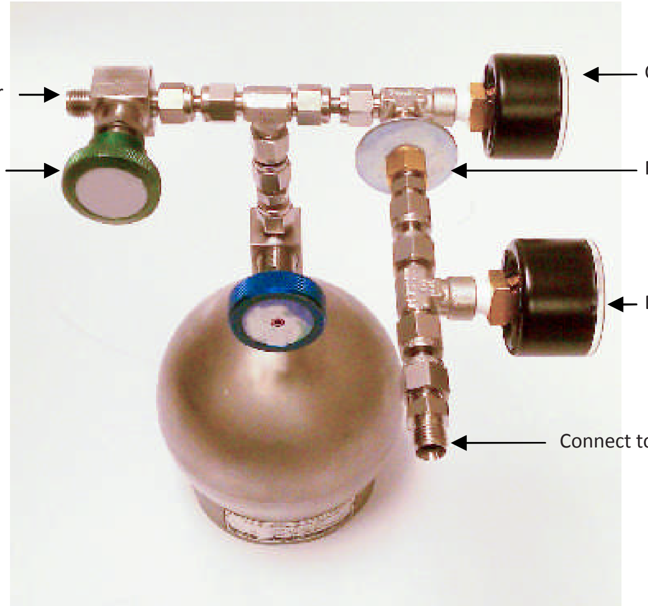
1. Confirm that valve is closed (knob should already be tightened clockwise).
2. Remove brass cap from canister.
3. Attach flow controller to canister if needed. The flow controller is securely attached if the flow controller body does not rotate. (Note: The frit-press flow controller and 1 L canister may be pre-assembled by the laboratory.)
4. Place the brass cap at the end of the flow controller creating an air tight train, and quickly open and close the canister valve in order to check for leaks. If the needle on the gauge drops, your train is not airtight. In this case, try refitting your connections and/or tightening them until the needle holds steady.
5. Once the sample train is airtight remove the brass cap from the flow controller and attach the probe tubing to the flow controller using the pink ferrule and Swagelok nut. (See 3.3.2 for proper positioning of the ferrule.)
6. Once the probe line has been purged and appropriate leak check measures have been implemented, open the canister valve a ½ turn.
7. Verify and record final vacuum of canister (simply read built-in gauge).
8. When canister fills to the desired end vacuum, close valve by hand tightening knob clockwise.

   Please note: Some projects require residual vacuum of approximately 5 in Hg at the end of sample collection even if time-integrated samples are not required. The residual vacuum serves to provide a check of the integrity of the canister during transport to the laboratory to insure no leaks occurred during shipment. A field vacuum reading similar to the lab receipt vacuum reading demonstrated that no leak occurred.

9. Detach tubing and flow controller and replace brass cap on the canister.
10. Fill out canister sample tag (make sure the sample ID and date of collection recorded on the sample tag matches what is recorded on the COC exactly).
11. Return canisters and associated media in boxes provided. **Failure to return all of the provided equipment will result in a replacement charge as outlined in the media agreement.**
12. Fill out chain-of-custody and relinquish samples properly (it is important to note the canister serial numbers on the chain-of-custody).
13. Place chain-of-custody in box and retain pink copy
14. Tape box shut and affix custody seal at each opening (if applicable)
15. Ship accordingly to meet method holding times

3.4.4 Collecting Soil Gas Samples with Sampling Manifolds

If required, Eurofins Air Toxics can provide a sampling manifold to assist with leak checking the sampling train, purging the sampling line, and monitoring the vacuum applied to the soil gas bore hole during sample collection. The manifold is shown below:



The 'Down Hole Gauge', located prior to the flow restrictor, is a vacuum gauge that monitors the vacuum applied to the soil gas probe. Because this is not a flow meter but a measure of pressure/vacuum, the gauge should read at zero if there is sufficient flow from the soil. If the gauge begins to read a vacuum, then the flow is being restricted. Low flow, high vacuum conditions can be encountered when sampling in low permeability soil. The 'Canister Gauge', in line after the flow controller and prior to the purge canister, is a vacuum gauge that indicates to the sampler whether or not the canister is filling properly at the expected rate. This setup enables the sampler to evaluate the lithologic conditions at the site and determine if a valid soil gas sample is being taken. Finally, when duplicate samples are required, the manifold can be used as a duplicate sampling "T" by simply replacing the purge canister with another sample canister.

