Watervliet Arsenal

Watervliet, New York

Vapor Intrusion Evaluation Work Plan

Main Manufacturing Area
Watervliet Arsenal, Watervliet New York

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US Army Corps of Engineers

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Contents

List of Figures

List of Tables

1. Introduction

The Watervliet Arsenal (WVA), located City of Watervliet, New York (Figure 1) is conducting a vapor intrusion evaluation at buildings located in the Main Manufacturing Area (MMA) of the WVA. The evaluation is being conducted at the request of the New York State Departments of Health (NYSDOH) and Environmental Conservation (NYSDEC) in accordance with an Administrative Order on Consent between the WVA, the NYSDEC, and the United States Environmental Protection Agency (USEPA). The purpose of the evaluation is to assess whether chlorinated volatile organic compounds (CVOCs) are present in the sub-slab soil vapor beneath, and the indoor air within, MMA buildings that once containing degreasing operations and/or are located near potential subsurface sources of CVOCs. The evaluation will also assess whether soil vapor at the WVA southeastern property boundary contains CVOCs.

2. Field Investigation

As shown on Figure 2, vapor intrusion evaluations will be conducted at the following buildings/locations within the MMA:

- WVA southeastern property boundary near Building 25;
- Building 25;
- Building 20;
- Building 115;
- Building 120; and
- Building 22.

2.1. Pre-Sampling Inspection for Confounding Sources

Interference from confounding sources can complicate the interpretation of indoor air sampling data and the evaluation of soil vapor intrusion pathways. Confounding sources could include material such as: paints, cleaning solvents, carpet and upholstery cleaners, lubricants, new furniture, new flooring, glues, and dry cleaned clothes. In addition to interference from confounding sources, indoor air samples can be affected by variability in building ventilation, changes in seasonal and weather conditions, and nature of the source.

Prior to initiating indoor air or sub-slab soil vapor sampling, a pre-sampling inspection, including an inventory of the materials/chemicals used in each building will be conducted to identify any potential confounding sources. Interviews with WVA and/or building tenants will also be conducted to gain a better understanding of the typical operations in each building, including, but not limited to, the use of degreasers or similar products that may contain CVOCs.

2.2. Sampling

Indoor air, outdoor air, and sub-slab soil vapor sampling, will be conducted to evaluate whether there is a potential for soil vapor intrusion at each building. Soil vapor sampling will also be conducted at the WVA property boundary near Building 25 to evaluate whether there is a potential for off-site vapor intrusion. Sub-slab vapor samples and indoor air samples are typically collected during the heating season since soil vapor intrusion is more likely to occur when a building's heating system is in operation and air is being drawn into the building (NYSDOH 2005). The exact date of sampling will be coordinated with the NYSDOH and NYSDEC. If confounding sources are identified during the pre-sampling inspections, the WVA will determine the most effective method

for reducing the potential interferences from the confounding sources. Typically, the most effective method is to remove the sources from the area where air samples will be collected and request that staff refrain from activities that impact indoor air quality during the time of sampling. However, given the size of the buildings, and the varied nature of the operations they contain, it may not be possible to mitigate all potential confounding sources. To the extent practicable, confounding sources will be removed from the sampling areas a minimum of 24 hours prior to the start of the air sampling. Sampling will be conducted in accordance with the *New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006 (NYSDOH 2006).

2.2.1. Indoor and Outdoor Air Sampling

Outdoor air samples will be collected concurrently with the indoor air samples using similar sampling methods to provide information on background ambient air quality at the WVA. Analytical results from these samples will be used to assess potential outdoor contributions from current activities at the site. The duration of the indoor and outdoor air sampling period will be eight hours. Heating, ventilation and air-conditioning (HVAC) systems will be operated in a normal fashion throughout the sampling period as they would for a typical workday. One indoor air sample will be collected from each building. One duplicate sample will also be collected. The approximate indoor air sample locations are shown on Figure 2 and are summarized below.

- Building 25: Third floor central hallway near the freight elevator and restrooms
- Building 20: Second floor mezzanine office area
- Building 115: First floor office area
- Building 120: First floor office area
- Building 22: First floor office area/fire rescue personnel quarters

Two outdoor air samples will be collected during the investigation. The approximate locations of the outdoor ambient air samples are also shown on Figure 2.

