FORMER LOUDON AND KEM CLEANERS SITE

350 NORTHERN BLVD, ALBANY, NEW YORK

ALBANY COUNTY, NEW YORK

REMEDIAL DESIGN REPORT FOR SOIL VAPOR EXTRACTION AND VAPOR MITIGATION

NYSDEC BCP Number: C401060

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SEPTEMBER 18, 2018

CERTIFICATIONS

I, Mark Schnitzer, PE, certify that I am currently a NYS registered professional engineer with Alpine Engineering Services LLC, and that this Remedial Design Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER-approved work plan and any DER-approved modifications

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

Mark Schnitzer, PE (License 077506) September 18, 2018 _____

Date Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

REMEDIAL DESIGN REPORT FOR SOIL VAPOR EXTRACTION AND VAPOR MITIGATION

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1.0 Introduction

This Remedial Design Report (Design Report) for Soil Vapor Extraction and Sub Slab Depressurization has been prepared on behalf of DF Acquisitions LLC (DFA) for submittal to the New York State Department of Environmental Conservation (DEC). This Design Report contains a summary of the engineering design of the planned soil vapor extraction (SVE) and sub slab depressurization (SSD) systems to be installed near the southern portion of the existing building at 350 Northern Boulevard, Albany, New York (the Subject Property or SP). The SP location is shown on Figure 1. The design layout and details for the SVE and SSD systems are shown on the design drawings provided in appendices D and F, respectively.

The planned SVE system includes existing SVE extraction wells, conveyance piping, a blower to provide vacuum to the SVE points, moisture separator, particulate filter, manifold, vapor phase carbon treatment, and an exhaust stack extending above the roof of the SP building. The planned SSD system includes four sub systems, each sub system with a vacuum fan, extraction points or trenches in the tenant spaces, and exhaust stacks outside the building above the roof.

This Design Report describes the individual elements of the SVE and SSD systems, the basis of design, and the system operation and maintenance requirements. Design calculations, manufacturer's equipment cut sheets, and construction specifications are included as appendices to this report.

1.1 Site Location and Description

The Former Loudon and Kem Cleaners site is located in a commercial and residential urban area in the northern section of the City of Albany, NY. The site is northwest of Northern Boulevard, northeast of Shaker Road, east of Old Hickory Road, and west of New Loudon Road (Route 9).

The site area is approximately 3.9 acres and is developed with an L-shaped retail building (retail strip mall). The building contains many separate businesses that operate in the single-story portion of the building and a three-story office building located in the center of the building. The remainder of the site is parking for the businesses and offices.

The site is currently zoned commercial and most of the tenant spaces in the strip mall are currently occupied. Tenants include restaurants, offices, retail stores, and a bank with commercial offices in the 3-story building. The surrounding parcels include an apartment complex to the north, west, and southwest, a hospital to the south, and a highway and golf course to the east and northeast. The nearest residence is located approx. 50 feet to the west of the site.

1.2 Background

Two separate tenant spaces were occupied by dry cleaners (known as Loudon Dry Cleaners, KEM Cleaners and possibly other names) that used tetrachloroethene (Perc, PCE) from approximately 1954 to 1997. KEM cleaner converted to drop-off only service in 1997 and this tenant space is currently occupied by Risotto Restaurant. The tenant space formerly occupied by Loudon Cleaners is now vacant. No dry cleaner businesses are currently present at the site. The 3.9-acre property is fully described in prior NYSDEC reports including the "*Final Phase I and Phase II Remedial Investigation Report" (RI)*, by Shaw Environmental & Infrastructure Engineering of New York, PC dated July 24, 2014 and "*Final Feasibility Study Report" (FS)*, Shaw Environmental & Infrastructure Engineering of New York, PC dated December, 2014. Copies of these reports are available at the Albany Public Library, Reference Desk, 161 Washington Avenue, Albany, NY 12210 and at NYSDEC offices.

Investigation activities conducted at the site indicate that on-site soil, shallow groundwater and soil gas are affected by CVOCs discharged from the former dry cleaner businesses. NYSDEC studies (2014 RI and FS) proposed the installation of SVE and SSD systems, leading to a March 2015 Record of Decision, requiring the installation of SVE and SSD systems to contain and minimize exposure from soil gas vapors to the site buildings. The onsite risk of exposure to CVOC's into the indoor tenant areas were identified as being limited to the southern wing of the SP building. To facilitate the design of the SVE and SSD systems, pilot testing was required to measure the areas of influence of the initially installed extraction wells and points, and to specify appropriate equipment for the respective systems.

2.0 Pilot testing

SVE Extraction wells and vacuum monitoring points for the pilot testing were installed on July 17 and 18, 2017. The extraction wells and vacuum couplet monitoring points were installed as specified in the Pre-Design Investigation Work Plan. Boring and well logs, and monitoring point construction logs are provided in Appendix A.

Pilot testing was performed at the site to collect data necessary for the design of the SVE and SSD systems. SVE pilot testing was performed on August 24, August 30, September 8,

and October 18, 2017. SSD pilot testing was performed on September 5 and September 12, 2017.

2.1 SVE Pilot testing

SVE pilot testing was performed by inducing a vacuum through the connection of a regenerative blower to individual SVE wells, and measuring the vacuum in monitoring points (SMPs) installed at varying distances from the SVE wells. Where possible, vacuum pressure was also measured on existing groundwater monitoring wells in proximity of the SVE wells being testing. The blower was "stepped", through the use of a variable frequency drive (VFD), to demonstrate the operating conditions for a range of applied vacuum and flow conditions.

2.1.1 SVE Extraction Wells

Three soil vapor extraction wells were installed using hollow-stem auger (HSA) drilling methods. The three wells, designated as SVE-1, SVE-2, and SVE-3, were installed to 19.4, 19.9, and 19.7 feet below ground surface (bgs), respectively. Soil borings were advanced using 11 inch outside diameter hollow stem augers (HSAs). Soils samples were collected continuously from the surface using 2-inch diameter split spoon samplers.

Split-spoon samples were logged on site by a geologist from Alpha Geoscience using a standard geologic classification. A portion of each soil sample was retained in a sealed plastic bag or jar for headspace analysis. The geologic description includes color, primary and secondary grain size, moisture, olfactory observations and a physical description of contaminants, if any.

Headspace samples were screened using a PID equipped with a 10.2 electron volt lamp. The PID was calibrated in accordance with the manufacturer's specifications to detect volatile organic vapors. The PID detects but does not differentiate volatile organic compounds that possess ionization potentials less than the PID lamp energy, thereby providing a relative indication of the presence of volatile organic compounds.

Headspace monitoring of soils removed from SVE-1 ranged from 1.5 to 8.6 ppm and for SVE-3 ranged from 0.4 to 23.9 ppm. SVE-2 was not sampled during installation as it was installed by over-drilling an existing unused groundwater monitoring well (formerly MW-3).

The wells were constructed as 4-inch, inner diameter schedule 40 PVC and consist of 10 feet of 0.020" slot screen with solid risers to the surface. The wells were constructed with a sand pack from the outside of the screen to the 11-inch diameter borehole. The screens were sealed off from the surface with non-shrinking hydrated bentonite chips and granular bentonite between 3 feet bgs and 8.5 to 9 feet bgs.

Locking, 8-inch steel protective enclosures were cemented over each well to prevent unauthorized access and to provide protection for the wells from driving traffic, plowing and other impacts. A concrete pad was constructed around the top of each well with a sufficient thickness to minimize frost heave and leakage of surface water around the protective casing. A "T" pipe connection was installed at approximately 1.5 feet bgs of each of the wells, with a stub pipe extending approximately 1.5 feet laterally, to be used for connection of the well to the SVE system. Each stub pipe was temporarily fitted with an air-tight expanding plug cap. The well and observation point locations are indicated on Figure S-10.

2.1.2 SVE Monitoring Point

Vacuum monitoring points were installed at five locations near the SVE extraction wells. VMP-1A and VMP-1B are located 17.1 and 18.7 feet, respectively, from SVE-1, VMP-2A and VMP-2B are located 18.2 and 32.1 feet, respectively, from SVE-2, and VMP-3A is located 27.9 feet from SVE-3.

Monitoring points were constructed by using direct push methods, where by a 2.5-inch diameter pilot hole was driven to approximately eighteen feet below grade. No soil samples were retrieved during the installation of the temporary monitoring points. The vacuum monitoring points were constructed by placing ¼-inch diameter polyethylene tubing connected to 6-inch long sections of $^{1}/_{2}$-inch diameter slotted stainless steel screen, surrounded by a sand pack. Each monitoring point consisted of a nested pair of a shallow and a deep monitoring points, located at approximately 8 and 18 feet bgs, respectively. The space between the shallow and deep points, as well as the space above the shallow point to the surface were filled and sealed with hydrated bentonite. Each probe was equipped with a barbed hose fitting, with a locking steel protective casing, cemented over each monitoring point location, to prevent unauthorized access and to provide protection from surface impacts. Each monitoring point was labeled so that the shallow and deep monitoring points were easy to distinguish.

2.1.3 SVE Blower

A vacuum blower and appurtenances were used during the pilot test to induce a vacuum on the SVE wells. The blower was housed on a small portable utility trailer with a portable generator so that the trailer could be located adjacent to each of the three SVE test well locations; to minimize pipe lengths, to connect the blower and the SVE well, and to minimize pressure loss due to the airflow in the pipe. The blower used for testing was a Rotron EN656 regenerative blower with a 3hp motor and a variable frequency drive (VFD), capable of airflow up to 70 cubic feet per minute (cfm) at 70 inches of water ("WC). The blower system contained the following components:

- 2-inch flexible inlet pipe with vacuum gauge and well couplings
- Inlet particulate air filter
- Air flow meter
- Vacuum relief valve
- Sample ports (air quality and flow)
- Exhaust Stack

2.2 SSD Pilot test

The Remedial Investigation and Feasibility Study indicated vapor intrusion was a concern in the south wing of the SP building, where dry cleaning had occurred in the past. This section of the building is the target or "Area of Influence" (AOI), for the SSD system. Figure 2.2a below shows a delineation of the AOI for the SSD system.

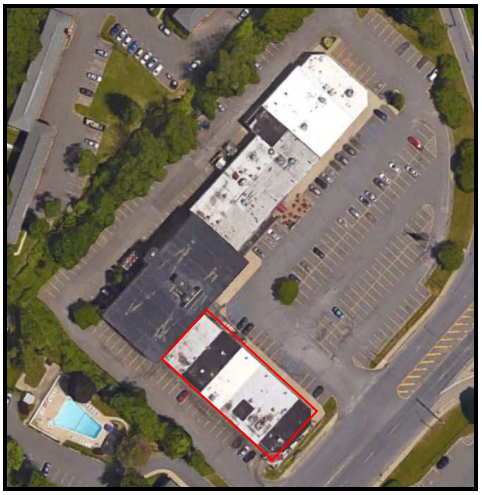


Figure 2.2a: Target Area of influence (in red) of the SSD system at the SP (Interior).

The slab on grade sections in this area of the building step to a lower elevations four times, from the northwest to southeast. The AOI section of the building is a single-story construction with roof mounted air handing units (AHUs). The interior spaces are divided into six tenant spaces, three of which are vacant as of the date of this design report.

2.2.1 SSD Pilot Test Extraction Points

Test extraction point installation was accomplished by coring 4 to 5-inch diameter holes through the concrete floor slab in the vacant tenant spaces. The core advanced through the concrete floor using wet coring methods. A cavity was created under the slab at least 1/2 cubic foot in size and was excavated using a drill mounted auger, hand auger, hand tools, and hand digging with impervious gloves. Following testing, the soils were placed back into the cavities from which they came and the test extraction points were sealed with concrete.

Test extraction point T1-1 was installed in the vacant space between the Dental Office and Risotto Restaurant and test extraction points T2-1 and T2-2 were installed into the vacant space north of the I Love NY Pizza restaurant. T2-2 was installed on top of the building footing which separates the two spaces and was drilled through the footing to the soils under the pizza restaurant. The extraction point locations are indicated on Figures V-10 and V-11.

2.2.2 SSD Pilot Test Temporary Monitoring Ports

Sub slab monitoring ports (SMPs) are temporary, 1/2" diameter holes in the concrete floor surface extending through into the sub slab soils below. SMPs can be made permanent by installing a sub slab monitoring pin and flush mounted cover. They are arranged radiating out from the test extraction point in 5-10 foot increments in multiple directions when conditions permit. A drill bit was advanced through the concrete floor with water spray and an active vacuum immediately adjacent to the drill hole.

2.2.3 SSD System fans

Commercially available, inline centrifugal vacuum fans were connected to the test extraction holes to determine which performs best with the site specific conditions in these building locations. Inline centrifugal vacuum fans are highly energy efficient and durable

and are the preferred fan for SSD systems. A Fantech RN4 centrifugal fan was used in the pilot testing. Alternative fans exist for high vacuum requirements for SSD systems. These fans depressurize a vessel, which in turn, creates a vacuum on the intake side. These are referred to as "high suction" or HS Series fans. HS 5000 fans were also used during the pilot test.

The test fans were connected in an airtight manner to the extraction hole with an exhaust ventilation fan and conduit to exhaust extracted vapors to the exterior of the building.

3.0 Pilot Test Summary and Basis for Design

Pilot test performance data was evaluated to determine full-scale system design parameters.

Key parameters evaluated include:

- Air flow rates achievable from each pilot study extraction well/point under given vacuum conditions.
- Measurable vacuum at specified distances from each extraction well/point (radial distances of vacuum influence).
- For the SVE system, quantitative estimates of VOC emissions from the SVE extraction system to determine flow rates and/or the need for pre-discharge air treatment.

3.1 SVE Pilot Test

The SVE pilot test demonstrated that SVE is a viable technology for reducing VOC mass in unsaturated unconsolidated deposits at the SP. Based on pilot test observations and data evaluation, the full-scale SVE system will target unconsolidated deposits at locations identified in the FS and ROD, along southern wing of the SP building. Extracted vapor flow rates, vacuum response at observation locations, and estimated VOC mass removal at each SVE point during pilot testing demonstrated the viability of SVE to reduce VOC mass in unsaturated unconsolidated deposits in the impacted area.

The extent of the observed radius of influence (ROI) varied between the three pilot test SVE points, with overlap observed between them. This demonstrates the ability of an SVE to influence unsaturated unconsolidated deposits beneath the remedial target portions of the SP. The variation of the extent of ROI were likely due to differences in subsurface lithology, unconsolidated deposit thicknesses, moisture content, preferential pathways, and variations of the competency of the

ground surface cover.

3.1.1 SVE Pilot Test Results

Step testing of the SVE points indicated that, although variable between SVE points, the ROI did not significantly increase with higher applied vacuums above a certain point. Constant rate testing indicated that the ROIs were relatively quickly established and did not measurably vary during the duration of the test.

The data collected from the pilot test at each SVE well is provided in Tables 3.1A, 3.1B, and 3.1C below. Following the completion of the stepped-tests, a system curve was prepared for the three wells tested. System curves consist of plotting the applied wellhead vacuum verses the observed wellhead flow rate for each well tested. The curves are presented as Figures 3.1A, 3.1B, and 3.1C below. These curves were compared to blower curves of commonly available vacuum blowers for the purpose of selecting/sizing the best commercially available blower for the site-specific conditions.