There are several options to use as a purge vacuum source to attach to the purge valve connection – a Summa canister, sampling pump or sampling syringe. The below instructions assume a Summa canister will be used as a purge volume source since other sources are generally provided by the client.

When ready to sample:

Leak Check Test

1. Confirm that canister valves are closed (knob should already be tightened clockwise).

2. Remove brass caps from both the sample canister and the purge canister. (Unless using certified media, there is no difference between the two).

3. Attach manifold center fitting to sample canister.

4. Attach purge canister to the Purge Valve end of the manifold by attaching provided Teflon tubing and compression fittings.

5. Confirm that there is a brass cap secured at the inlet of the manifold creating an air tight train, make sure the manifold valve above the purge canister is open, and quickly open and close the purge canister valve in order to check for leaks. If the needle on the gauge drops, your train is not airtight. In this case, try refitting your connections and/or tightening them until the needle holds steady.

Purging

6. Once the sample train is airtight remove the brass cap from the manifold inlet, connect the tubing from the sample port using a compression fitting and open the purge canister valve, 1/2 turn.

7. Monitor integrated sampling progress periodically. *Please note, because the purge canister is inline after the flow restrictor the line will not purge faster than at a rate of 167 ml/min.

8. Once the desired purge volume is met close both the manifold valve and the purge canister valve by hand tightening the knobs clockwise.

9. If sampling at multiple locations, the purge canister can be disconnected from the manifold and used to begin purging the next sample location without compromising the sample train.

Sampling

10. The line is now ready to be sampled. Open the sample canister valve and monitor sampling progress periodically.

11. When the sampling is complete close the valve and replace the brass cap on the canister; record final vacuum of canister (simply read built-in gauge).

12. Fill out canister sample tag (make sure the sample ID and date of collection recorded on the sample tag matches what is recorded on the COC exactly).

13. Return canisters in boxes provided and all parts of the soil gas manifold. **Unreturned media will result in a replacement charged assessed as described in the media agreement**.

14. Fill out chain-of-custody and relinquish samples properly (it is important to note the canister serial numbers on the chain-of-custody).

15. Place chain-of-custody in box and retain pink copy.

16. Ship accordingly to meet method holding times.

Section 4.0 Sampling with Bags

This section provides a description of the types of air sampling bags, selecting the right bag for your application, practical considerations for sampling, and step-by-step instructions for collecting a grab sample. Photographs illustrate the correct way to assemble the various sampling components.

4.1 Introduction to Bags

Air sampling bags are containers used to collect whole air samples for landfill gas, soil gas and stationary source applications. Bags can be constructed from various materials which can differ in terms of stability characteristics and cleanliness. In general, air sampling bags are best suited for projects involving analysis of compounds in the ppmv range. They can be used to collect sulfur compounds, but only if the fittings are non-metallic (e.g., polypropylene, Teflon®, or Nylon).

Air sampling bags are equipped with a valve that allows for filling. Sample collection requires a pressurized sampling port, a low flow rate pump or a lung sampler. The bag expands as the vapor sample is pulled in. When the target volume of the sample is collected, the valve is closed and the bag is returned to the laboratory. Bag materials should be selected based on the specific application. Common air sampling bags include Tedlar film and FlexFoil. Eurofins Air Toxics maintains a limited inventory of air sampling bags in 1 L, 3 L and 5 L volumes.

4.1.1 Tedlar® Film

Tedlar® is a trade name for a polyvinyl fluoride film developed by DuPont Corporation in the 1960's. This patented fluoropolymer has been used in a wide variety of applications including protective surfacing for signs, exterior wall panels and aircraft interiors. Tedlar® film is tough yet flexible and retains its impressive mechanical properties over a wide range of temperatures (from well below freezing to over 200°F). Tedlar® exhibits low permeability to gases, good chemical inertness, good weathering resistance and low off-gassing.

Tedlar® bags may be used to collect samples containing common solvents, hydrocarbons, chlorinated solvents, sulfur compounds, atmospheric and biogenic gases and many other classes of compounds. Compounds with low vapor pressures such as Naphthalene are not appropriate for Tedlar bags as recovery is very low even under short sample storage times. Low molecular compounds such as Helium and Hydrogen can diffuse through the Tedlar bag material resulting in poor storage stability.