Indoor and outdoor air samples will be collected using a Summa canister sampling train (Figure 3), which consists of a Summa canister, flow controller, particulate filter, pressure gage, and associated fittings. All canisters will be batch-certified as analyte-free by the analytical laboratory prior to use. Flow regulators calibrated and supplied by the analytical laboratory will be used to allow for continuous sampling over the eight-hour sampling period. Each flow regulator will be equipped with a filter to prevent particulate matter from entering the canister.

The following procedure will be used for the collection of indoor and outdoor air samples:

- Place Summa canister at sampling location so the sample is collected at a height of approximately two to three feet above the floor.
- Note the environmental conditions in the sample area on the sample collection sheet.
- Remove the brass fitting covering the 6-liter Summa canister sampling port using a wrench.
- Assemble the sampling train (Figure 3), connecting the flow controller with integral pressure gage to the Summa canister sampling port. Each fitting should be hand tightened and then tightened with a wrench approximately ¼ turn.
- Confirm that the sampling train is air tight by conducting a vacuum test. Place the brass cap at the end of the sampling train (particulate filter), quickly open and close the sampling valve and monitor the vacuum on the pressure gage. If the vacuum decreases, there is a leak in the system and the fitting should be rechecked and the vacuum test redone.
- Initiate sampling by opening the Summa canister valve. Record starting time and the vacuum within the canister on the sample collection sheet and canister identification tag.
- Check the sampling train pressure gage after one hour of sampling to confirm that the air sampling is proceeding as planned.
- When approximately eight hours have elapsed since initiation of sampling, close the canister valve. Check the vacuum within the canister using the pressure gage and record the measurement on the sample collection sheet and canister identification tag.
- Since the flow rate into the canister can fluctuate due to variations in atmospheric conditions, the measured final vacuum may range from 2 to 12 inches of mercury (Hg). If the measured vacuum is greater the 12 inches of Hg or less than 1.0 inches of Hg, the sample may be flagged and re-sampling may be required.
- Disassemble the sampling train and place the brass cap on the sampling port of the canister and tighten. The air sampling is complete.
- Place the canister in the travel box and complete the chain-of-custody forms and identification tag on the canister.
- Send the canister to the laboratory via next day airmail service for analysis.

All samples will be analyzed by a laboratory accredited by the National Environmental Laboratory Accreditation Conference (NELAC) and certified by the (NYSDOH) for analysis of air samples. EPA Method Low Level TO-15 (GC/MS) in Selective Ion Mode (SIM), or equivalent, will be used to analyze indoor and outdoor samples. Full data packages will be requested for all samples. The reporting limits for each compound are shown in Table 1.

The samples will be analyzed for the following compounds:

- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- 1,1,2,2-Tetrachloroethane
- 1,1,1-Trichloroethane (TCA)
- 1,1,2-Trichloroethane
- Chloromethane
- Vinyl chloride
- 1,1-Dichloroethene
- cis- & trans-1,2-Dichloroethene (DCE)
- 1,2-Dichloroethane
- Chlorobenzene
- Carbon tetrachloride
- Chloroethane
- 1,1-Dichloroethane

The field sampling team will maintain a sample log sheet for each sample collected. The sample log sheets will include:

- Sample identification;
- Date and time of sample collection;
- Sampling height;
- Identity of samplers;
- Sampling methods and devices;
- Volume of air sampled;
- Vacuum of canister before and after samples are collected; and
- Chain of custody protocols and records used to track samples from sampling point to analysis.

2.2.2. Sub-Slab Soil Vapor Sampling

Sub-slab soil vapor sampling will be conducted immediately after the completion of indoor air sampling at the approximate locations shown on Figure 2. Samples will be collected over an eight-hour time period from just below the concrete slab of each building through a small-diameter borehole drilled with a hammer drill. Each sample will be collected using a Summa canister sampling train, which will consist of Teflon-lined polyethylene tubing, a Summa canister, flow controller, particulate filter, pressure gage, fittings and a sampling line. The procedures for temporary sub-slab soil vapor collection point construction are as follows:

- Core through the floor using a hammer drill.
- Drill into the sub-slab material to a depth of no more than two (2) inches beneath the base of the concrete slab.
- Insert Teflon lined polyethylene tubing, suspending the end of the tube approximately 1/4" inch above the bottom of the hole.