Table 3.1Ai: Pilot Test Data from SVE-1

Pilot Test Data: SVE-1 (9/8/2017)														
Time (minutes)	0	10	20	30	40	50	60	70	80	90	100	110	120	130
P At Well ("WC)	-30	-30	-30	-30	-30	-40	-40	-40	-40	-50	-50	-50	-50	-50
P Post Filter("WC)	-30	-30	-30	-30	-30	-40	-40	-40	-40	-50	-50	-50	-50	-50
Frequency (Hz)	34.5	34.5	34.5	34.5	34.5	40.1	38.4	38.4	38.4	46.5	46.5	46.5	46.5	46.5
Flow (FPM)	2100	2100	2100	2100	2200	3000	2600	2800	3050	4590	4720	4650	4500	4500
Flow (CFM)	46.2	46.2	46.2	46.2	48.4	66	57.2	61.6	67.1	100.98	103.84	102.3	99.0	99.0
PID (PPM)	450	540	380	387	385	381	381	380	378	392	386	380	375	360
VMP-1A - Shallow	NM*	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
VMP-1A - Deep	5.0	5.6	6.0	6.0	8.0	8.2	8.5	8.7	8.7	NM	10.5	11.9	12.0	12.0
VMP-1B - Shallow	1.5	3.2	5.0	5.0	5.1	7.0	7.0	7.5	7.5	8.2	9.0	9.2	9.2	9.2
VMP-1B - Deep	0.8	2.0	6.5	6.5	7.0	9.0	9.5	9.5	9.5	10.8	10.5	10.5	10.5	10.6
MW-22	NM	NM	NM	NM	1.20	1.20	1.20	1.20	1.40	1.20	1.30	1.40	1.4	1.5

*Point appeared to be clogged and not able to measure pressure
NM- Not Measured
All vacuum reading in inches of water column ("WC)

Table 3.1Aii: Pilot Test Data from SVE-1

Pilot Test Data: SVE-1 (10/17/2017)							
Time (minutes)	10	20	30	0	10	20	30
P At Well ("WC)	-30	-30	-30	-40	-40	-40	-40
SSD Test Hole A (inside bldg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSD Test Hole B (inside bldg)	-0.004	-0.004	-0.004	-0.004	-0.008	-0.007	-0.007
SSD Test Hole C (inside bldg)	-0.013	-0.013	-0.013	-0.016	-0.018	-0.018	-0.020
SSD Test Hole D (inside bldg)	-0.005	-0.005	-0.005	-0.010	-0.010	-0.011	-0.011

All vacuum reading in inches of water column ("WC)

Figure 3.1A: System Curve for SVE-1 Pilot Testing

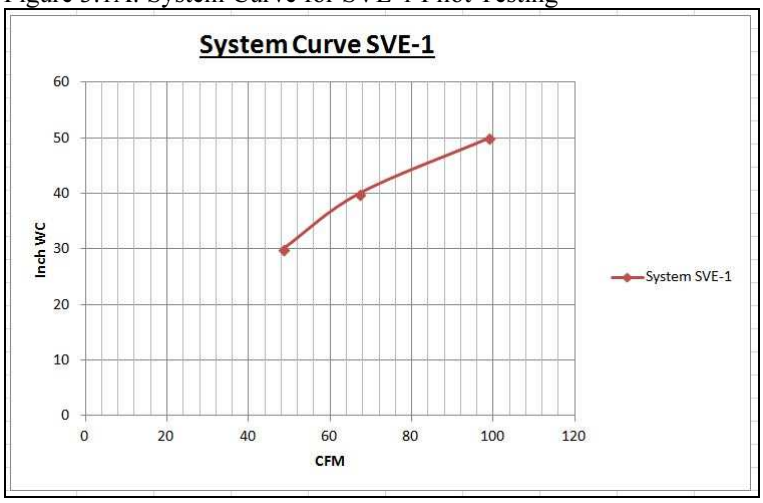


Table 3.1Bi: Pilot Test Data from SVE-2

Pilot Test Data: SVE-2 (8/30/2017)							
Time (minutes)	0	5	10	15	25	35	45
P At Well ("WC)	-30	-30	-30	-40	-40	-50	-50
Frequency (Hz)	NR	NR	NR	NR	NR	NR	NR
P Post Filter ("WC)	-30	-30	-30	-40	-40	-50	-50
Flow (FPM)	600	610	600	700	800	1100	1100
Flow (CFM)	13.2	13.4	13.2	15.4	17.6	24.2	24.2
PID (PPM)	107	130	141	140	144	145	150
VMP-2A - Shallow	0.1	1	1	1	1	1	1
VMP-2A - Deep	0.4	1	1	1	1	1	1
VMP-2B - Shallow	0	0.3	0.3	0.4	0.4	0.4	0.4
VMP-2B - Deep	0	0.3	0.3	0.4	0.4	0.4	0.4

NM- Not Measured, NR- Not Recorded
All vacuum reading in inches of water column ("WC)

Table 3.1Bii: Pilot Test Data from SVE-2

Pilot Test Data: SVE-2 (10/17/2017)							
Time (minutes)	20	30	20	30	20	30	15
P At Well ("WC)	-30	-30	-40	-40	-50	-50	-60
SSD Test Hole A (inside bldg)	0.0	0.0	0.0	0.0	0.0	0.0	-0.001
SSD Test Hole B (inside bldg)	0.0	0.0	0.0	0.0	-0.002	-0.002	-0.001
SSD Test Hole C (inside bldg)	-0.002	-0.003	-0.007	-0.008	-0.007	-0.009	-0.011
SSD Test Hole D (inside bldg)	-0.002	-0.003	-0.002	-0.008	-0.005	-0.006	-0.010
MW-8	-0.056	-0.063	-0.180	-0.260	-0.366	-0.385	-0.435
+MW-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MW-22	+0.022	+0.022	+0.015	+0.002	-0.013	-0.013	-0.015

+GW level at MW-25 was measured from top of PVC casing at 22.8 ft bgs. The well logs show the screen is installed at 25-35 ft bgs, so vacuum cannot be measured from this point.
All vacuum reading in inches of water column ("WC)

Figure 3.1B: System Curve for SVE-2 Pilot Testing

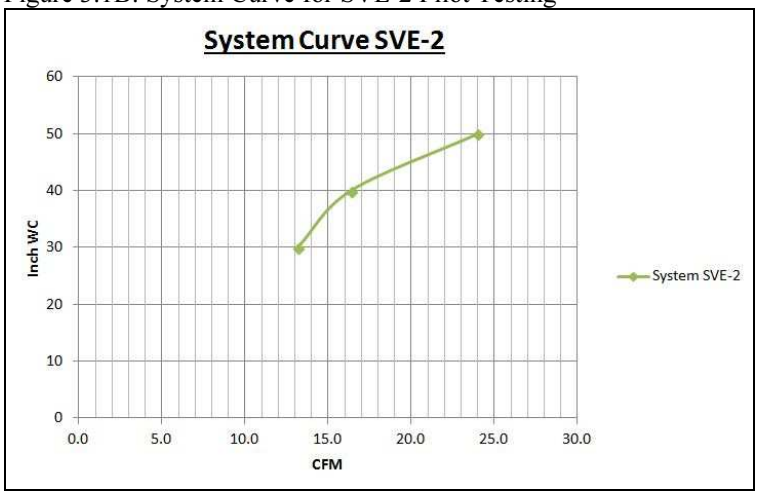


Table 3.1Ci: Pilot Test Data from SVE-3

Pilot Test Data: SVE-3 (8/24/2017)									
Time (minutes)	0	10	30	40	45	55	60	70	80
P At Well ("WC)	-30	-30	-40	-40	-50	-50	-60	-60	-70*
Frequency (Hz)	30	30	36	36	41	41	47	47	NR
P Post Filter ("WC)	-30	-30	-40	-40	-50	-50	-60	-60	-70
Flow (FPM)	1170	1100	1700	1350	2000	2100	3100	2700	4400
Flow (CFM)	25.74	24.2	37.4	29.7	44	46.2	68.2	59.4	96.8
PID (PPM)	31	31	49	59	62	63	67	68	70
VMP-3A - Shallow	0	0.6	0.9	0.9	1	1.1	1.2	1.2	1.4
VMP-3A - Deep	0	0.4	0.8	0.9	1	1	1	1.1	1.4

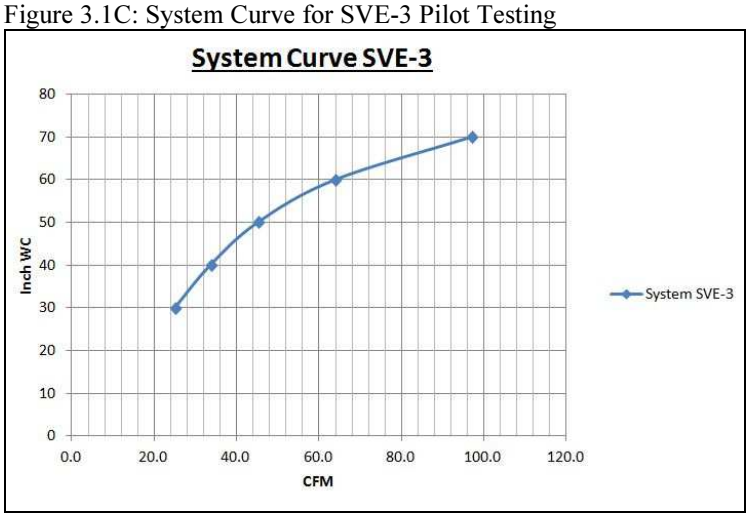
*Blower shut down fault at -70"WC after 5 minutes.
NM- Not Measured, NR- Not Recorded
All vacuum reading in inches of water column ("WC)

Table 3.1Cii: Pilot Test Data from SVE-3

Pilot Test Data: SVE-3 (10/17/2017)						
Time (minutes)	20	30	40	10	20	30
P At Well ("WC)	-30	-30	-30	-40	-40	-40
SSD Test Hole A (inside bldg)	0.0	-0.002	-0.001	0.0	0.0	0.0
SSD Test Hole B (inside bldg)	0.0	0.0	0.0	-0.002	0.0	0.0
SSD Test Hole C (inside bldg)	0.0	-0.001	0.0	-0.002	0.0	0.0
SSD Test Hole D (inside bldg)	0.0	-0.001	-0.001	-0.002	0.0	0.0
MW-8	-0.230	-0.240	-0.204	-0.154	-0.092	-0.096
+MW-25	0.0	0.0	-0.002	0.0	0.0	0.0

+GW level at MW-25 was measured from top of PVC casing at 22.8 ft bgs. The well logs show the screen is installed at 25-35 ft bgs, so vacuum cannot be measured from this point.
All vacuum reading in inches of water column ("WC)

Figure 3.1C: System Curve for SVE-3 Pilot Testing



3.1.2 SVE Effluent Discharge Testing

VOC concentrations for the SVE system exhaust are expected to decline substantially within the first days to a month of operations, therefore the air samples collected during this pilot testing are expected to represent a worst case discharge concentration and will be further evaluated following designed system start-up to confirm the initial sample results and to help develop a correlation between system PID readings and actual VOC concentrations. Air samples were collected at each of the three emission sources during the same vacuum pressure of the step testing for each well.

The grab samples were collected in a laboratory supplied, certified-clean, 1-liter SUMMA canisters. Sample media and NYS DOH ELAP certified laboratory analysis were provided by Alpha Analytical, 320 Forbes Boulevard, Mansfield, MA 02048.

Calculations of Estimated effluent discharge at start up are provided in Appendix C.

Table 3.1D: Estimated untreated effluent discharge rate from SVE System

Vapor Phase Constituent	Effluent Concentration (From Pilot Test)	SVE Design Flow Rate	Emission Rate
	$\mu g/m^3$ / lb/ft^3	cfm	lb/hr
SVE-1	9,123,500 / $5.7854E^{-4}$	50.6	1.73
SVE-2	871,500 / $5.4406E^{-5}$	14.7	0.05
SVE-3	273,912 / $1.7100E^{-5}$	19.4	0.02
		Total	**1.8**

3.1.3 Basis for Design

The SVE is intended to reduce VOC vapors available for intrusion into the onsite buildings and reduce the total mass of VOCs in the ground at the site over time. The highest residual sub surface vapors are currently found in close proximity to the former KEM Cleaners space, with substantially more VOC vapors identified during pilot testing from SVE-1 (9,123,500 ug/m^3) than the other test locations (SVE-2 - 871,500 ug/m^3; SVE-3 - 273,912 ug/m^3).

The full-scale design includes three SVE extraction wells with applied vacuums of approximately 33 inches of water and a nominal composite extracted soil vapor flow rate of 84.7 standard cubic feet per minute (SCFM). The planned applied vacuum levels provide manageable soil vapor flow rates and are not expected to result in groundwater mounding that would interfere with the system operations. Subsurface vacuum levels will continue to be monitored to evaluate the radius of influence achieved by the SVE system, within the first months of operation.

The nominal flow rate and applied vacuum levels were developed using a pneumatic model of the SVE system in which pilot step test data were used to predict flow rates from extraction wells under variable applied vacuum. The model results were used to refine the conceptual flow rate and applied vacuum parameters, to account for expected system pressure losses. The model also allowed predictions of the flow rate and applied vacuums produced by the planned piping configuration and blower (Appendix C for pneumatic model calculations). Based on the overlapping ROI observed during the pilot test, the actual flow rate is expected to be less than that predicted by the model. This condition is likely to allow higher vacuum to be applied to the SVE points if necessary as determined by system monitoring.

The three SVE extraction wells for the final system will incorporate the existing SVE extraction wells used during the pilot test SVE-1, SVE-2, and SVE-3. The locations of the existing SVE wells are shown on Figure S-10 following this summary. SVE-1 and SVE-2 are designed to provide overlapping coverage beneath the former KEM Cleaners space.

The location of extraction well SVE-3 is intended to capture vapor from the northern end of the groundwater plume to prevent vapor intrusion from migrating to the attached onsite office building to the north, as well as reduce VOC mass in the area around and beneath the former Loudon Cleaners Space.

The existing observation points at the SP will constitute all of the performance monitoring points

for the full-scale SVE system.

The full scale SVE design shall incorporate the following elements:

- To allow for point-by-point adjustment of applied vacuum and extracted vapor flow rate, each extraction well will be piped independently to a manifold at the extraction blower.
- VOCs present in the extracted vapor stream shall be treated through granular activated carbon to reduce the discharge effluent to below the aggregate amount of 0.1 pound per hour, below the NYSDEC stipulated discharge limit requiring treatment of High Toxicity Air Contaminants (PCE) in the effluent discharge.
- The full-scale system would be operated until cumulative mass removal reaches asymptotic conditions and mitigation of potential
- VOC-impacted soil vapor into the building is determined to be unnecessary through final testing.
- An operation and maintenance plan
- Design specifications
- Performance monitoring, including vacuum monitoring at existing SVMP points
- Regular VOC discharge monitoring of the effluent;

The blower selected for the full-scale design is an 3.0 horsepower regenerative blower (see Appendix E for additional information on the selected SVE equipment). The blower system includes an in-line particulate filter and a vacuum release valve. Also integral into the system is a 7 gallon air/water separator (knockout tank). The knockout tank has a high liquid level alarm switch that shall interrupt blower power when/if activated. A dilution air pipe and associated control valve will be installed and connected to the blower inlet. It is not expected that full-scale system operation will require ongoing dilution air; however, the ability to provide dilution air will allow flexibility in the use of the blower if conditions change in the future.

SVE System Design Specifications are located in Appendix D.

3.2 SSD Pilot Test

The SSD pilot test demonstrated that an SSD system is a viable technology for reducing the potential for vapor intrusion under the south wing of the SP building. Sub slab pressure extension was in the normal range, providing for a layout that would not significantly hinder the future

commercial usage of the space.

3.2.1 SSD Pilot Test Results

The purpose of the SSD pilot test is to evaluate the radius of influence from individual extraction points. Data collected is used to determine the best suited commercially available fans as well as radius of vacuum influences to be used in the layout of extraction points throughout the AOI. Results of the SSD pilot test are located in Tables 3.2A, 3.2B, and 3.2C below.