4.1.2 Tedlar® Bag Suppliers and Re-use

Compounds commonly detected from analyzing new Tedlar® bags include methylene chloride, toluene, acetone, ethanol, 2-propanol, phenol, and dimethylacetamide. While levels of these common artifacts are typically in the ppbv range, the cleanliness of bags can vary significantly between vendors, and purchasing bags directly from an unknown vendor should be avoided. Once the Tedlar® bag is used for sample collection, the surface has been exposed to moisture and possible VOCs. It may irreversibly adsorb many VOCs at the low ppbv level. A series of purges with certified gas may not remove the VOCs from the surface. Consider your data quality objectives to determine whether re-using Tedlar® bags is appropriate.

4.1.3 Hold Time for a Tedlar® Bag

The media hold time for a Tedlar® bag is indefinite if stored out of sunlight in a cool, dry location.

The sample hold time to analysis varies by method and compound. See Table 4.1.3 for recommended sample storage times for commonly requested parameters.

Table 4.1.3 Recommended Maximum Sample Storage Times for Tedlar® Bags

Analytical Method	Chemical Class	Storage Time
ASTM D5504	Suite of sulfur compounds including Reactive Sulfur compounds (Hydrogen sulfide, Methyl mercaptan)	24 hours
ASTM D1946 ASTM D1945	Atmospheric and natural gases: CO, CO2, CH4, C2-C5 hydrocarbons (He and H_2 not recommended)	Up to 3 days
Modified TO-14A, TO-15, TO-3, TO-12	Volatile Organic Compounds (VOCs)	Up to 3 days

4.1.4 FlexFoil Bags

FlexFoil bags are made from an opaque and flexible material with 4-ply construction resulting in high physical strength to minimize rupture and leakage and low permeability to provide good stability for low molecular weight compounds. FlexFoil bags are ideal for target compounds such as Hydrogen and Helium and can be used for the suite of atmospheric and natural gas components. While the reactive sulfur compounds, Hydrogen Sulfide and Methyl Mercaptan, show good stability over 24 hours in FlexFoil bags, other sulfur compounds demonstrate low recovery. Table 4.1.4 summarizes the compounds and the hold times amenable to FlexFoil bags.

Table 4.1.4 Recommended Maximum Sample Storage Times for FlexFoil Bags

Analytical Method	Chemical Class	Storage Time
ASTM D5504	Hydrogen sulfide, Methyl mercaptan only Not recommended for full sulfur list.	24 hours
ASTM D1946 ASTM D1945	Atmospheric and natural gases Full List	Up to 3 days

4.2 Air Bag Sampling

Using a bag to collect an air sample normally involves "active" sampling, unlike an evacuated canister that can be filled "passively" by simply opening the valve. There are two methods commonly used to fill a bag: a pump or a lung sampler.

- **Sampling with a Pump**: The most common method for filling a bag is to use a small pump with low flow rates (50-200 mL/min) and tubing to fill the bag. Eurofins Air Toxics, Inc. does not provide pumps but pumps may be rented from equipment providers or purchased from manufacturers such as SKC or Gilian.
- **Sampling with a Lung Sampler**: A "lung sampler" may be used to fill a bag. Although a little more complicated than simply using a pump, the main advantage to using a lung sampler to fill a bag is that it avoids potential pump contamination.

A bag with attached tubing is placed in a small airtight chamber (even a 5-gallon bucket can work) with the tubing protruding from the chamber. The sealed chamber is then evacuated via a pump, causing the bag to expand and draw the sample into the bag through the protruding tube. The sample air never touches the wetted surfaces of the pump. Eurofins Air Toxics does not provide lung samplers, but they can be rented from equipment suppliers or purchased by manufacturers such as SKC Inc.

4.2.1 Considerations for Bag Sampling

Some considerations for collecting a bag sample:

- **Fill the bag no more than 2/3 full**: Allow for possible expansion due to an increase in temperature or decrease in atmospheric pressure (e.g., the cargo hold of a plane)
- **Keep the Tedlar® bag out of sunlight**: Tedlar® film is transparent to ultraviolet light (although opaque versions are available) and the sample should be kept out of sunlight to avoid any photochemical reactions
- **Protect the bag**: Store and ship the bag samples in a protective box at room temperature. An ice chest may be used, but DO NOT CHILL
- **Fill out the bag label**: It is much easier to write the sample information on the label before the bag is inflated. Make sure to use a ball-point pen, never a Sharpee or other marker which can emit VOCs.
- **Provide a "back-up" bag**: Consider filling two bags per location in the rare occasion that a defective bag deflates before analysis. The "hold" sample does not need to be documented on the Chain-of-Custody and should have an identical sample ID to the original sample indicating that it is the "hold" sample
- **Avoid Contamination**: Care should be taken to avoid contamination introduced by the pump or tubing. Begin sampling at locations with the lowest compound concentrations (e.g., sample the SVE effluent before the influent). Decontaminate the pump between uses by purging with certified air for an extended period; better yet, use a lung sampler. Use the shortest length possible of Teflon® tubing or other inert tubing. DO NOT REUSE TUBING. If long lengths of tubing are used, consider purging the tubing with several volumes worth before sampling. If you are concerned about sampling for trace compounds, you shouldn't be using a Tedlar® bag (see Section 1.2)
- **Don't Sample Dangerous Compounds in a Bag**: Do not ship any explosive substances, radiological or biological agents, corrosives or extremely hazardous materials to Eurofins Air Toxics. Bag rupture during transit to the laboratory is possible and the sampler assumes full liability.

4.2.2 Step-by-Step Procedures for Bag Sampling (Pump)

Note: These procedures are for a typical stationary source (e.g., SVE system) sampling application; actual field conditions and procedures may vary.

Before you get to the field:

1. Verify contents of the shipped package (e.g., chain-of-custody, bag, and tubing/fittings – if requested).
2. Verify pump cleanliness and operation (Eurofins Air Toxics does not provide pumps).

When ready to sample:

3. Purge sample port.
4. Attach new Teflon® tubing from sample port or probe to low flow rate pump.
5. Purge tubing.
6. Fill out bag sample tag.
7. Attach additional new Teflon® tubing from the pump outlet to the bag valve.
8. Open bag valve.
9. Collect sample (FILL NO MORE THAN 2/3 FULL).
10. Close bag valve by hand tightening valve clockwise.
11. Return filled bags in a rigid shipping container (DO NOT CHILL).
12. Fill out chain-of-custody and relinquish samples properly.
13. Place chain-of-custody in box and retain pink copy.

14. Tape box shut and affix custody seal (if applicable) across flap.
15. Ship first overnight or priority overnight to meet method holding times.

Expedite delivery of air sampling bags to the laboratory for analysis.

Section 5.0 Special Sampling Considerations

This section provides recommendations for the collection of field QC samples such as field duplicates. Considerations for sampling at altitude, sampling SVE ports and using sample cylinders are presented.

5.1 Field QC

To measure accuracy and precision of the field activities, project plans often include field duplicates, field blanks, ambient blanks, trip blanks and/or equipment blanks.

5.1.1 Field Duplicate

A field duplicate is a second sample collected in the field simultaneously with the primary sample at one sampling location. The results of the duplicate sample may be compared (e.g., calculate relative percent difference) with the primary sample to provide information on consistency and reproducibility of field sampling procedures. Due to the nature of the gas phase, duplicate samples should be collected from a common inlet. The configuration for collecting a field duplicate includes stainless steel or Teflon® tubing connected to a Swagelok "T". If integrated samples are being collected and the sample duration is to be maintained, the sample train should be assembled as follows: each canister should have a flow controller attached, then the duplicate sampling T should be attached to the flow controllers. If the collection flow rate from the sample port is to be maintained then the duplicate sampling T should be connected to the canisters; then the flow controller is connected to the inlet of the sampling T.

Alternatively, if the project objective is to assess spatial or temporal variability, then field duplicates may be deployed in close proximity (ambient air sampling) or samples may be collected in succession (soil vapor).

5.1.2 Field Blank

A field blank is a sample collected in the field from a certified air source. Analysis of the field blank can provide information on the decontamination procedures used in the field. Clean stainless steel or Teflon® tubing and a certified regulator should be used. It is imperative that individually certified canisters (the sample canister and the source canister/cylinder, if applicable) be used to collect a field blank.

5.1.3 Ambient Blank

An ambient blank is an ambient air sample collected in the field. It is usually used in conjunction with soil gas or stationary source (e.g., SVE system) sampling. Analysis of the ambient blank can provide information on the ambient levels of site contaminants. It is recommended that an individually certified canister be used to collect an ambient blank.