- Backfill the borehole with clean, coarse grained, silica sand up to the bottom of the concrete slab.
- Seal the temporary sample probe to the surface with melted beeswax.
- Connect a three-way valve to the Teflon tubing (with valves closed). The three-way valve will be used to connect the vapor sampling point to the sampling train without allowing indoor air to mix with soil vapors.
- The sampling point and tubing will be purged at a rate of 0.2 liters per minute or less, using a syringe, until one to three sampling point volumes are removed.
- A helium tracer gas will be used to verify the integrity of the soil vapor point seal. Prior to and after sampling of the sub-slab soil vapor, the atmosphere in the immediate vicinity of the area where the vapor point tubing intersects the ground will be enriched with the tracer gas. This will be accomplished by using an inverted plastic pail to keep the tracer gas in contact with the vapor point during testing. A portable monitoring device (specific to the tracer gas) will be used to analyze a sample of soil vapor for the tracer gas prior to and after sampling for VOCs. If the tracer gas is detected at a concentration of less than 20 percent, it will be assumed that the probe is sealed and the vapor sample has not been diluted by surface air.
- Upon completion of purging and testing, set up the soil gas sampling train as shown on Figure 3 using a six-liter Summa canister and a flow controller calibrated for an eight-hour collection period.
- Begin sampling using the same procedure as that used for indoor air sampling.
- Upon completion of the sub-slab soil vapor sampling, all sampling equipment will be removed and the holes will be filled with cement.

Soil vapor samples will be analyzed by a laboratory accredited by the National Environmental Laboratory Accreditation Conference (NELAC) and certified by the (NYSDOH) for analysis of air samples. EPA Method Low Level TO-15 (GC/MS) SIM, or equivalent, will be used to analyze soil vapor samples. The reporting limits for each compound are included as Table 1. The samples will be analyzed for the same list of VOCs as the indoor air samples.

The field sampling team will maintain a sample log sheet for each sample collected. The sample log sheets will include:

- Sample identification;
- Date and time of sample collection;
- Sampling depth;
- Identity of samplers;
- Sampling methods and devices;
- Tracer gas testing results;

- Soil vapor purge volumes;
- Volume of soil vapor extracted;
- Vacuum of canister before and after samples are collected;
- Relative moisture content of the sampling zone (i.e., dry, moist, wet); and
- Chain of custody protocols and records used to track samples from sampling point to analysis.

2.2.3. Property Boundary Soil Vapor Sampling

Four soil vapor sampling points will be installed along the southeastern WVA property boundary at the approximate locations shown on Figure 2. The actual locations of the points will be dependent on the locations of subsurface utilities. It is anticipated that all soil vapor points will be located in areas covered by concrete or asphalt. The target depth for each of the soil vapor points will be the basement floor level of the adjacent residential structures or just above the groundwater table, whichever is shallower. The soil vapor points will be installed using a direct-push drilling rig to advance a borehole to the target depth. Upon reaching the target depth, a six-inch small-diameter stainless steel screen attached to Teflon-lined polyethylene tubing will be lowered to the bottom of the borehole. The bottom one-foot of the borehole will then be backfilled with clean silica sand. The remaining borehole annulus will be backfilled to the surface with hydrated bentonite. Soil vapor sampling and analysis will then be conducted using the same methods and procedures as those for sub-slab soil vapor sampling (Section 2.2.2). Upon completion of the soil vapor sampling, all sampling equipment will be removed and the boreholes will be covered with asphalt patch or concrete, depending on the nature of the surrounding ground surface.

2.3. Quality Assurance/Quality Control (QA/QC)

The following protocols will be followed to ensure that high quality data are obtained. The sampling team will avoid actions (e.g., using permanent marking pens, and wearing freshly dry cleaned clothing) that can cause sample interference in the field. Field personnel will avoid lingering in the immediate area of the sampling devices. All canisters will be batch certified as analyte-free by the analytical laboratory prior to use at the site. Two field duplicate samples, one sub-slab vapor, and one indoor air, will be collected to assess the precision of the laboratory.

A third party data validation subcontractor will review and validate the analytical data collected during the evaluation. Data will be assessed by the validator for completeness and compliance with the appropriate state and federal protocols. A data usability summary report (DUSR) will be prepared by the data validator following review of the analytical data.

3. Reporting

A summary report will be prepared upon the receipt of validated analytical results from the vapor intrusion evaluation. The summary report will include the following:

- Discussion of sampling activities and methodologies;
- Analytical results for indoor air, outdoor air, and soil vapor samples;
- Maps showing the locations of the sampling points;
- Conclusions drawn from the interpretation of the data and recommendations for future work; and
- Supporting data, including analytical data packages, DUSR, and field log forms.