Table 3.2A: Pilot Test Data from TP1-1

TP1-1	Static In WC	GP501 -3.80	Rn4-4 -4.80	HS5000 -37.00
12-10	0.003	-0.086	-0.110	-0.864
12-15	0.003	-0.048	-0.056	-0.437
12-20	0.001	-0.030	-0.034	-0.252
12-25	0.000	-0.014	-0.011	-0.121
12-30	0.000	-0.004	-0.004	-0.030
12-35	0.000	0.000	0.000	-0.001
12-40	0.000	0.001	0.000	0.000
6-10	0.000	-0.028	-0.030	-0.158
6-15	0.000	0.000	0.000	-0.005

Table 3.2B: Pilot Test Data from TP2-1

TP2-1	Static In WC	HS5000 38.00	Rn4-4 4.70
12-20	0.005	-0.585	-0.083
12-25	0.002	-0.095	-0.014
12-30	0.000	0.000	0.000
2-20	0.010	-0.094	-0.025
2-25	0.002	-0.023	0.000
4-20	0.003	-0.160	-0.018
4-25	0.001	-0.012	0.000
6-20	0.002	-0.145	-0.017
6-25	0.000	-0.025	-0.004
8-20	0.000	-0.135	-0.016
8-25	0.000	-0.062	-0.007
10-25	0.000	-0.084	-0.009
10-30	0.000	-0.001	0.000

Table 3.2C: Pilot Test Data from TP2-2

TP2-2	Static In WC	HS5000	Rn4-4
3-23	0.002	-0.057	-0.012
4-40	0.003	-0.021	-0.004
4-45	0.001	-0.002	0.000
5-39	0.000	-0.062	-0.014
5-43	0.000	-0.016	-0.004
6-34	0.000	-0.353	-0.091
6-37	0.000	-0.159	-0.041
11-10	0.000	-0.431	n/a

3.2.2 SSD Effluent Discharge Evaluation

SSD system is not intended to remediate source contamination, only to act as a low pressure barrier to reduce the potential of vapor migration from beneath the building slab into the occupied spaces. As such, the DEC has not generally required testing or treatment of the exhaust discharge for SSD systems. To avoid entrapment of VOCs in the exhaust discharge through windows or other openings, the final design shall direct exhaust discharges above the roof of the building areas which they serve. The system design will also comply with system exhaust requirements of ANSI/AARST RMS-LB 2014, Radon Mitigation Standards for Schools and Large Buildings, with respect to separation distance to other windows or openings.

3.2.3 SSD Basis for Design

The full-scale SSD design includes four SSD subsystems, each with a fan and two to three sub-slab extraction points or lines, with one of the sub systems utilizing a trench rather than extraction points. The sub systems will all exit through the roof of the building, a fan shall be mounted on an aluminum stand, and the exhaust shall exhaust shall discharge above the roof.

The minimum goal of the SSD system is to maintain a sub slab to room vacuum pressure of not less than 0.004"WC, beneath the building slab, within the footprint of the south wing of the plaza, the area of influence. This is generally accepted as an effective sub slab vacuum pressure to sufficiently prevent or reduce vapor intrusion into a building.

This SSD design includes the permanent installation of sub slab pressure monitoring ports in the six locations throughout the AOI to allow for verification of sub slab vacuum in the AOI. The full scale system design also includes the following elements:

- To allow for point-by-point adjustment of applied vacuum, each extraction point will be fitted with a ball valve prior to any common manifold.
- Each subsystem shall have a monitoring panel with a system pressure gauge and local low vacuum alarm.
- The exhaust of each subsystem shall be above the roof and greater than 10 feet away from any opening to the building which it is not at least 2 feet above.
- All piping shall be pitched back toward extraction points.

The SVE system design calls for SVE-1 piping to run through a trench to be created inside the vacant space between the Dental Office and Risotto Restaurant. The SSD in this space shall also utilize this same trench to conceal the SSD piping.

SSD System Design Specifications are provided in Appendix F.

4.0 SVE System Operation

The SVE system requires the production of a report for continued operations, maintenance, and monitoring. The report shall incorporate the requirements detailed in this report, the SVE final design drawings, and additional requirements mandated by the NYSDEC. The report shall include the following:

- Start up and shut down procedures
- Regular maintenance requirements with a schedule.
- Handling procedures for potentially contaminated condensate water.
- Monitoring/Testing requirements with a schedule.

4.1 SVE System Condensate Management

Based on the pilot test results, vacuum-induced groundwater mounding and introduction into the SVE system through the SVE points is not expected. Nonetheless, the SVE system will be equipped with an air/water phase separator which will be equipped with a high-level float switch. When the high-level water volume sensor in the air/water separator tank is engaged, the switch shall turn off power to the blower. If this occurs, the maintenance schedule should be modified to empty the water prior to future system shut down events.

4.2 SVE Effluent Treatment

The primary VOC contaminant in the effluent stream is tetrachrloroethylene (PCE). PCE is rated as a High Toxicity Air Contaminant (HLAC). The DEC maintains that the SVE exhaust is limited to 0.1 pounds per hour untreated discharge. The contaminant concentrations in the effluent at system start up are expected to be 1.83 pounds/hour. Therefore, upon startup, the SVE design shall provide for treatment of the effluent stream with granular activated carbon (GAC) and a minimum of 94.5% reduction of contaminants in the effluent stream prior to discharge.

The calculated mass flow rate was used to determine expected carbon use and replacement frequency. Vapor phase carbon adsorption data, provided by Carbtrol, manufacturer of the carbon treatment drums, was used to evaluate adsorptive capacity of the individual compounds at their estimated influent concentration. Carbtrol also provided the expected pressure loss through the treatment drums.

The SVE effluent treatment will be accomplished in two configurations, Phase 1 and Phase 2. The initial configuration, Phase 1, will have a higher capacity for contaminant absorption to correspond to the high contaminant levels in the waste stream during the initial stages of operation. Phase 1 will consist of two parallel lines of three carbon drums in series and Phase 2 will consist of two parallel lines of two carbon drums in series. Each drum contains 200 pounds of GAC for a total of 800 pounds in the primary drums and 400 pounds in the secondary drums for Phase 1, and 400 pounds in the primary drums and 400 pounds in the secondary drums for Phase 2. See Appendix C for calculation of mass flow rates and carbon usage.

The carbon treatment in Phase 1, consists of two parallel line of three drums, treatment line (TL) A, with drums A1, A2, and A3, and TL B, with drums B1, B2, and B3. A2, A3, B2, and B3 are primary treatment drums. A1 and B1 are secondary treatment drums.

Breakthrough occurs when the carbon can no longer sufficiently absorb the contaminants and the contaminants pass through the treatment drum, which occurs before full saturation of the carbon. Lab analysis will be collected periodically to confirm effluent concentrations remain within the allowable limit, the process between sample collection and laboratory analysis is typically several days to a couple of weeks, too long to provide useful information about breakthrough.

The mass flow rate was calculated to correspond to a concentration 79.9 parts per million (ppm) (assuming all PCE) at a flow rate of 48.5 cfm to equal 0.1 pound/hour. This level represents breakthrough threshold at the maximum allowable discharge level for PCE. For real-time field

monitoring, breakthrough shall be measured with a photo-ionization detector (PID) with a 10.6 eV lamp. PIDs are not laboratory quality data and are not contaminant specific so conservative safety factors are built into the breakthrough indicator (BI). Determination of breakthrough shall be as follows:

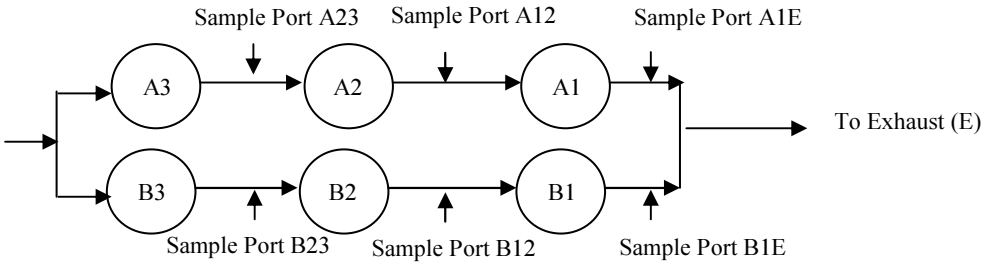


Figure 4.2: Phase 1 GAC Treatment Configuration

Table 4.2: GAC Breakthrough Determination at 48.5 cfm

Sample Location	**Breakthrough Indicator on PID (ppm)*	Safety Factor Used (SF)	Action at Breakthrough Indicator
A23	32	2.5	Remove Drum for disposal
B23	32	2.5	Remove Drum for disposal
A12	16	5	Move Drum to position 3
B12	16	5	Move Drum to position 3
A1E	2	40	Move Drum to Position 2, install new drum in position 1
B1E	2	40	Move Drum to Position 2, install new drum in position 1

*A concentration of 79.9 ppm (PCE) at 48.5cfm equates to 0.1 pound per hour.

** New breakthrough indicators needed for different airflows.

During the operation, periodic sampling shall be performed from the effluent discharge with laboratory analysis to verify the discharge limits are being met. Correlation between PID reading and laboratory sample results shall be attempted and adjustments to the breakthrough indicators and actions may be necessary following system start up.

4.3 SVE Variable Operation (Throttling)

Based on the initial effluent contaminant levels obtained during the pilot testing, the estimated GAC usage at full operation flow at start up is expected to be 83.7 pounds per day. Based on the

previous testing of groundwater and soils at the site, this level of effluent contamination was not anticipated when financing was obtained as part of the purchase of the site. As such, the cost of GAC treatment at the full design flow rate based on the initial effluent contaminant levels is not financially sustainable for the property owner. Budgetary constraints limit the amount of carbon that is available each month to no more than 800 pounds. Therefore, the SVE system shall need to be throttled in the initial stages in order to control the amount of carbon used. Throttling shall be accomplished by reduction of ground derived system airflow through the use of valves, operating frequency adjustment, and/or with the introduction of ambient outside air to the system.

In order to provide treatment of the effluent while also remaining within budgetary constraints, the SVE system flow rate shall be stepped up over time based on the GAC usage until it reaches full design flow. 800 pounds of carbon per month (30 days) equates to 26.7 pounds per day.

The treatment of SVE2 and SVE3 are relatively minor contributors to carbon usage and will be started at full design flow of 14.7 and 19.4 cfm, respectively. These extraction wells will contribute 0.07 pounds per hour of contaminants, at start up conditions, to the treated effluent stream, and will remain at full design flow rate until contaminant concentrations reach asymptotic levels for each extraction well. At start up contaminant concentrations, this will result in a carbon usage rate of 4.4 pounds per day for SVE2 and SVE3, with a budget balance of 22.3 pound of carbon per day for SVE1. This corresponds to a maximum flow rate of SVE1 at initial contaminant concentrations of 14.4 cfm. The SVE1 flow rate shall be increased corresponding to the decrease in the contaminant level until the full design flow rate of 50.6 cfm is obtained.

4.4 SVE System Monitoring

The performance of the SVE system will be monitored during routine site visits by the contracted system operator. Initially, the operator will visit the site on a weekly basis. Routine visit frequency shall be reduced once operating parameters are established. The operator will collect and record PID screening readings, vacuum and flow velocity measurements, and other operational parameters as described below. System monitoring information will be used to evaluate system operations and make decisions regarding system optimization. Section 4.5 provides guidelines for system optimization procedures.

4.4.1 VOC Monitoring

A PID will be used to screen extracted soil vapor from the total system and individual SVE wells for VOCs. These results will be considered when optimizing SVE operation. A sample port consisting of a brass valve fitting will be installed in the conveyance piping from each SVE well upstream of

the manifold. An isolation valve will be installed on the conveyance pipe downstream of the sample port. To screen the soil vapor with the PID, the isolation valve will be closed to eliminate the vacuum applied by the blower and allow the a peristaltic pump to draw soil vapor from inside the conveyance pipe. The extracted soil gas shall be collected in a tedlar bag and tested with the PID or the PID will be connected to the discharge port of the pump. A sample port shall be installed downstream of the blower, prior to the vapor phase treatment drums, for sampling the total pre-treatment effluent by direct connection of a PID or a summa canister. The maximum stable PID reading shall be recorded.

A sample of the overall system effluent, will be collected weekly for the first four weeks, then monthly for the first six months, with reductions in frequency following six months if results stabilize over multiple sampling events during system operation. The samples shall be collected in a one-liter Summa canister (or equivalent) and analyzed for VOCs by USEPA Method TO-15.

4.4.2. Applied Vacuum and Velocity

Individual vacuum gauges at the manifold will be used to measure the vacuum applied to each SVE well. Friction loss in the conveyance piping is expected to be minimal (up to 0.5 "WC); the vacuum measured at the manifold will be representative of the vacuum at the SVE extraction well. Each conveyance pipe will also contain a valved sample port before the manifold that will allow the insertion of a portable thermal mass flow meter to measure the temperature and velocity of vapor extracted from the SVE well. A valved sample port shall also be present in the exhaust pipe to measure the velocity of SVE system exhaust. A permanent thermometer shall also be installed into the exhaust line to monitor blower exhaust stream temperature.

4.4.3. Vacuum Response

Sub-slab/subsurface vacuum will be measured at the SMPs and existing groundwater monitoring wells in close proximity using a digital manometer or magnehelic gauge, to determine response to applied vacuums. The sub-slab/subsurface vacuum response will be measured at start-up and following any system operational modifications that may result in a change in response (e.g., a change in applied vacuum to one or more SVE points). Based on pilot test observations, the sub-slab/subsurface vacuum is expected to establish relatively quickly and should not change significantly over time. Periodic measurement of sub-slab/subsurface vacuum at the new and existing monitoring points during routine operations is therefore unnecessary.

4.4.4 SVE Blower System

Vacuum and pressure gauges will be installed to allow monitoring of the SVE blower inlet vacuum and discharge pressure. Vacuum gauges, installed upstream and downstream of the particulate filter will be used to determine the vacuum differential across the filter. An increase in vacuum differential across the filter will indicate particulate loading of the filter. When vacuum loss through the filter begins to affect SVE system performance (greater than 5 "WC), the filter element will be replaced.

Other blower operational parameters that will be monitored and recorded include the blower discharge air temperature, humidity, depth of accumulated water in the air/water separator, and the blower run hours. If dilution air is being used, the temperature and velocity of the dilution air stream will be measured using a portable thermal mass flow meter through a sample port in the inlet pipe and recorded. The vacuum in the pipe will also be measured and recorded.

4.5 SVE System Optimization and Shutdown

To maximize the mass of VOCs removed by the SVE system, optimization of the SVE system will be performed at system startup, and again when significant changes in extracted VOC concentrations are observed.

The vacuum on any individual SVE point may be adjusted using control valves on the conveyance piping at the manifold. Total mass removal by the system will be optimized by adjusting the vacuum applied to the individual SVE points. Additionally, the VFD blower control system can be adjusted to optimize the extraction rates with an energy savings component, as opposed to using dilution valves.

Optimal system performance will be based on PID screening and laboratory analysis air quality testing results from individual SVE extraction wells. The control valve will be adjusted to increase the vacuum (and resultant flow) at points that have higher PID readings and reduce flow from points with low readings. Periodic shutdown and rebound tests may also be performed to determine if individual SVE points should be temporarily or permanently discontinued. After system optimization, monitoring points will be used to monitor the area of influence of the system.

The full-scale system will be operated within budgetary constraints until cumulative VOC mass removal approaches asymptotic conditions for each SVE extraction area. At that time, a one-month shutdown test will be conducted to assess whether pulsed operation of the system or final shutdown

should be considered. Prior to shut down and upon re-start, one-liter Summa canisters will be used to collect a sample from each SVE zones for analysis of VOCs by EPA Method TO-15. VOC concentrations in the re-start samples will be compared to concentrations in samples collected prior to shut down to assess rebound.

Shutting down of any of the SVE zones or the SVE system overall shall be subject to conditions of the SMP and NYSDEC approval.

5.0 SSD System Operation and Monitoring

The SSD system requires the production of an operations and maintenance manual (O&M Manual). The O&M Manual shall incorporate the requirements detailed in this report, the SSD final design drawings, and any additional requirements mandated by the NYSDEC. The O&M Manual shall include the following:

- A descriptions of all system components and operation of the system
- Start up and shut down procedures
- Regular maintenance requirements with a maintenance schedule.
- Monitoring/Testing requirements with a schedule
- A basic operations troubleshooting guide for the system
- Emergency contacts for system maintenance and repair

5.1 Condensate Management

The SSDS has been designed to allow inline condensation to drain back below the slab of the building. There is no special condensate handling required.