5.1.4 Trip Blank

When sampling for contaminants in water, the laboratory prepares a trip blank by filling a VOA vial with clean, de-ionized water. The trip blank is sent to the field in a cooler with new sample vials. After sampling, the filled sample vials are placed back in the cooler next to the trip blank and returned to the laboratory. Analysis of the trip blank provides information on decontamination and sample handling procedures in the field as well as the cleanliness of the cooler and packaging.

When sampling for compounds in air, a trip blank provides little, if any, of the information above. A trip blank canister can be individually certified, evacuated, and sent to the field in a box with the sample canisters. Since the valve is closed and the brass cap tightened, it is questionable if the trip blank canister contents are ever "exposed" to sampling conditions. The trip blank VOC concentrations essentially provide information regarding the cleanliness and performance of the trip blank canister. Results cannot necessarily be applied to the associated field sample canisters accompanying the trip blank. **Eurofins Air Toxics does not recommend collecting a trip blank for air sampling.**

5.2 Considerations for Sampling at Altitude

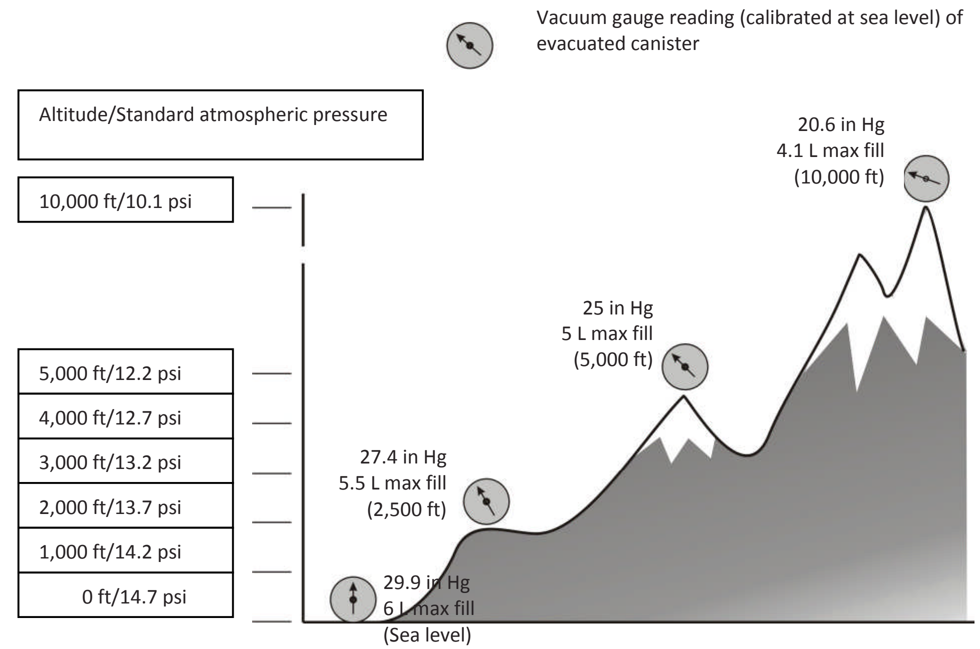
Sampling at altitudes significantly above sea level is similar to sampling a stationary source under vacuum in that target fill volumes may be difficult to achieve. The figure to the right illustrates the relationship between increasing altitude and decreasing atmospheric pressure. Ambient conditions in Denver at 5,000 ft altitude are quite different from ambient conditions at sea level. Canister sampling is driven by the differential pressure between ambient conditions and the vacuum in the canister.

There is less atmospheric pressure in Denver and 5 L is the maximum fill volume of standard air assuming the canister is allowed to reach ambient conditions (i.e., final gauge reading of 0 in Hg). Theoretically, if you sample high enough (e.g., in space), no sample would enter the canister because there is no pressure difference between the evacuated canister and ambient conditions. To fill a canister to 6 L in Denver, you would need to use an air pump.

Sampling at altitude also affects gauge readings. The gauges supplied by Eurofins Air Toxics, Inc. (see Section 2.2.4) measure canister vacuum relative to atmospheric pressure and are calibrated at approximately sea level. Before sampling at altitude, the gauges should be equilibrated (see Section 3.1). But even after equilibrating the gauge, verifying the initial vacuum of a canister at altitude is misleading. In Denver at 5,000 ft, expect the gauge to read 25, not 29.9 in Hg. You do not have a bad canister (i.e., leaking or not evacuated properly). The canister is ready for sampling and the gauge is working properly.