The draft summary report will be submitted to the agencies upon review by the WVA. A final report and/or response to comments will be prepared and submitted to the regulators upon the receipts of any comments on the draft report.

4. References

NYSDOH 2006. *New York State Department of Health Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006.

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Vapor Intrusion Evaluation Work Plan

Figures

2118097

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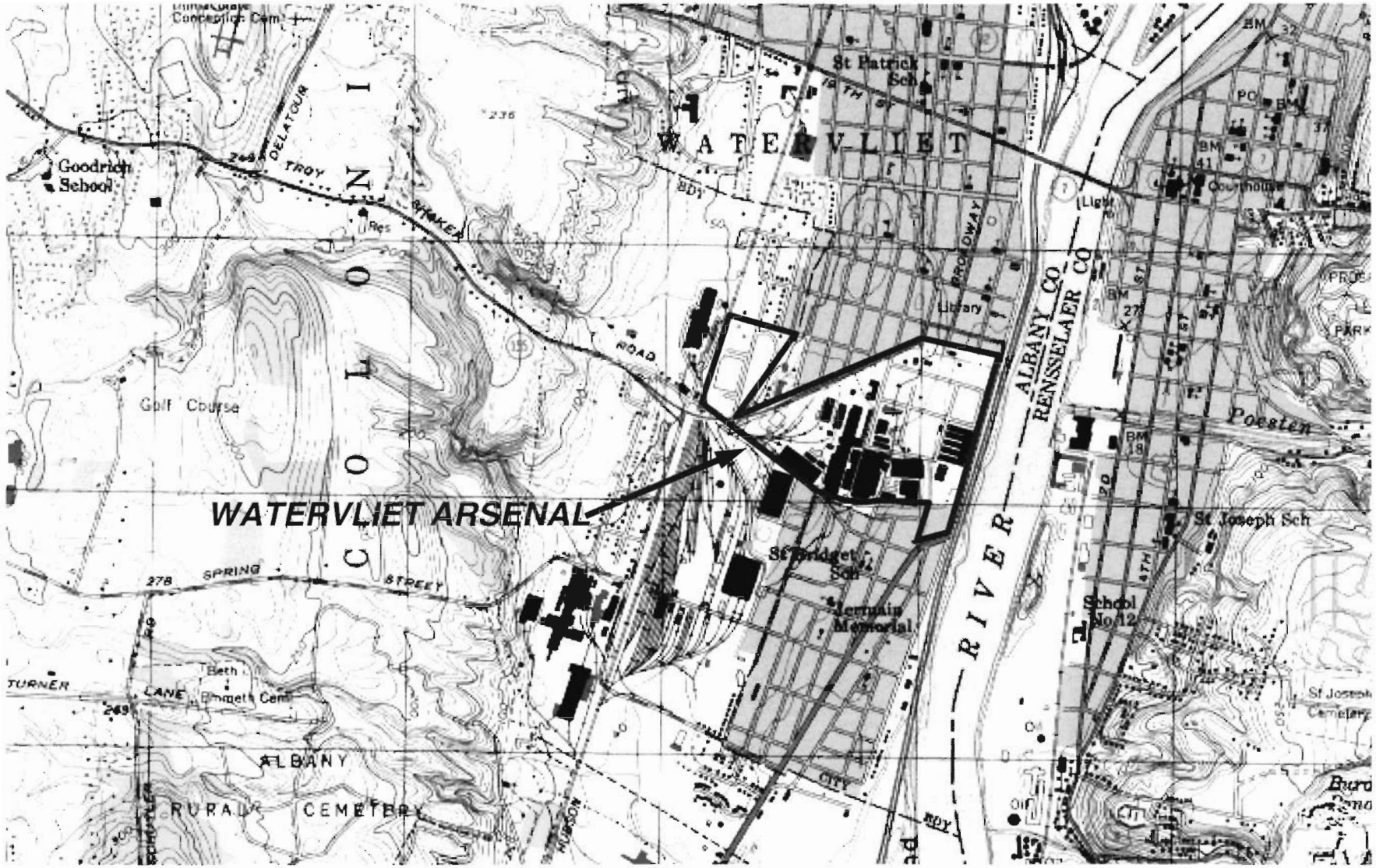