5.2 SSD System Monitoring

The performance of the SSD system will be monitored during a semi-annual inspection by the contracted system operator. The inspection will involve collecting system vacuum readings from gauges and testing functionality of the monitoring equipment, and low vacuum alarms.

5.3 SSD System Optimization and Shutdown

The SSD system is expected to operate until the contaminants in the sub surface of the site no longer pose a vapor intrusion risk. Following the shutdown of the SVE system and at such a time that it is believed vapor intrusion risk no longer exists, vapor intrusion testing shall be performed in each of the tenant spaces in the target area which include a sub-slab sample and a corresponding indoor air sample, with the SSD system off. Vapor intrusion testing shall be performed during the "Heating Season", November 15 - March 15. Analysis of the samples for VOCs shall be by EPA Method TO-15. Results of the vapor intrusion testing shall be compared to the New York State Department for Health Vapor Intrusion Guidance (2006) decision matrices. When all of the test results achieve a "no further action" result, the SSD system may be decommissioned permanently, with NYSDEC and NYSDOH approval. Any attempt to decommission portions of the system, should be fully supported by additional test data.

Shutting down of any of the SSDS zones shall be subject to conditions of the Site Management Plan and NYSDEC/NYSDOH approval.

6.0 CAMP Monitoring

Installation of the SVE system includes the installation of pipe in trenches cut through the concrete sidewalks outside the building and through asphalt pavement in the parking lot. A Community Air Monitoring Plan has been developed to be used during the installation of the systems.

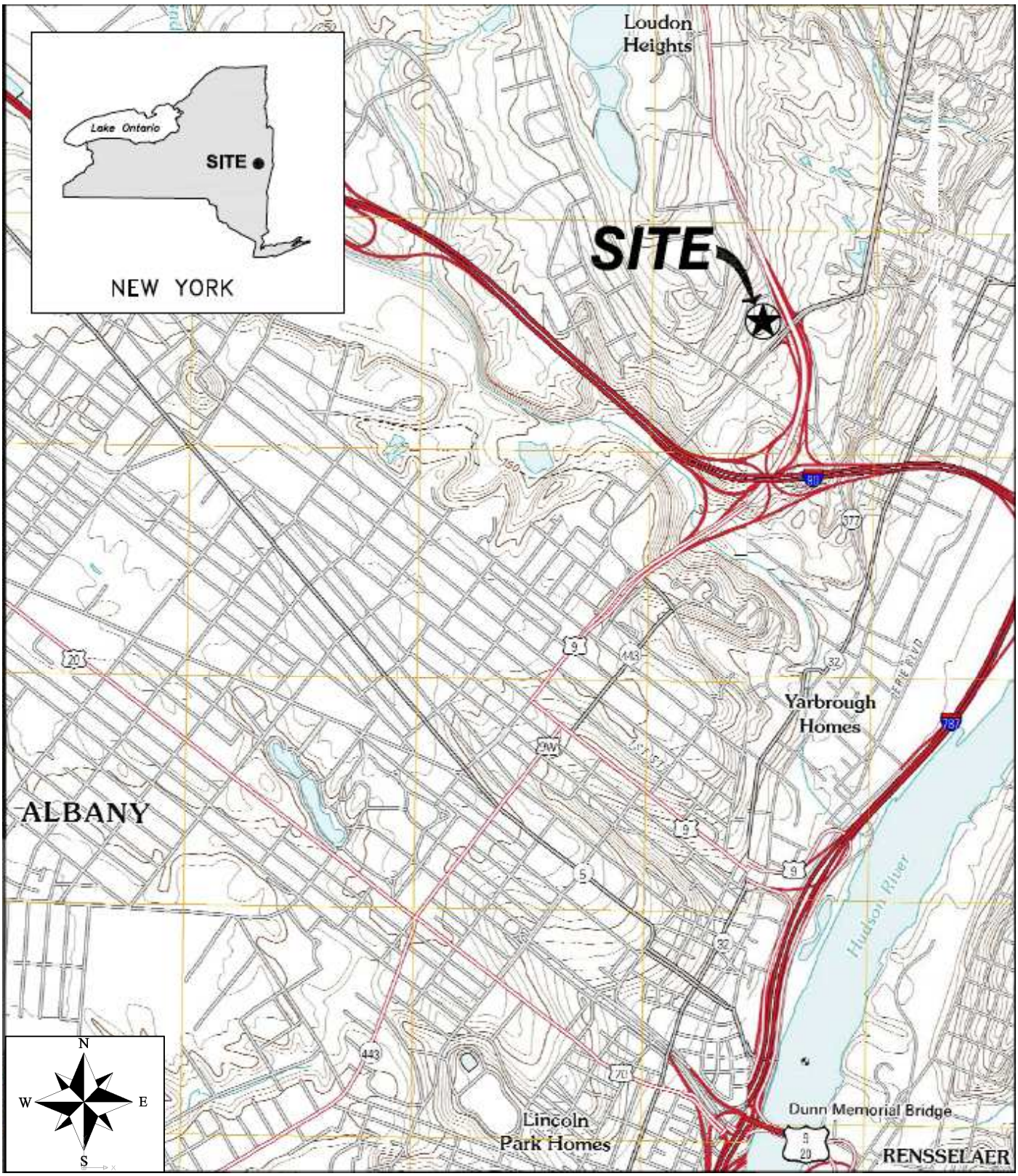
7.0 Soil Management Plan

Installation of the SVE and SSD systems include excavation of sub surface soils in areas shown by previous testing to contain VOC contamination. A soil management plan was developed to be used for the handling, storage, and disposal, of sub surface soils removed as part of the SVE and SSD installations. The plan is attached in Appendix I.

8.0 Asbestos Evaluation

The SP building contained flooring which was tested and determined to contain asbestos. A Path of construction (POC) asbestos inspection was performed prior to the installation of the SSD system and asbestos in the POC was abated by a licensed contractor prior to the installation of the SVE and SSD systems.

FIGURES



Project: Former Loudon/Kem Cleaners Site
DRAWING DATE: October, 2017
NYSDEC BCP Site Number: C401060

FIGURE – 1 SITE LOCATION

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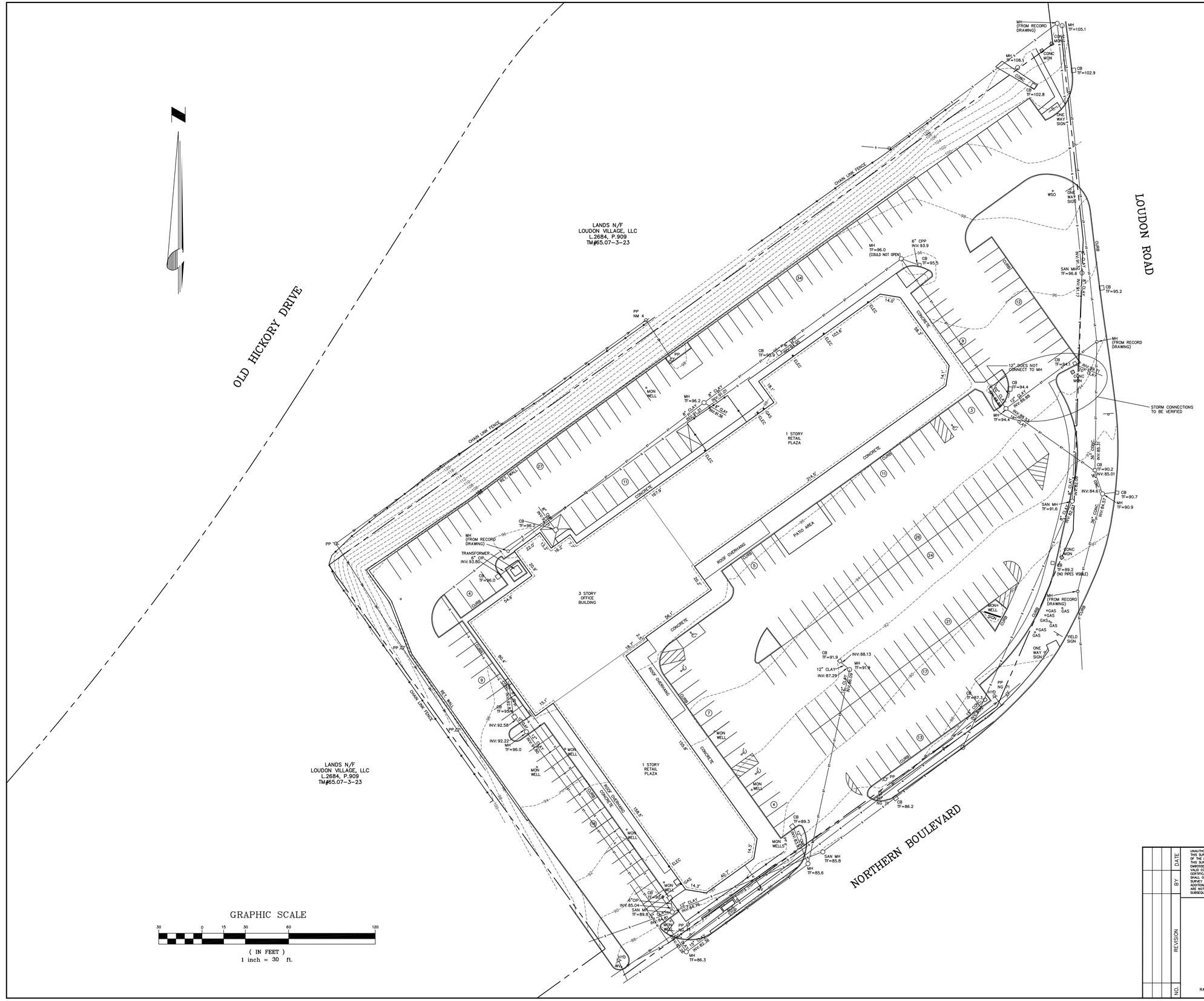

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

NOTES:

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Schenectady, NY 12305
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www.abdeng.com

DATE:	SCALE:	DWG.	SHEET OF
JUNE 5, 2017	1" = 30'	4787A-P	1 1

A SVE Pilot Test Points and Point Identification.

DATE: September 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

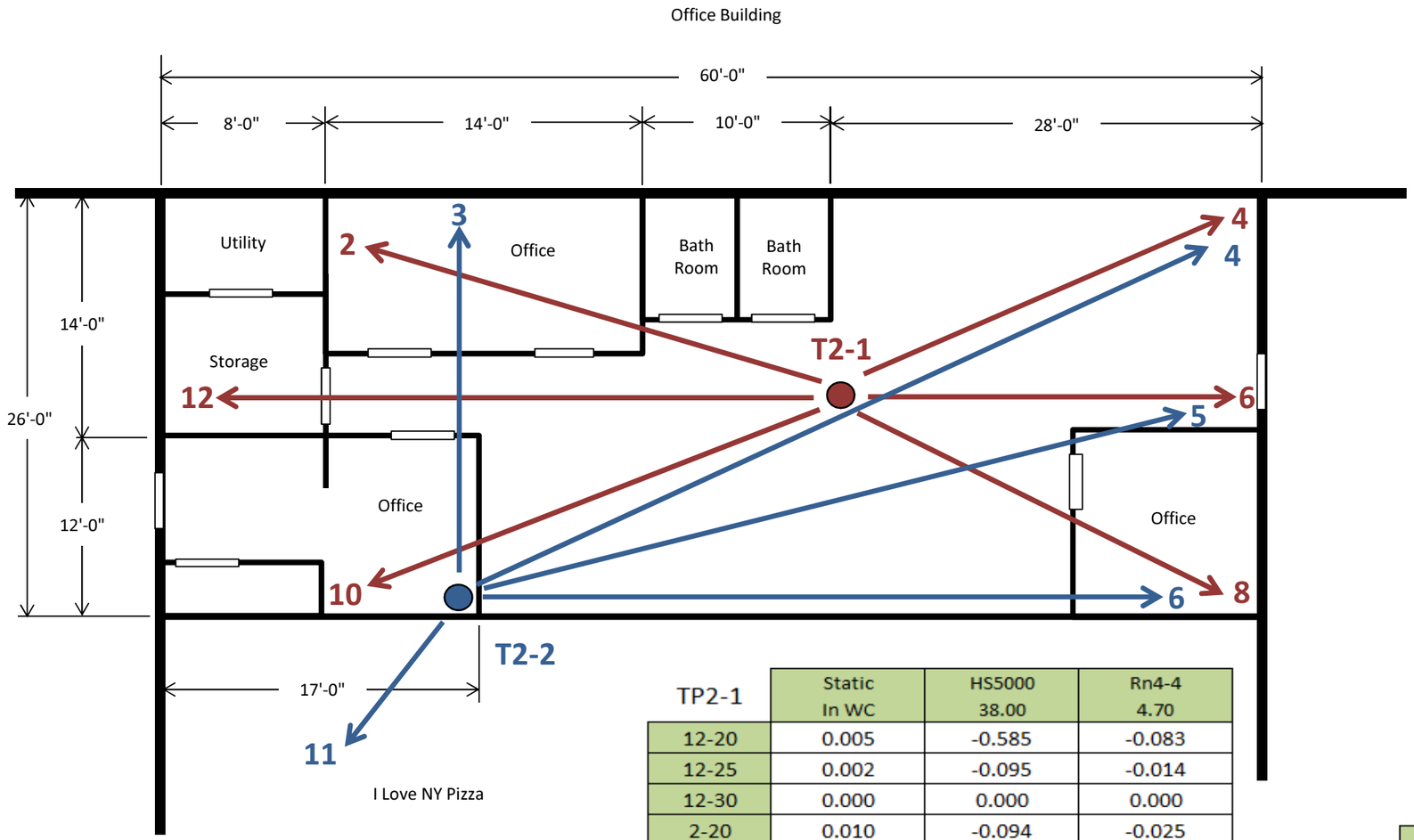
DESCRIPTION:	DATE:
	October 27, 2017

PROJECT NO:

SHEET NO:

S - 10

SHEET TITLE:	SVE PILOT TEST LOCATIONS		
DRAWN BY:	BG	CHECKED BY:	MS



Legend

Orientation/Direction (6 oclock)

Test point ID 4-20

Distance (feet)

Test ExtactionPoint

TP2-1	Static In WC	HS5000 38.00	Rn4-4 4.70
12-20	0.005	-0.585	-0.083
12-25	0.002	-0.095	-0.014
12-30	0.000	0.000	0.000
2-20	0.010	-0.094	-0.025
2-25	0.002	-0.023	0.000
4-20	0.003	-0.160	-0.018
4-25	0.001	-0.012	0.000
6-20	0.002	-0.145	-0.017
6-25	0.000	-0.025	-0.004
8-20	0.000	-0.135	-0.016
8-25	0.000	-0.062	-0.007
10-25	0.000	-0.084	-0.009
10-30	0.000	-0.001	0.000

TP2-2	Static In WC	HS5000	Rn4-4
3-23	0.002	-0.057	-0.012
4-40	0.003	-0.021	-0.004
4-45	0.001	-0.002	0.000
5-39	0.000	-0.062	-0.014
5-43	0.000	-0.016	-0.004
6-34	0.000	-0.353	-0.091
6-37	0.000	-0.159	-0.041
11-10	0.000	-0.431	n/a

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: September 2017

Loudon Plaza
350 Northern Blvd.
Albany, NY

DESCRIPTION	DATE
	October 18, 2017

PROJECT NO.

SHEET NO.