> Rule of Thumb: For every 1,000 ft of elevation, the gauge will be off by 1 in Hg and the fill volume will be reduced by 1/5 L.

If you have questions about sampling at altitude, please call your Project Manager at 800-985-5955.



5.3 Considerations for SVE/LFG Collection System Sampling

There are some additional sampling considerations for collecting grab samples (canister or bag) from a Soil Vapor Extraction (SVE) system or landfill gas (LFG) collection system. The general challenge with these samples arises from the need to employ a length of tubing to direct the landfill gas or process air to the canister or bag. Tubing introduces the potential for contamination and diluting the sample.

- **Use inert tubing**. Teflon® tubing is recommended. Tubing with an outer diameter of ¼" works best with the fittings on the particulate filter. (See Section 3.3.1).
- **Do not reuse tubing**.
- **Purge tubing adequately**. A long length of tubing has significant volume of "dead air" inside. Without purging, this air will enter the canister and dilute the sample. Consider using a handheld PID/FID to confirm that you have purged the tubing and are drawing sample air through the tubing.
- **Avoid leaks in the sampling train**. Leaks of ambient air through fittings between pieces of the sampling train (e.g., tubing to particulate filter) will dilute the sample.
- Always use compression fittings for all connections; never use tube in tube connections.
- **Purge the sample port**. A sample port on an SVE system or LFG collection system can accumulate solids or liquids depending upon the location of the port in the process and the orientation of the port. An influent sample port located upstream of a filter or moisture knock-out can be laden with particulates or saturated with water vapor. Heavy particulate matter can clog the particulate filter and foul the canister valve. It is important to prevent liquids from entering the canister. A sample port oriented downward may have liquid standing in the valve. Purge the sample port adequately before connecting the sampling train.
- **Consider the effects of sampling a process under vacuum or pressure**. When collecting a grab sample from a stationary source such as an SVE system or LFG collection system, some sample ports may be under vacuum or pressure relative to ambient conditions. When the sample port is under vacuum, such as the header pipe from the extraction well network, it may be difficult to fill the canister with the desired volume of sample. A vacuum pump may be used to collect a canister grab sample from a sample port under considerable vacuum. See the related discussion on sampling at altitude in Section 5.2. When the sample port is under pressure, such as the effluent stack downstream of the blower and treatment system, you may inadvertently pressurize the canister. Only a DOT-approved sample cylinder should be used to transport pressurized air samples (see Section 5.4). Under no circumstances should a Summa canister be pressurized more than 15 psig. Bleed off excess pressure by opening the valve temporarily while monitoring the canister with a pressure gauge.

5.4 Considerations for Sample Cylinder Sampling

Sample cylinders, also known as "sample bombs", are DOT-approved, high pressure, thick-walled, stainless steel cylinders with a valve at each end. They were intended for collecting a pressurized sample for petroleum gas applications. Sample cylinders differ from sample canisters in that they do not have a Summa-passivated interior surface and are not evacuated prior to shipment. Sample cylinders are not suitable for analysis of hydrocarbons at ppbv levels. Sample cylinders can be used for analysis of natural gas by ASTM D-1945 and calculation of BTU by ASTM D-3588. Eurofins Air Toxics assumes that clients requesting a sample cylinder have a pressurized process and sample port with a built-in gauge and 1/4" Swagelok fitting to attach to the sample cylinder. Eurofins Air Toxics has a limited inventory of 500 mL sample cylinders that are particularly suited for landfill gas collection systems (i.e., LFG to energy applications). This section provides step-by-step procedures for sampling with a sample cylinder.

Inform the lab during project set up if hazardous samples (e.g. high Hydrogen Sulfide concentrations) will be collected to verify the lab can safely handle the samples.

Step-by-Step Procedures for Sample Cylinder Sampling

These procedures are for a typical stationary source sampling application and actual field conditions; procedures may vary. Follow all precautions in the site Health and Safety Plan when dealing with a pressurized sample port and sample cylinder. Follow required DOT guidelines for packaging and shipping.

1. Verify contents of the shipped package (e.g., chain-of-custody, sample cylinder, particulate filter).
2. Verify that gauge on sample port is working properly.
3. Purge sample port.