SOURCE: U.S.G.S 7.5 MIN. TROY SOUTH QUADRANGLE

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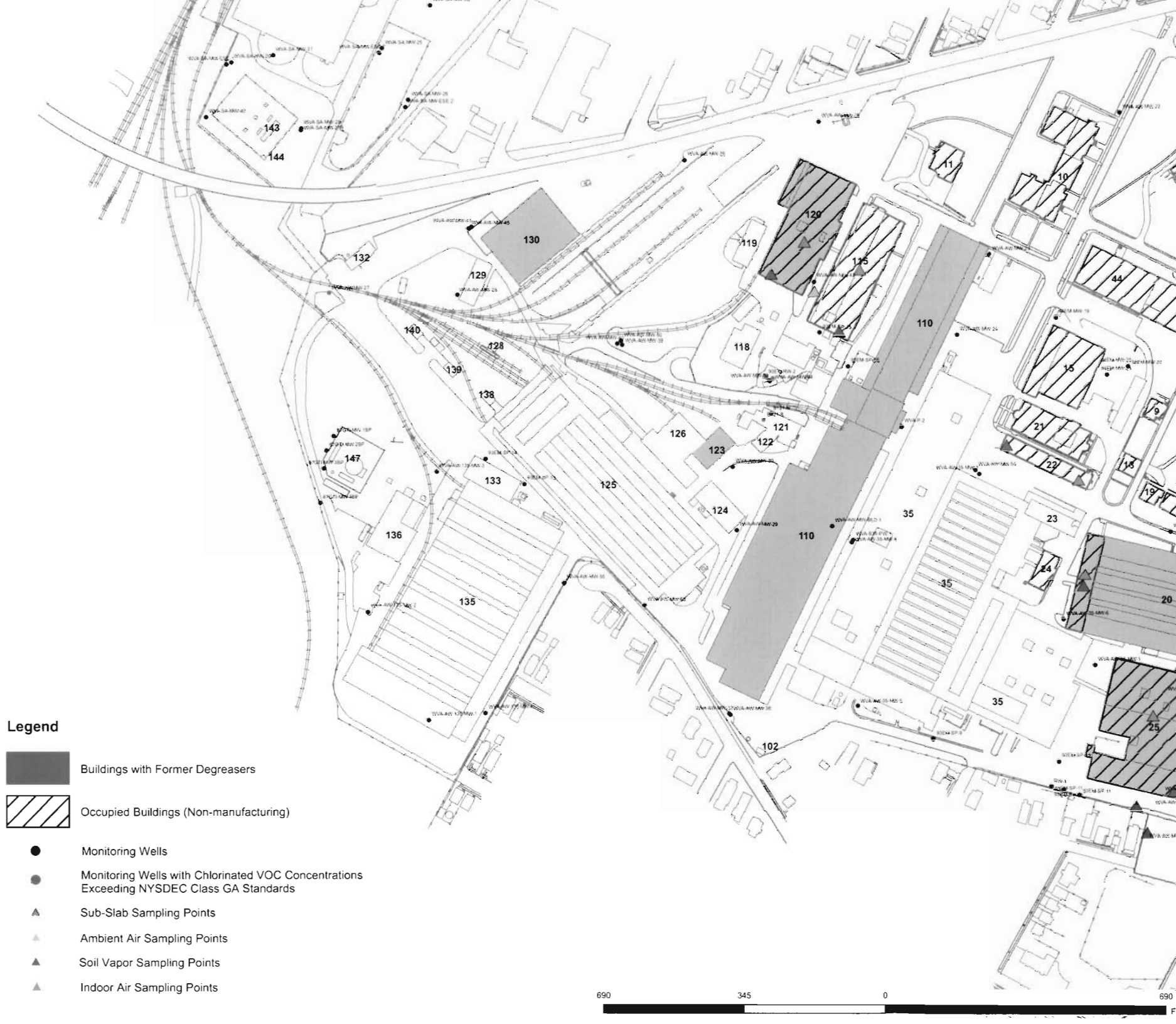
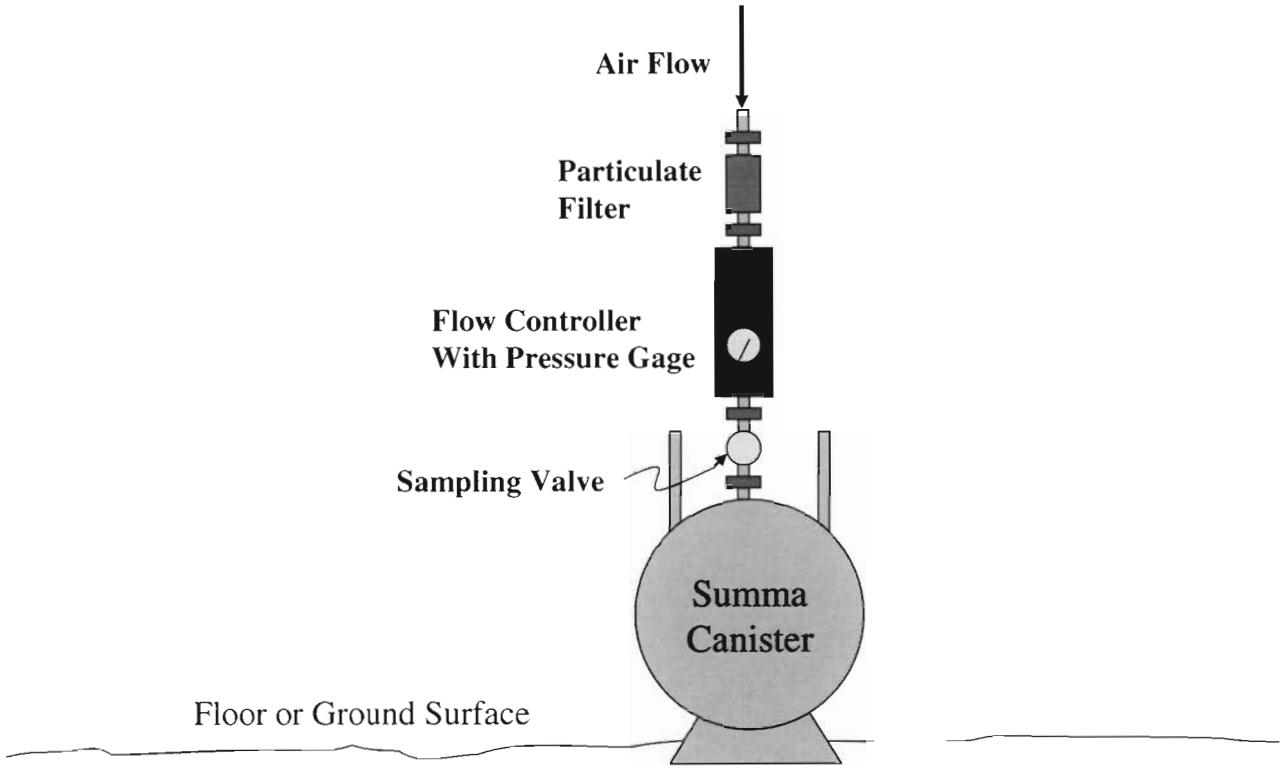
SITE LOCATION