V - 10

SHEET TITLE	VM PILOT TEST LOCATIONS, UPPER VACANT		
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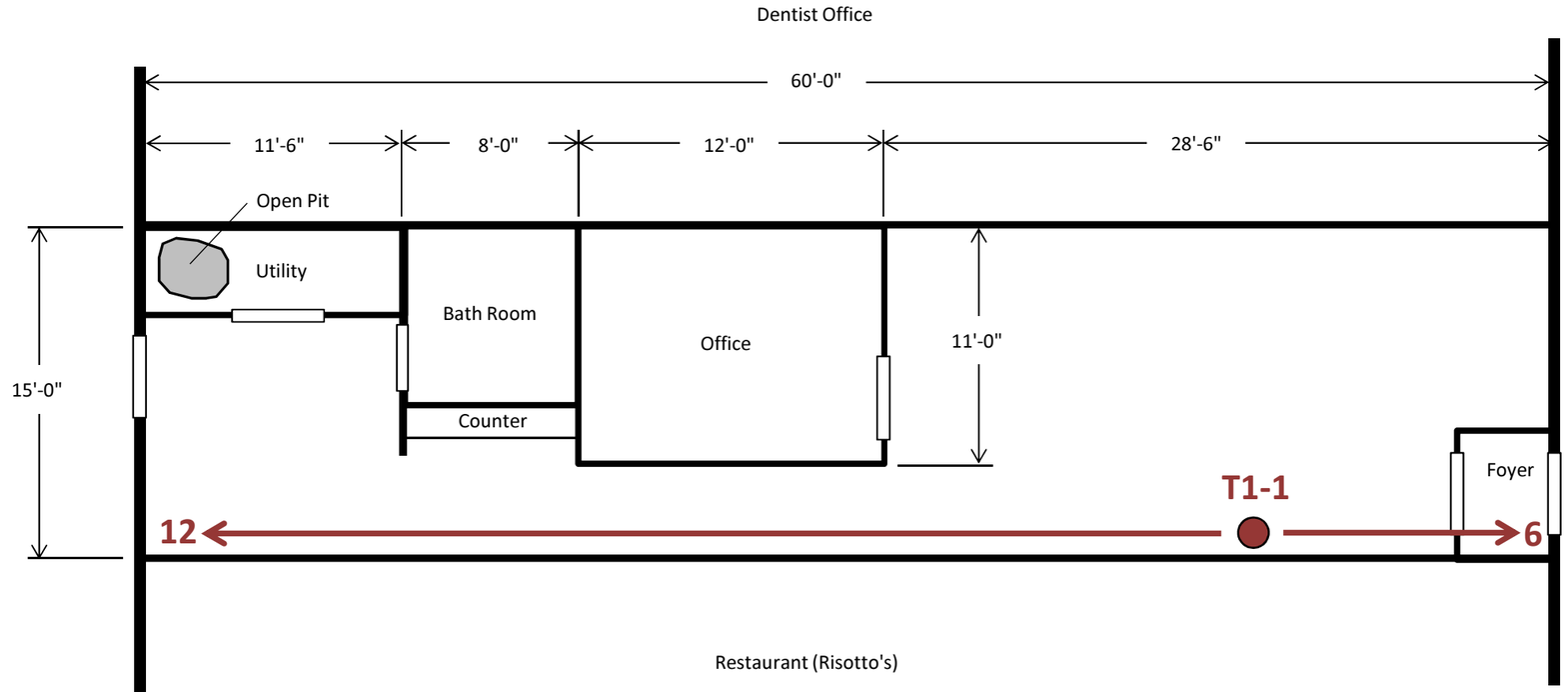


Legend

Orientation/Direction (6 oclock)

Test point ID 6-15

Distance (feet)

Test ExtactionPoint

TP1-1	Static In WC	GP501 -3.80	Rn4-4 -4.80	HS5000 -37.00
12-10	0.003	-0.086	-0.110	-0.864
12-15	0.003	-0.048	-0.056	-0.437
12-20	0.001	-0.030	-0.034	-0.252
12-25	0.000	-0.014	-0.011	-0.121
12-30	0.000	-0.004	-0.004	-0.030
12-35	0.000	0.000	0.000	-0.001
12-40	0.000	0.001	0.000	0.000
6-10	0.000	-0.028	-0.030	-0.158
6-15	0.000	0.000	0.000	-0.005

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: September 2017

Loudon Plaza
350 Northern Blvd.
Albany, NY

DESCRIPTION	DATE
	October 18, 2017

PROJECT NO.

SHEET NO.

V - 11

SHEET TITLE	VM PILOT TEST LOCATIONS, LOWER VACANT		
DRAWN BY	PS	CHECKED BY	MS

Appendix A:

Boring Logs for SVE Pilot Test Wells and Monitoring Ports

ALPHA GEOSCIENCE

Geology
Hydrology
Remediation
Water Supply

August 4, 2017

Mr. Kim L. Baines, LEP
Alpine Environmental Services, Inc.
438 New Karner Road
Albany, NY 12205

Re: Geologic & Well Completion Logs
Former Loudon and Kem Cleaners Brownfield Cleanup Site
350 Northern Boulevard
Albany, New York
NYSDEC Site ID #C401060

Dear Mr. Baines:

The geologic and well completion logs for the soil vapor extraction wells (SVE-1, SVE-2, and SVE-3) and soil vapor monitoring points (VMP-1A, VMP-1B, VMP-2A, VMP-2B, and VMP-3A). The locations are shown on the attached site map.

The wells and monitoring points were installed for the purpose of conducting the Pre-Design Investigation and for the soil vapor extraction system that will be installed as part of the on-site remedy for the Former Loudon and Kem Cleaners Brownfield Cleanup Site.

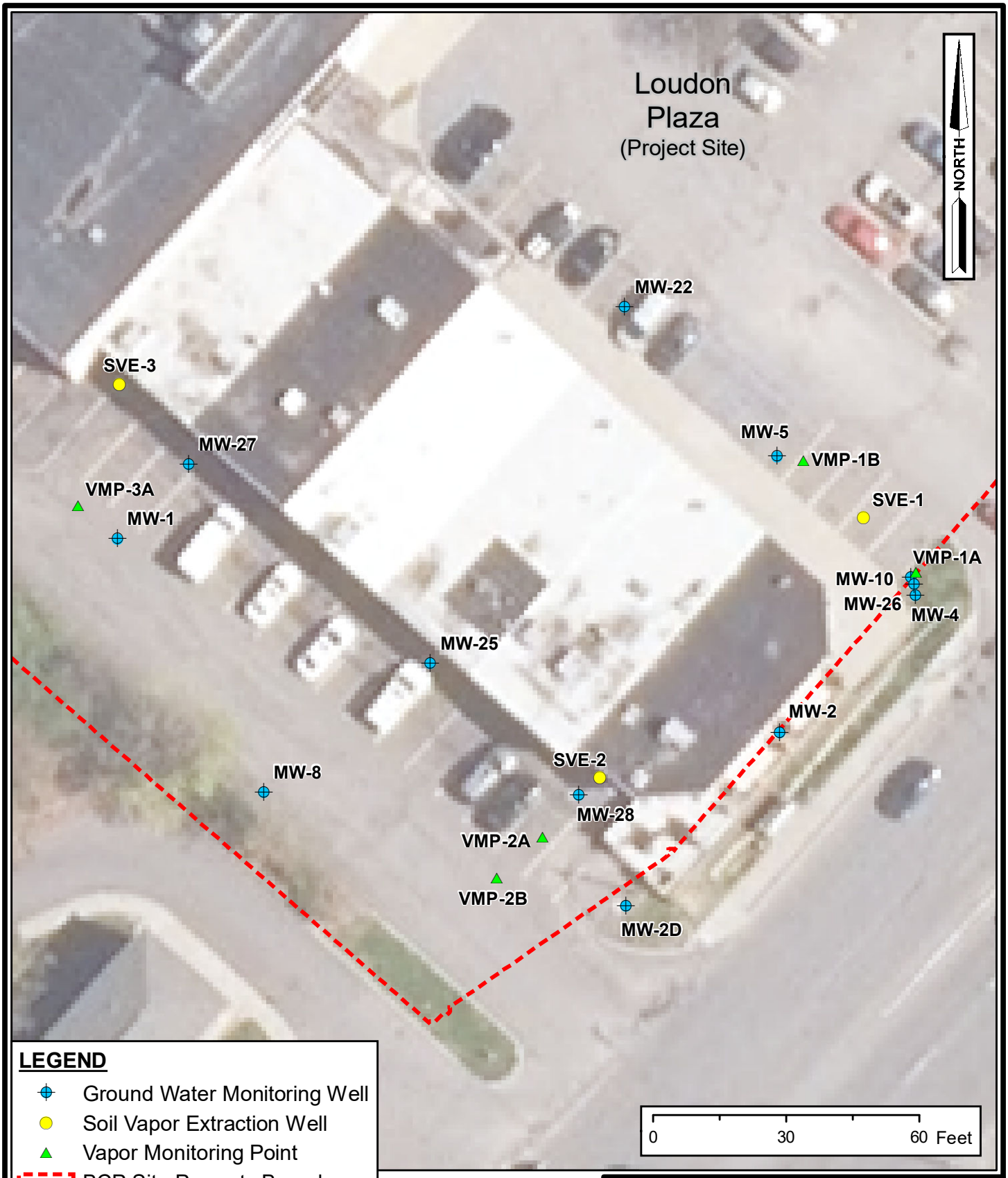
Please do not hesitate to contact me if you have any questions.

Sincerely,
Alpha Geoscience

Scott M. Hulseapple, PG, CPG
Hydrogeologist

Attachments
Cc: F. Lanni – DF Acquisitions
J. Privitera – MLTW, P.C.

SMH/bms
Z:\projects\2016\16100 - 16120\16117 - Loudon Plaza\2_0 Correspondence\Well Logs 2017-08-04.docx



LEGEND

- Ground Water Monitoring Well
- Soil Vapor Extraction Well
- Vapor Monitoring Point
- BCP Site Property Boundary

Notes:
-Parcel boundaries: Albany County Tax Map (2015), Sheet 65-07.
-Basemap: Albany County 12-inch resolution natural color orthoimagery (2014), NYS Office of Information Technology Services (ITS) (http://www.nysgis.state.ny.us).
-Locations and boundaries are approximate.

ALPHA GEOSCIENCE
Proj. No. 16117

FIGURE 1
Well Location Map

Former Loudon & Kem Cleaners BCP Site
NYSDEC ID #C401060
350 Northern Boulevard
City of Albany
Albany County, New York

Path: Z:\projects\2016\16100 - 16120\16117 - Loudon Plaza\15_0 GIS\Site_Map.mxd
Date Saved: 8/4/2017 9:59:39 AM

Alpha Geoscience 679 Plank Road Clifton Park, New York 12065	**GEOLOGIC LOG**	**Boring ID: SVE-1** Page 1 of 1

Project Number/Name: 16117 / Loudon Plaza BCP Location: Albany, New York

Drilling Contractor/Personnel: Cascade Technical Services (E. Ramey)

Geologist/Hydrogeologist: Scott Hulseapple — Start/Finish Date: 7/17/17

Drilling Equip/Method: CME 75 / 6 1/4" ID HSA — Size/Type of Bit: 11" OD

Sampling Method: 1 1/2" diameter & 5' long macrocore — Well Installed? Yes

Elevation/Ground Surface: NM

Depth to Ground Water from Ground Surface (Date): 23.5 feet at adjacent MW-26 (7/19/17)

REMARKS:

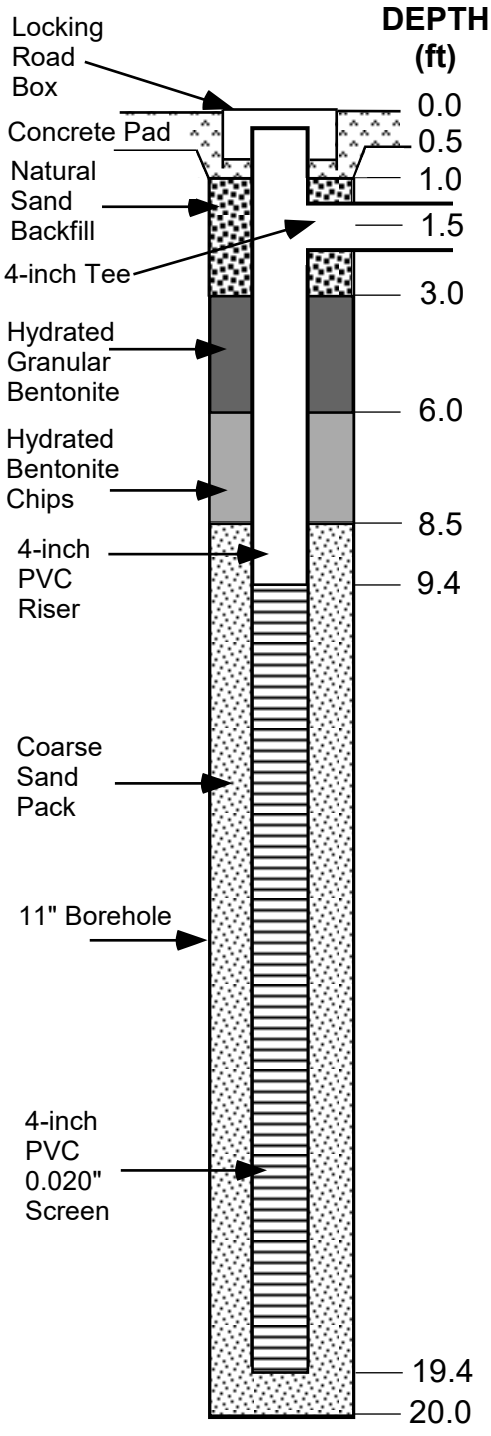
Depth (Ft)	Sample No.	PID (ppm)	Recovery (in)	DESCRIPTION	REMARKS
	No Sample			Pavement 1.0' Brown f-c SAND, some fines; moist;no odor (FILL) 2.8'	Hand-cleared to 2.8' Piece of cement at ~ 2.8'
	MC-1	4.0 (2.8'-5')	36	Green grey medium dense silty CLAY, trace medium sand; occasional silty/fine sand partings; moist; no odor 5.0'	
5	MC-2	3.8 (5'-7') 8.6 (8'-10')	54	Red brown silty f-m SAND with occasional layers (up to 8") of clayey f-m sand; moist; no odor; clayey sections are medium dense and moist to wet on top	Sample SVE-1 (8-10') sent to lab for analysis of VOCs. Summary of detected compounds: PCE - 0.040 mg/kg c-1,2-DCE - 0.0061 mg/kg
10	MC-3	6.2 (11'-13') 1.5 (13'-15')	60		
15	MC-4	2.5 (15'-18')	36	16.0' Brown f-m SAND; trace silt; moist; no odor 20.0'	
20				End of Boring	

Proportions Used: Trace=0-10% Little=10-20% Some=20-35% And-35-50%

SOIL VAPOR EXTRACTION WELL COMPLETION LOG

ALPHA GEOSCIENCE
679 Plank Road
Clifton Park, New York
(518) 348-6995

Well	SVE-1
Project	Loudon Plaza BCP
Project No.	16117
Client	DF Acquisitions, LLC
Date Drilled	7/17/2017



INSPECTION NOTES

Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Extraction
Static Water Level 23.50 feet* Date 7/19/17
Measuring Point PVC
Total Well Depth 19.4 ft bgs

Riser Pipe
Material PVC Diameter 4 inches
Length 9.0 Joint Type flush threaded

Screen
Material PVC Diameter 4 inches
Slot Size 0.020" Length 10.0'
Stratigraphic Unit Screened Sand / Silty Sand

Packing
Sand X Gravel Natural
Amount Interval 8.5' - 20.0'

Seal
Type 1 Bentonite Chips Interval 6' - 8.5'
Type 2 Granular Bentonite Interval 3' - 6'

Locking Case Yes
Diameter 8 inches

Notes:
4-inch diameter tee and ~18" long stub pipe solvent glued and temporarily capped.
*Water level measured at adjacent ground water monitoring well MW-26.