4. Remove brass caps on either end of cylinder.
5. Attach particulate filter to upstream valve.
6. Attach filter/cylinder assembly directly to the sample port.
7. Open both valves 1/2 turn.
8. Allow sample air to flow through sample cylinder (approximately 10 L for a 500 mL cylinder).
9. Close downstream valve of sample cylinder by hand tightening knob clockwise.
10. Allow sample cylinder to pressurize to process pressure (max 100 psig).
11. Close upstream valve of sample cylinder and sample port.
12. Detach filter/cylinder assembly from sample port and remove particulate filter.
13. Replace brass caps.
14. Fill out sample cylinder sample tag.
15. Fill out chain-of-custody and relinquish samples properly.
16. Include the chain-of-custody with the samples and retain pink copy.
17. Pack, label, and ship according to DOT regulations.

Follow DOT regulations for packaging and shipping hazardous samples.

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Soil Gas Sampling – PRT System Operation

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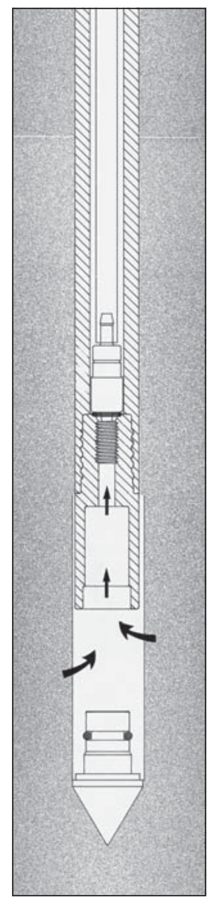


Soil Gas Sampling using the Post-Run Tubing (PRT) System.

Soil Gas Sampling — PRT System Operation

Basics
Using the Post-Run Tubing System, one can drive probe rods to the desired sampling depth, then insert and seal an internal tubing for soil gas sampling. The usual Geoprobe probe rods and driving accessories and the following tools are required:

- PRT Expendable Point Holder
- PRT Adapter
- Selected PRT Tubing

Preparation
1. Clean all parts prior to use. Install O-rings on the PRT Expendable Point Holder and the PRT adapter.

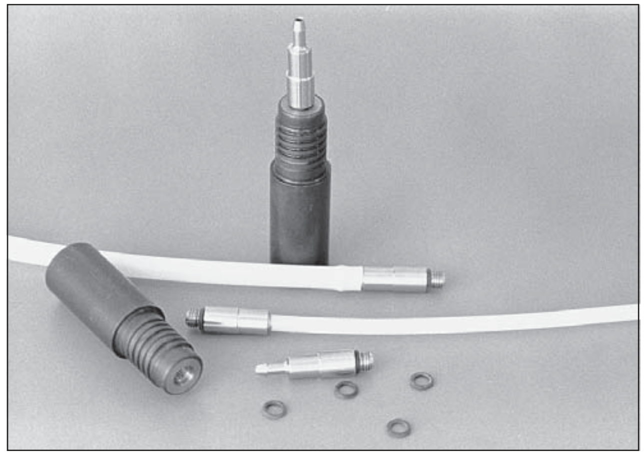
2. Inspect the probe rods and clear them of all obstructions.

3. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly.

   NOTE: PRT fittings are left-hand threaded.

4. Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection – especially when using Teflon tubing **(Figure 1)**.

   REMEMBER: The sample will not contact the outside of the tubing or adapter.



PRT SYSTEM PARTS
PRT Expendable Point Holder, PRT Adapters, Tubing, and O-rings.

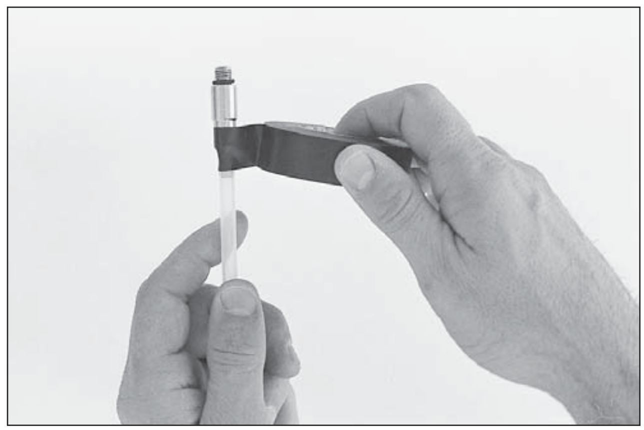


Figure 1. Securing adapter to tubing with tape. NOTE: Tape does not contact soil gas sample.