FIGURE 1


Legend
Buildings with Former Degreasers
Occupied Buildings (Non-manufacturing)
Monitoring Wells
Monitoring Wells with Chlorinated VOC Concentrations Exceeding NYSDEC Class GA Standards
Sub-Slab Sampling Points
Ambient Air Sampling Points
Soil Vapor Sampling Points
Indoor Air Sampling Points
690
345
0
690



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VAPOR SAMPLING TRAIN

FIGURE 3

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Tables

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Table 1
Air and Soil Vapor Analytes and Reporting Limits
Vapor Intrusion Evaluation
Watervliet Arsenal, Watervliet, New York

Compound	Reporting Limit (ug/m^3)
Trichloroethene (TCE)	0.11
Tetrachloroethene (PCE)	0.34
1,1,2,2-Tetrachloroethane	0.34
1,1,1-Trichloroethane (TCA)	0.27
1,1,2-Trichloroethane	0.27
Chloromethane	0.21
Chloroethane	0.26
Vinyl Chloride	0.26
1,1-Dichloroethane	0.40
cis-1,2-Dichloroethene	0.40
trans-1,2-Dichoroethene	0.40
1,2-Dichloroethane	0.40
Chlorobenzene	0.46
Carbon tetrachloride	0.13
1,1-Dichloroethene	0.40

Notes:
ug/m^3 - micrograms per cubic meter
Reporting limits for Air Toxics, Inc.