Alpha Geoscience
679 Plank Road
Clifton Park, New York 12065

GEOLOGIC LOG

Boring ID: SVE-2

Project Number/Name: 16117 / Loudon Plaza BCP Location: Albany, New York

Drilling Contractor/Personnel: Cascade Technical Services (E. Ramey)

Geologist/Hydrogeologist: Scott Hulseapple

Start/
Finish Date: 7/18/17

Drilling Equip/Method: CME 75 / 6 1/4" ID HSA

Size/Type of Bit: 11" OD

Sampling Method: No samples collected

Well Installed? Yes

Elevation/Ground Surface: NM

Depth to Ground Water from Ground Surface (Date): 23.4 feet at adjacent MW-28 (7/19/17)

REMARKS:

Depth (Ft)	Sample No.	PID (ppm)	Recovery (in)	DESCRIPTION	REMARKS
				(from 2013 geologic log by Shaw of Well MW-28 located 6.2 feet to the southwest)	Well installed by removing and overdrilling ground water monitoring well MW-3. No samples collected.
				4.0'	
5				Light brown SILT, some fine Sand	
				7.0'	
				Light brown Clayey SILT	
				8.5'	
				Light brown fine SAND, little Silt	
10				11.0'	
				Light brown fine SAND and SILT	
				14.5'	
15				Light brown fine SAND, little to some Silt	
				18.0'	
				Light brown fine SAND	
				20.0'	
20				End of Boring	

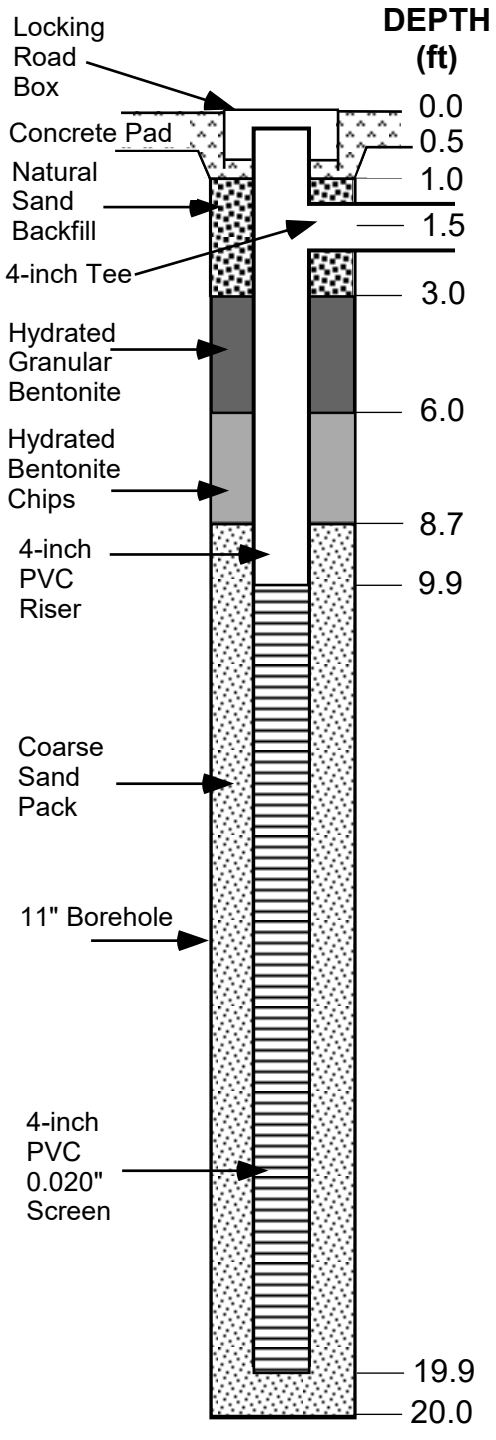
Proportions Used: Trace=0-10% Little=10-20% Some=20-35% And-35-50%

SOIL VAPOR EXTRACTION WELL COMPLETION LOG

ALPHA GEOSCIENCE

679 Plank Road
Clifton Park, New York
(518) 348-6995

Well	SVE-2
Project	Loudon Plaza BCP
Project No.	16117
Client	DF Acquisitions, LLC
Date Drilled	7/18/2017



INSPECTION NOTES

Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Extraction
Static Water Level 23.40 feet* Date 7/19/17
Measuring Point PVC
Total Well Depth 19.9 ft bgs

Riser Pipe
Material PVC Diameter 4 inches
Length 9.5 Joint Type flush threaded

Screen
Material PVC Diameter 4 inches
Slot Size 0.020" Length 10.0'
Stratigraphic Unit Screened Sand / Silty Sand

Packing
Sand X Gravel Natural
Amount Interval 8.7' - 20.0'

Seal
Type 1 Bentonite Chips Interval 6' - 8.7'
Type 2 Granular Bentonite Interval 3' - 6'

Locking Case Yes
Diameter 8 inches

Notes:
SVE-2 installed at former MW-3 location.
4-inch diameter tee and ~18" long stub pipe solvent glued and temporarily capped.
*Water level measured at adjacent ground water monitoring well MW-28.

Alpha Geoscience
679 Plank Road
Clifton Park, New York 12065

GEOLOGIC LOG

Boring ID: SVE-3

Page 1 of 1

Project Number/Name: 16117 / Loudon Plaza BCP Location: Albany, New York

Drilling Contractor/Personnel: Cascade Technical Services (E. Ramey)

Geologist/Hydrogeologist: Scott Hulseapple

Start/
Finish Date: 7/18/17

Drilling Equip/Method: CME 75 / 6 1/4" ID HSA

Size/Type of Bit: 11" OD

Sampling Method: 1 1/2" diameter & 5' long macrocore (Geoprobe)

Well Installed? Yes

Elevation/Ground Surface: NM

Depth to Ground Water from Ground Surface (Date): 22.6 feet at adjacent MW-27 (7/19/17)

REMARKS:

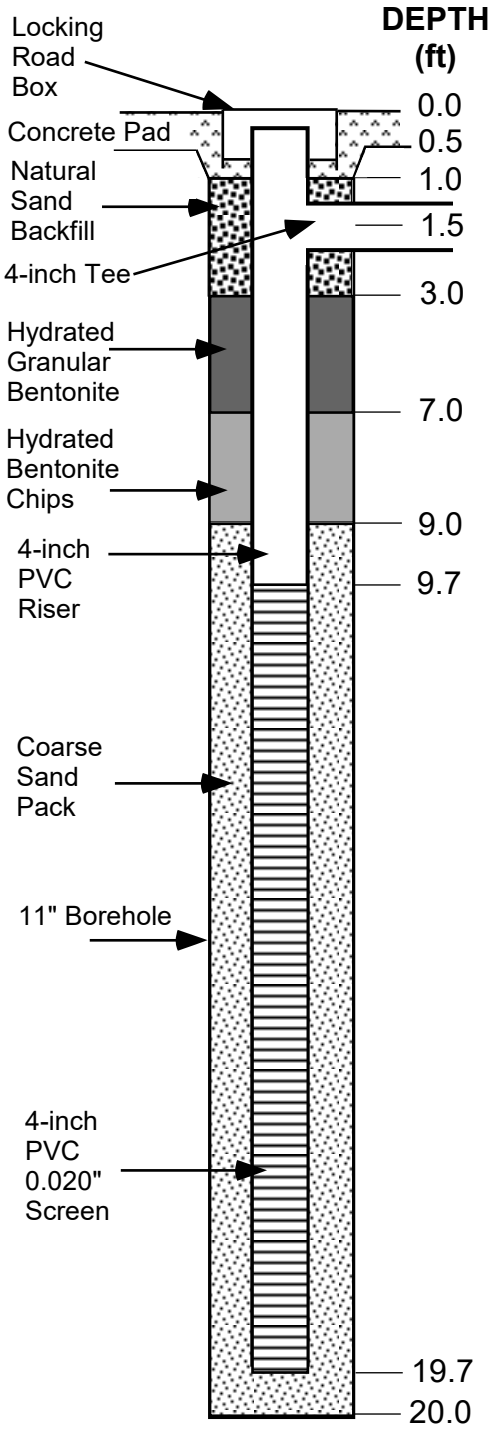
Depth (Ft)	Sample No.	PID (ppm)	Recovery (in)	DESCRIPTION	REMARKS
	No Sample		NS	Pavement / Cement	Hand-cleared to 5' on 7/17/17'
				Brown f-m SAND, trace Silt; moist;no odor (FILL) 2.0'	
				Green grey medium dense silty CLAY, trace medium sand; trace to some sand; moist; no odor	
5	MC1	0.4 (5'-7')	60	7.2'	
				Brown silty f-m SAND; moist; no odors; occasional clayey SAND layer (up to 2.5")	
		4.4 (8'-10')			
10	MC2	23.9 (10'-12')	33		Sample SVE-3 (10-12') sent to laboratory for analysis of VOCs Summary of detected compounds: PCE - 0.030 mg/kg c-1,2-DCE - 0.0092 mg/kg
		15.4 (12'-13')			
		NR			
15	MC3	11.2 (15'-18')	36		
		NR			
20				20.0' End of Boring	

Proportions Used: Trace=0-10% Little=10-20% Some=20-35% And-35-50%

SOIL VAPOR EXTRACTION WELL COMPLETION LOG

ALPHA GEOSCIENCE
679 Plank Road
Clifton Park, New York
(518) 348-6995

Well	SVE-3
Project	Loudon Plaza BCP
Project No.	16117
Client	DF Acquisitions, LLC
Date Drilled	7/18/2017



INSPECTION NOTES

Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Extraction
Static Water Level 22.59 feet* Date 7/19/17
Measuring Point PVC
Total Well Depth 19.7 ft bgs

Riser Pipe
Material PVC Diameter 4 inches
Length 9.3 Joint Type flush threaded

Screen
Material PVC Diameter 4 inches
Slot Size 0.020" Length 10.0'
Stratigraphic Unit Screened Sand / Silty Sand

Packing
Sand X Gravel Natural
Amount Interval 9.0' - 20.0'

Seal
Type 1 Bentonite Chips Interval 7.0' - 9.0'
Type 2 Granular Bentonite Interval 3.0' - 7.0'

Locking Case Yes
Diameter 8 inches

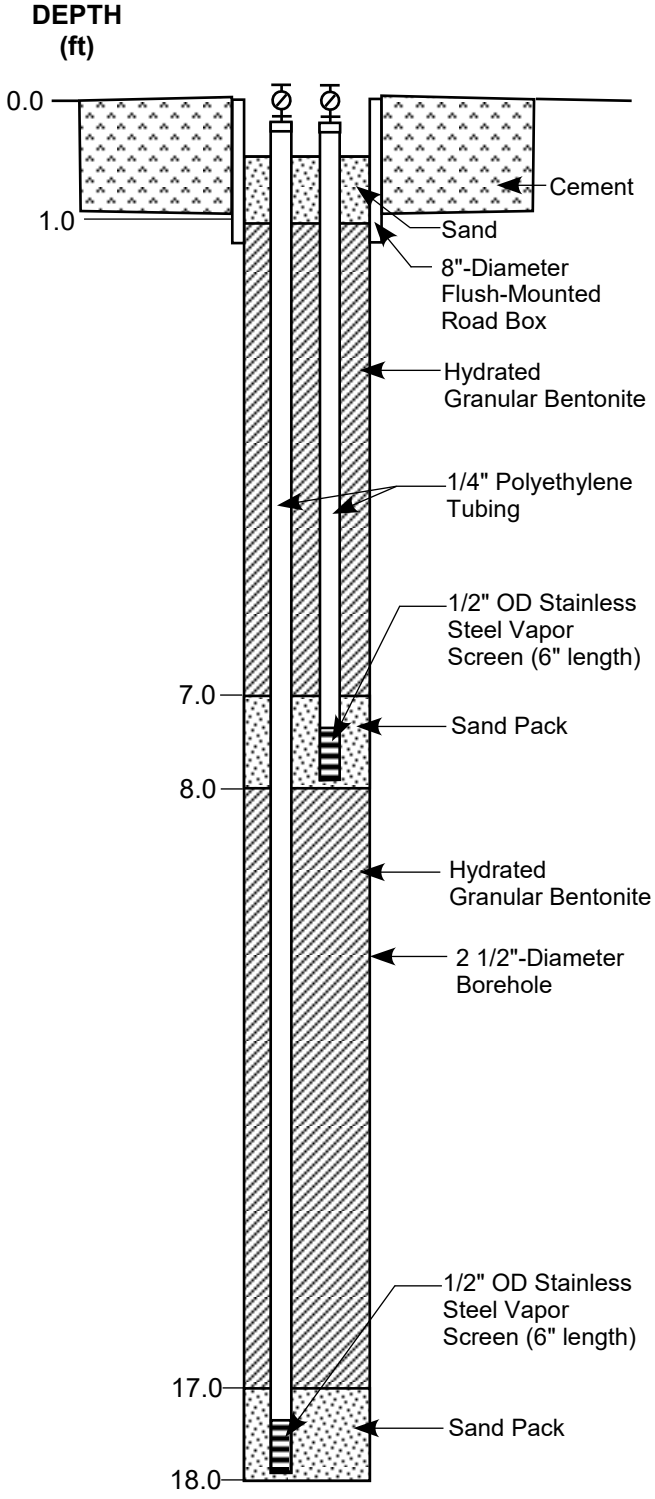
Notes:
4-inch diameter tee and ~18" long stub pipe solvent glued and temporarily capped
*Water level measured at adjacent ground water monitoring well MW-27.

SOIL VAPOR MONITORING POINT COMPLETION LOG

679 Plank Road
Clifton Park, New York
(518) 348-6995

Well VMP-1A
Project Loudon Plaza BCP
Project No. 16117
Client DF Acquisitions, LLC
Date Drilled 7/18/17
Date Developed NA

NOT TO SCALE



Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Monitoring Point
Static Water Level NA Date NA
Measuring Point NA
Total Well Depth 18.0'

Riser Pipe
Material Polyethylene Diameter 1/4"
Length 8' / 18' Joint Type Barbed

Screen
Material Stainless Steel Diameter 1/2"
Slot Size _____ Length 6"
Stratigraphic Unit Screened Silty Sand

Packing
Sand X Gravel ____ Natural ____
Amount _____ Intervals 7'-8' / 17'-18'

Seal
Type Granular Bentonite Intervals 1'-7' / 8'-17'

Locking Case: flush-mounted Yes [x] No [ ]
Diameter 8"

Notes:

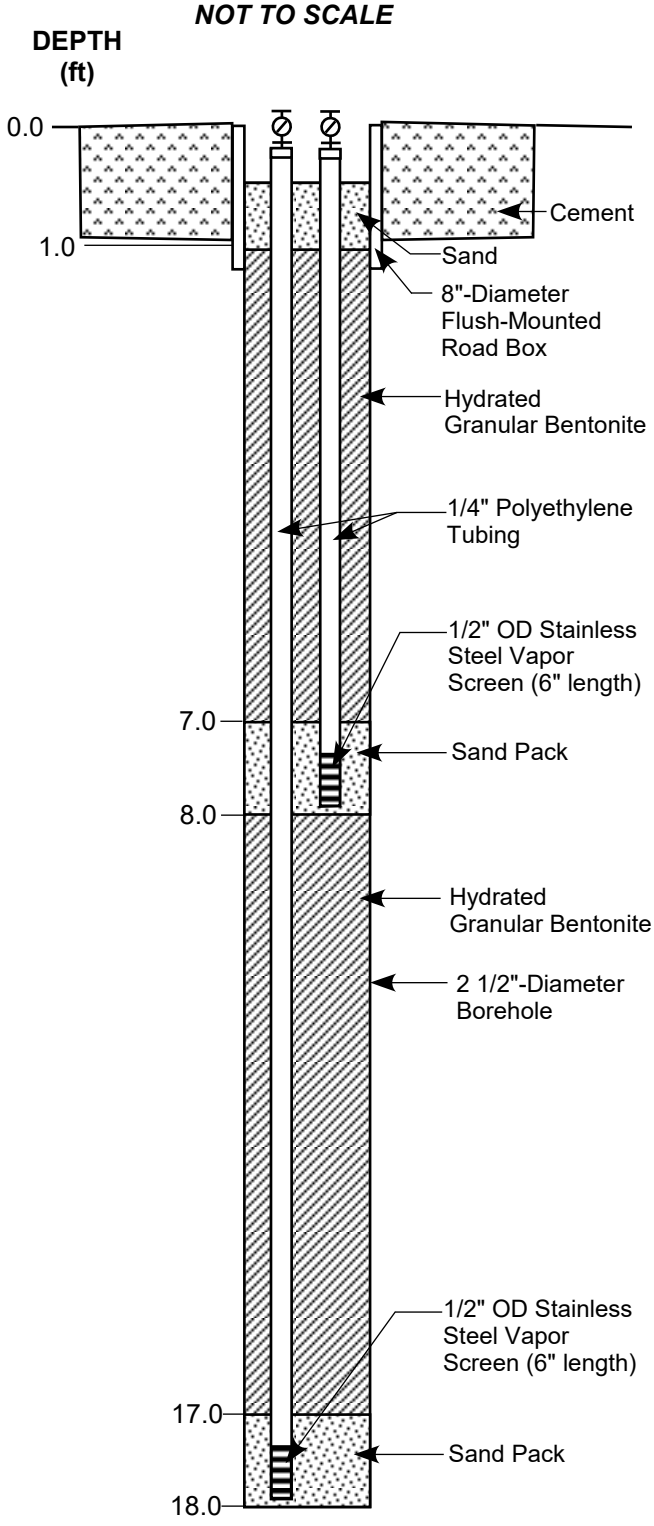
Tape on tubing denotes the shallow screen.
Located 17.1' south of SVE-1.