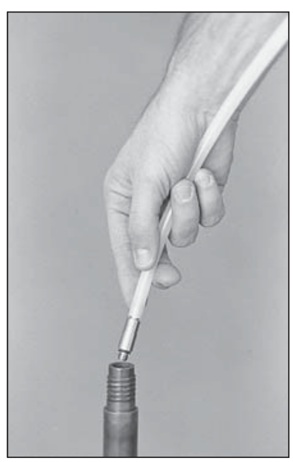
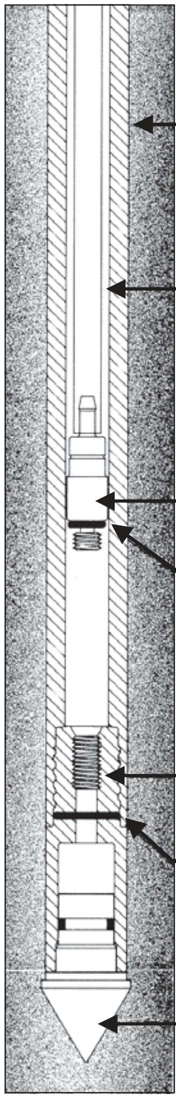


Figure 2. Insertion of tubing and PRT adapter.

Figure 3. Engaging threads by rotating tubing.



A cross section of probe rods driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.

Probing

Drive the PRT tip configuration into the ground. Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work.

Connection

1. Insert the adapter end of the tubing down the inside diameter of the probe rods **(Figure 2)**.

2. Feed the tubing down the rod bore until it hits bottom on the expendable point holder. Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it.

3. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder **(Figure 3)**.

4. Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)

Sampling

1. Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus).

2. Follow the appropriate sampling procedure for collecting a soil gas sample **(Figure 1)**.

Removal

1. After collecting a sample, disconnect the tubing from the vacuum hose or sampling system.

2. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.)

3. Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon tubing as protocol dictates.

4. Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter.

5. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter.

6. Prepare for the next sample.

Figure 1. Taking a soil gas sample for direct injection into a GC with the PRT system.

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Soil Gas Sampling Kit Instructions

Please read the entire set of instructions prior to beginning your sampling activity.

(If at any point you have questions, please call your TestAmerica Project Manager immediately.)

To begin you will need to connect the:

- Tubing from the Soil Vapor Probe to Valve 1.
- Tubing from Valve 2 to the flow controller device with a Swagelock™ fitting and ferrule (the flow controller should already be attached to the canister).
- Syringe to Valve 3
- See the diagram on page 2

Step 1: "Shut in Test" - This is where you use the vacuum on the canister to ensure you have a leak tight system before purging or sampling.

- Turn Valve 1 to "off" (horizontal to tubing direction).
- Turn Valve 2 so the off switch is pointed towards Valve 3.
- Open the canister for just a second and close.
- The gauge should read approximately 30" Hg.
- Watch the gauge and make sure it does not drop after about 30 seconds. If it does, you have a leak and need to adjust your fittings. If it does not, proceed to Step 2.

Step 2: Purging the line. This is where you will use the syringe to purge the line before sampling.

- Turn Valve 1 to "on" (vertical to tubing direction).
- Turn Valve 2 so the off switch is pointed towards the flow controller.
- Turn Valve 3 so the off switch is pointed towards the open port.
- Draw air into the syringe. Sample however many mLs you have determined equate to your necessary purge volumes.
- If you need to draw more than one syringe worth of air, turn Valve 3 so the off switch is pointed towards Valve 2, and push the air back through the syringe and out the side port. When you are ready to draw more air, turn Valve 3 back with the off switch pointed towards the open port.
- Once you are done purging, turn Valve 3 so the off switch is pointed towards Valve 2, and proceed to Step 3.

Step 3: Sampling

- Make sure Valve 1 is "on" (vertical to tubing direction).
- Turn Valve 2 so the off switch is pointed towards Valve 3.
- Open the canister valve and begin sampling.

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Soil Gas Sampling Kit

Valve #1 is a one way shut off valve

Valve #2 is a three way valve for sampling

Valve #3 is a three way valve for purging