SOIL VAPOR MONITORING POINT COMPLETION LOG

ALPHA GEOSCIENCE
679 Plank Road
Clifton Park, New York
(518) 348-6995

Well VMP-1B
Project Loudon Plaza BCP
Project No. 16117
Client DF Acquisitions, LLC
Date Drilled 7/18/17
Date Developed NA

NOT TO SCALE



Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Monitoring Point
Static Water Level NA Date NA
Measuring Point NA
Total Well Depth 18.0'

Riser Pipe
Material Polyethylene Diameter 1/4"
Length 8' / 18' Joint Type Barbed

Screen
Material Stainless Steel Diameter 1/2"
Slot Size _____ Length 6"
Stratigraphic Unit Screened Silty Sand

Packing
Sand X Gravel ____ Natural ____
Amount _____ Intervals 7'-8' / 17'-18'

Seal
Type Granular Bentonite Intervals 1'-7' / 8'-17'

Locking Case: flush-mounted Yes [x] No [ ]
Diameter 8"

Notes:

Tape on tubing denotes the shallow screen.
Located 18.7' north of SVE-1.

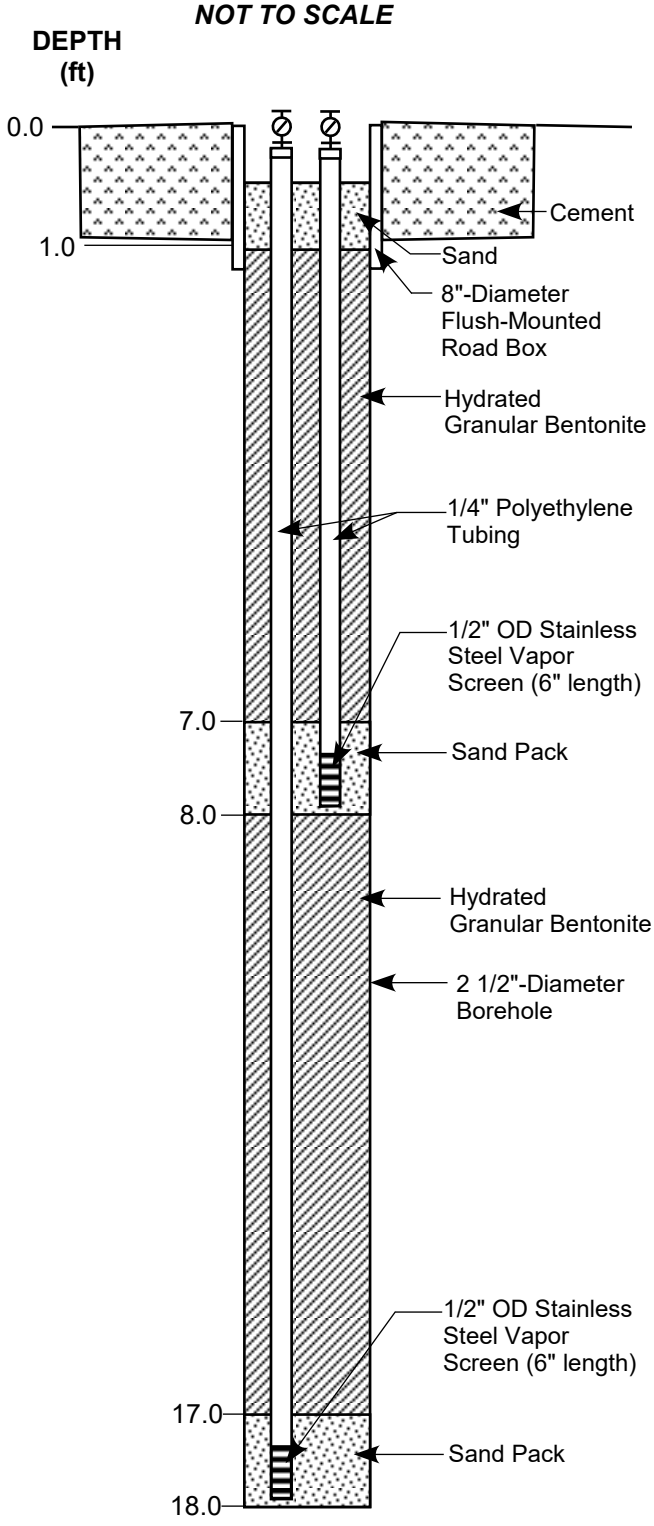
SOIL VAPOR MONITORING POINT COMPLETION LOG

ALPHA GEOSCIENCE

679 Plank Road
Clifton Park, New York
(518) 348-6995

Well VMP-2A
Project Loudon Plaza BCP
Project No. 16117
Client DF Acquisitions, LLC
Date Drilled 7/18/17
Date Developed NA

NOT TO SCALE



Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Monitoring Point
Static Water Level NA Date NA
Measuring Point NA
Total Well Depth 18.0'

Riser Pipe
Material Polyethylene Diameter 1/4"
Length 8' / 18' Joint Type Barbed

Screen
Material Stainless Steel Diameter 1/2"
Slot Size _____ Length 6"
Stratigraphic Unit Screened Silty Sand

Packing
Sand X Gravel ____ Natural ____
Amount _____ Intervals 7'-8' / 17'-18'

Seal
Type Granular Bentonite Intervals 1'-7' / 8'-17'

Locking Case: flush-mounted Yes [x] No [ ]
Diameter 8"

Notes:

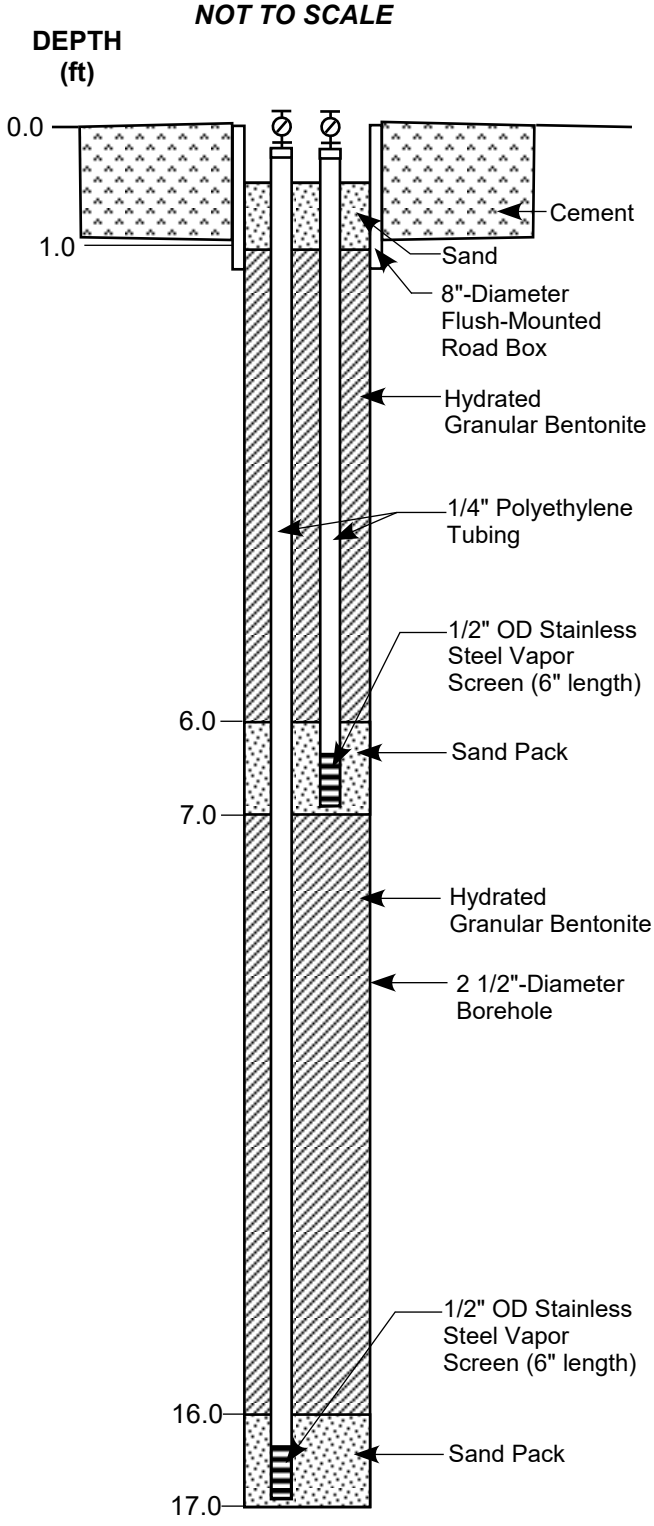
Tape on tubing denotes the shallow screen.
Located 18.2' west of SVE-2.

SOIL VAPOR MONITORING POINT COMPLETION LOG

679 Plank Road
Clifton Park, New York
(518) 348-6995

Well VMP-2B
Project Loudon Plaza BCP
Project No. 16117
Client DF Acquisitions, LLC
Date Drilled 7/18/17
Date Developed NA

NOT TO SCALE



Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Monitoring Point
Static Water Level NA Date NA
Measuring Point NA
Total Well Depth 17.0'

Riser Pipe
Material Polyethylene Diameter 1/4"
Length 7' / 17' Joint Type Barbed

Screen
Material Stainless Steel Diameter 1/2"
Slot Size _____ Length 6"
Stratigraphic Unit Screened Silty Sand

Packing
Sand X Gravel ____ Natural ____
Amount _____ Intervals 6'-7' / 16'-17'

Seal
Type Granular Bentonite Intervals 1'-6' / 7'-16'

Locking Case: flush-mounted Yes [x] No [ ]
Diameter 8"

Notes:

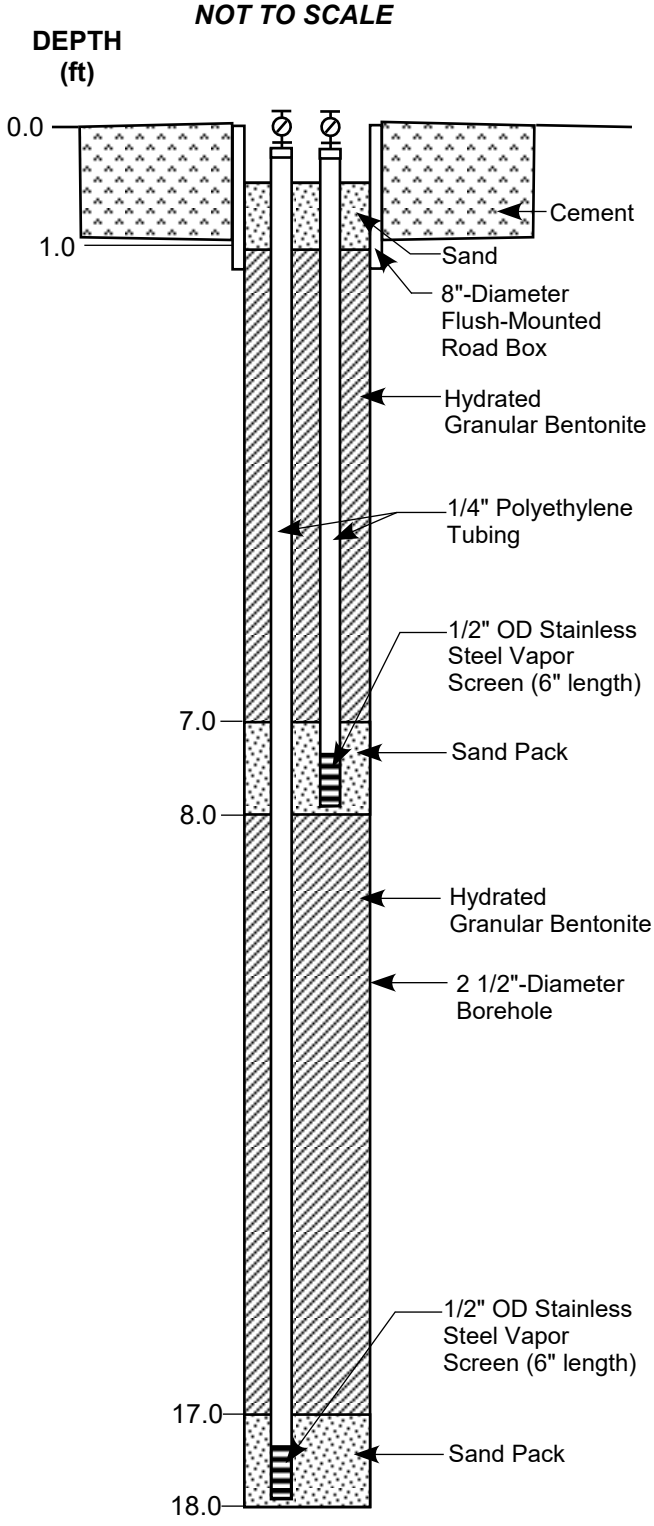
Tape on tubing denotes the shallow screen.
Located 32.1' west of SVE-2.

SOIL VAPOR MONITORING POINT COMPLETION LOG

679 Plank Road
Clifton Park, New York
(518) 348-6995

Well VMP-3A
Project Loudon Plaza BCP
Project No. 16117
Client DF Acquisitions, LLC
Date Drilled 7/18/17
Date Developed NA

NOT TO SCALE



Geologist Scott Hulseapple
Drilling Contractor Cascade Technical Services
Type of Well Vapor Monitoring Point
Static Water Level NA Date NA
Measuring Point NA
Total Well Depth 18.0'

Riser Pipe
Material Polyethylene Diameter 1/4"
Length 8' / 18' Joint Type Barbed

Screen
Material Stainless Steel Diameter 1/2"
Slot Size _____ Length 6"
Stratigraphic Unit Screened Silty Sand

Packing
Sand X Gravel ____ Natural ____
Amount _____ Intervals 7'-8' / 17'-18'

Seal
Type Granular Bentonite Intervals 1'-7' / 8'-17'

Locking Case: flush-mounted Yes [x] No [ ]
Diameter 8"

Notes:

Tape on tubing denotes the shallow screen.
Located 27.9' west-southwest of SVE-3.

Appendix B:

SVE Effluent Emission Test Laboratory Results

ANALYTICAL REPORT

Lab Number:	L1732063
Client:	Alpine Environmental 438 New Karner Road Albany, NY 12205
ATTN:	Kim Baines
Phone:	(518) 250-4047
Project Name:	LOUDON PLAZA
Project Number:	Not Specified
Report Date:	09/19/17

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), NJ NELAP (MA015), CT (PH-0141), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-13-00067), USFWS (Permit #LE2069641).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1732063-01	SVE-1@50"	SOIL_VAPOR	ALBANY, NY	09/08/17 10:56	09/12/17

Project Name:	LOUDON PLAZA	**Lab Number:**	L1732063
Project Number:	Not Specified	**Report Date:**	09/19/17

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	LOUDON PLAZA	**Lab Number:**	L1732063
Project Number:	Not Specified	**Report Date:**	09/19/17

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on August 29, 2017. The canister certification results are provided as an addendum.

L1732063-01: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Christopher J. Anderson

Title: Technical Director/Representative Date: 09/19/17

AIR

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

SAMPLE RESULTS

Lab ID: L1732063-01 D
Client ID: SVE-1@50"
Sample Location: ALBANY, NY
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 09/18/17 20:35
Analyst: MB

Date Collected: 09/08/17 10:56
Date Received: 09/12/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	Results	RL	MDL	Results	RL	MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	2500	--	ND	12400	--		12500
Chloromethane	ND	2500	--	ND	5160	--		12500
Freon-114	ND	2500	--	ND	17500	--		12500
Vinyl chloride	ND	2500	--	ND	6390	--		12500
1,3-Butadiene	ND	2500	--	ND	5530	--		12500
Bromomethane	ND	2500	--	ND	9710	--		12500
Chloroethane	ND	2500	--	ND	6600	--		12500
Ethanol	ND	62500	--	ND	118000	--		12500
Vinyl bromide	ND	2500	--	ND	10900	--		12500
Acetone	ND	12500	--	ND	29700	--		12500
Trichlorofluoromethane	ND	2500	--	ND	14000	--		12500
Isopropanol	ND	6250	--	ND	15400	--		12500
1,1-Dichloroethene	ND	2500	--	ND	9910	--		12500
Tertiary butyl Alcohol	ND	6250	--	ND	18900	--		12500
Methylene chloride	ND	6250	--	ND	21700	--		12500
3-Chloropropene	ND	2500	--	ND	7830	--		12500
Carbon disulfide	ND	2500	--	ND	7790	--		12500
Freon-113	ND	2500	--	ND	19200	--		12500
trans-1,2-Dichloroethene	ND	2500	--	ND	9910	--		12500
1,1-Dichloroethane	ND	2500	--	ND	10100	--		12500
Methyl tert butyl ether	ND	2500	--	ND	9010	--		12500
2-Butanone	ND	6250	--	ND	18400	--		12500
cis-1,2-Dichloroethene	34000	2500	--	135000	9910	--		12500
Ethyl Acetate	ND	6250	--	ND	22500	--		12500

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

SAMPLE RESULTS

Lab ID: L1732063-01 D
Client ID: SVE-1@50"
Sample Location: ALBANY, NY

Date Collected: 09/08/17 10:56
Date Received: 09/12/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Chloroform	ND	2500	--	ND	12200	--		12500
Tetrahydrofuran	ND	6250	--	ND	18400	--		12500
1,2-Dichloroethane	ND	2500	--	ND	10100	--		12500
n-Hexane	ND	2500	--	ND	8810	--		12500
1,1,1-Trichloroethane	ND	2500	--	ND	13600	--		12500
Benzene	ND	2500	--	ND	7990	--		12500
Carbon tetrachloride	ND	2500	--	ND	15700	--		12500
Cyclohexane	ND	2500	--	ND	8610	--		12500
1,2-Dichloropropane	ND	2500	--	ND	11600	--		12500
Bromodichloromethane	ND	2500	--	ND	16700	--		12500
1,4-Dioxane	ND	2500	--	ND	9010	--		12500
Trichloroethene	14300	2500	--	76900	13400	--		12500
2,2,4-Trimethylpentane	ND	2500	--	ND	11700	--		12500
Heptane	ND	2500	--	ND	10200	--		12500
cis-1,3-Dichloropropene	ND	2500	--	ND	11300	--		12500
4-Methyl-2-pentanone	ND	6250	--	ND	25600	--		12500
trans-1,3-Dichloropropene	ND	2500	--	ND	11300	--		12500
1,1,2-Trichloroethane	ND	2500	--	ND	13600	--		12500
Toluene	37600	2500	--	142000	9420	--		12500
2-Hexanone	ND	2500	--	ND	10200	--		12500
Dibromochloromethane	ND	2500	--	ND	21300	--		12500
1,2-Dibromoethane	ND	2500	--	ND	19200	--		12500
Tetrachloroethene	1100000	2500	--	7460000	17000	--		12500
Chlorobenzene	ND	2500	--	ND	11500	--		12500
Ethylbenzene	56000	2500	--	243000	10900	--		12500
p/m-Xylene	195000	5000	--	847000	21700	--		12500
Bromoform	ND	2500	--	ND	25800	--		12500
Styrene	ND	2500	--	ND	10600	--		12500

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

SAMPLE RESULTS

Lab ID: L1732063-01 D
Client ID: SVE-1@50"
Sample Location: ALBANY, NY

Date Collected: 09/08/17 10:56
Date Received: 09/12/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
1,1,2,2-Tetrachloroethane	ND	2500	--	ND	17200	--		12500
o-Xylene	44000	2500	--	191000	10900	--		12500
4-Ethyltoluene	ND	2500	--	ND	12300	--		12500
1,3,5-Trimethylbenzene	ND	2500	--	ND	12300	--		12500
1,2,4-Trimethylbenzene	5820	2500	--	28600	12300	--		12500
Benzyl chloride	ND	2500	--	ND	12900	--		12500
1,3-Dichlorobenzene	ND	2500	--	ND	15000	--		12500
1,4-Dichlorobenzene	ND	2500	--	ND	15000	--		12500
1,2-Dichlorobenzene	ND	2500	--	ND	15000	--		12500
1,2,4-Trichlorobenzene	ND	2500	--	ND	18600	--		12500
Hexachlorobutadiene	ND	2500	--	ND	26700	--		12500

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	91		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	99		60-140

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1732063
Report Date: 09/19/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/18/17 12:06

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG1042855-4								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1732063
Report Date: 09/19/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/18/17 12:06

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG1042855-4								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1732063
Report Date: 09/19/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/18/17 12:06

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG1042855-4								
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
No Tentatively Identified Compounds					

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG1042855-3								
Chlorodifluoromethane	86		-		70-130	-		
Propylene	106		-		70-130	-		
Propane	92		-		70-130	-		
Dichlorodifluoromethane	79		-		70-130	-		
Chloromethane	99		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	98		-		70-130	-		
Methanol	89		-		70-130	-		
Vinyl chloride	96		-		70-130	-		
1,3-Butadiene	103		-		70-130	-		
Butane	86		-		70-130	-		
Bromomethane	93		-		70-130	-		
Chloroethane	98		-		70-130	-		
Ethyl Alcohol	91		-		70-130	-		
Dichlorofluoromethane	90		-		70-130	-		
Vinyl bromide	93		-		70-130	-		
Acrolein	90		-		70-130	-		
Acetone	103		-		70-130	-		
Acetonitrile	90		-		70-130	-		
Trichlorofluoromethane	98		-		70-130	-		
iso-Propyl Alcohol	104		-		70-130	-		
Acrylonitrile	92		-		70-130	-		
Pentane	88		-		70-130	-		
Ethyl ether	89		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG1042855-3								
1,1-Dichloroethene	97		-		70-130	-		
tert-Butyl Alcohol	87		-		70-130	-		
Methylene chloride	102		-		70-130	-		
3-Chloropropene	103		-		70-130	-		
Carbon disulfide	93		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	96		-		70-130	-		
trans-1,2-Dichloroethene	96		-		70-130	-		
1,1-Dichloroethane	95		-		70-130	-		
Methyl tert butyl ether	92		-		70-130	-		
Vinyl acetate	113		-		70-130	-		
2-Butanone	92		-		70-130	-		
cis-1,2-Dichloroethene	92		-		70-130	-		
Ethyl Acetate	101		-		70-130	-		
Chloroform	96		-		70-130	-		
Tetrahydrofuran	88		-		70-130	-		
2,2-Dichloropropane	86		-		70-130	-		
1,2-Dichloroethane	94		-		70-130	-		
n-Hexane	102		-		70-130	-		
Isopropyl Ether	92		-		70-130	-		
Ethyl-Tert-Butyl-Ether	94		-		70-130	-		
1,1,1-Trichloroethane	102		-		70-130	-		
1,1-Dichloropropene	95		-		70-130	-		
Benzene	99		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG1042855-3								
Carbon tetrachloride	105		-		70-130	-		
Cyclohexane	103		-		70-130	-		
Tertiary-Amyl Methyl Ether	89		-		70-130	-		
Dibromomethane	99		-		70-130	-		
1,2-Dichloropropane	105		-		70-130	-		
Bromodichloromethane	109		-		70-130	-		
1,4-Dioxane	103		-		70-130	-		
Trichloroethene	102		-		70-130	-		
2,2,4-Trimethylpentane	106		-		70-130	-		
Methyl Methacrylate	126		-		70-130	-		
Heptane	108		-		70-130	-		
cis-1,3-Dichloropropene	109		-		70-130	-		
4-Methyl-2-pentanone	112		-		70-130	-		
trans-1,3-Dichloropropene	94		-		70-130	-		
1,1,2-Trichloroethane	105		-		70-130	-		
Toluene	90		-		70-130	-		
1,3-Dichloropropane	86		-		70-130	-		
2-Hexanone	102		-		70-130	-		
Dibromochloromethane	97		-		70-130	-		
1,2-Dibromoethane	94		-		70-130	-		
Butyl Acetate	88		-		70-130	-		
Octane	84		-		70-130	-		
Tetrachloroethene	85		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG1042855-3								
1,1,1,2-Tetrachloroethane	86		-		70-130	-		
Chlorobenzene	90		-		70-130	-		
Ethylbenzene	92		-		70-130	-		
p/m-Xylene	93		-		70-130	-		
Bromoform	95		-		70-130	-		
Styrene	92		-		70-130	-		
1,1,2,2-Tetrachloroethane	101		-		70-130	-		
o-Xylene	98		-		70-130	-		
1,2,3-Trichloropropane	88		-		70-130	-		
Nonane (C9)	92		-		70-130	-		
Isopropylbenzene	87		-		70-130	-		
Bromobenzene	88		-		70-130	-		
o-Chlorotoluene	84		-		70-130	-		
n-Propylbenzene	85		-		70-130	-		
p-Chlorotoluene	87		-		70-130	-		
4-Ethyltoluene	91		-		70-130	-		
1,3,5-Trimethylbenzene	93		-		70-130	-		
tert-Butylbenzene	88		-		70-130	-		
1,2,4-Trimethylbenzene	99		-		70-130	-		
Decane (C10)	92		-		70-130	-		
Benzyl chloride	102		-		70-130	-		
1,3-Dichlorobenzene	92		-		70-130	-		
1,4-Dichlorobenzene	91		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG1042855-3								
sec-Butylbenzene	88		-		70-130	-		
p-Isopropyltoluene	81		-		70-130	-		
1,2-Dichlorobenzene	90		-		70-130	-		
n-Butylbenzene	93		-		70-130	-		
1,2-Dibromo-3-chloropropane	92		-		70-130	-		
Undecane	98		-		70-130	-		
Dodecane (C12)	119		-		70-130	-		
1,2,4-Trichlorobenzene	98		-		70-130	-		
Naphthalene	90		-		70-130	-		
1,2,3-Trichlorobenzene	86		-		70-130	-		
Hexachlorobutadiene	89		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1042855-5 QC Sample: L1732228-01 Client ID: DUP Sample						
Dichlorodifluoromethane	0.313	0.289	ppbV	8		25
Chloromethane	0.521	0.537	ppbV	3		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ppbV	NC		25
1,3-Butadiene	ND	ND	ppbV	NC		25
Bromomethane	ND	ND	ppbV	NC		25
Chloroethane	ND	ND	ppbV	NC		25
Ethyl Alcohol	431	464	ppbV	7		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	10.8	11.6	ppbV	7		25
Trichlorofluoromethane	0.272	0.273	ppbV	0		25
iso-Propyl Alcohol	2.98	3.16	ppbV	6		25
tert-Butyl Alcohol	ND	ND	ppbV	NC		25
Methylene chloride	ND	ND	ppbV	NC		25
3-Chloropropene	ND	ND	ppbV	NC		25
Carbon disulfide	ND	ND	ppbV	NC		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25
1,1-Dichloroethane	ND	ND	ppbV	NC		25
Methyl tert butyl ether	ND	ND	ppbV	NC		25
2-Butanone	0.734	0.735	ppbV	0		25
Ethyl Acetate	2.19	2.28	ppbV	4		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1042855-5 QC Sample: L1732228-01 Client ID: DUP Sample						
Chloroform	0.241	0.259	ppbV	7		25
Tetrahydrofuran	ND	ND	ppbV	NC		25
1,2-Dichloroethane	ND	ND	ppbV	NC		25
n-Hexane	ND	ND	ppbV	NC		25
Benzene	0.331	0.346	ppbV	4		25
Cyclohexane	ND	ND	ppbV	NC		25
1,2-Dichloropropane	ND	ND	ppbV	NC		25
Bromodichloromethane	ND	ND	ppbV	NC		25
1,4-Dioxane	ND	ND	ppbV	NC		25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC		25
Heptane	ND	ND	ppbV	NC		25
cis-1,3-Dichloropropene	ND	ND	ppbV	NC		25
4-Methyl-2-pentanone	ND	ND	ppbV	NC		25
trans-1,3-Dichloropropene	ND	ND	ppbV	NC		25
1,1,2-Trichloroethane	ND	ND	ppbV	NC		25
Toluene	0.772	0.859	ppbV	11		25
2-Hexanone	ND	ND	ppbV	NC		25
Dibromochloromethane	ND	ND	ppbV	NC		25
1,2-Dibromoethane	ND	ND	ppbV	NC		25
Chlorobenzene	ND	ND	ppbV	NC		25
Ethylbenzene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1042855-5 QC Sample: L1732228-01 Client ID: DUP Sample						
p/m-Xylene	ND	ND	ppbV	NC		25
Bromoform	ND	ND	ppbV	NC		25
Styrene	ND	0.202	ppbV	NC		25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC		25
o-Xylene	ND	ND	ppbV	NC		25
4-Ethyltoluene	ND	ND	ppbV	NC		25
1,3,5-Trimethylbenzene	ND	ND	ppbV	NC		25
1,2,4-Trimethylbenzene	ND	ND	ppbV	NC		25
Benzyl chloride	ND	ND	ppbV	NC		25
1,3-Dichlorobenzene	ND	ND	ppbV	NC		25
1,4-Dichlorobenzene	ND	ND	ppbV	NC		25
1,2-Dichlorobenzene	ND	ND	ppbV	NC		25
1,2,4-Trichlorobenzene	ND	ND	ppbV	NC		25
Hexachlorobutadiene	ND	ND	ppbV	NC		25

Project Name: LOUDON PLAZA

Lab Number: L1732063

Project Number:

Report Date: 09/19/17

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Date Prepared	Bottle Order	Cleaning Batch ID	Can Leak Check	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Controler Leak Chk	Flow Out mL/min	Flow In mL/min	% RPD
L1732063-01	SVE-1@50"	244	2.7L Can	08/29/17	248245	L1729840-01	Pass	29.9	-5.2	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/24/17 17:55
Analyst: MB

Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Methanol	ND	5.00	--	ND	6.55	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Butane	ND	0.200	--	ND	0.475	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Dichlorofluoromethane	ND	0.200	--	ND	0.842	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acrolein	ND	0.500	--	ND	1.15	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Acetonitrile	ND	0.200	--	ND	0.336	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
Pentane	ND	0.200	--	ND	0.590	--		1
Ethyl ether	ND	0.200	--	ND	0.606	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
2,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
Diisopropyl ether	ND	0.200	--	ND	0.836	--		1
tert-Butyl Ethyl Ether	ND	0.200	--	ND	0.836	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
1,1-Dichloropropene	ND	0.200	--	ND	0.908	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
tert-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Methyl Methacrylate	ND	0.500	--	ND	2.05	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
1,3-Dichloropropane	ND	0.200	--	ND	0.924	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Butyl acetate	ND	0.500	--	ND	2.38	--		1
Octane	ND	0.200	--	ND	0.934	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
1,1,1,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
1,2,3-Trichloropropane	ND	0.200	--	ND	1.21	--		1
Nonane	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
4-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
tert-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Decane	ND	0.200	--	ND	1.16	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2-Dibromo-3-chloropropane	ND	0.200	--	ND	1.93	--		1
Undecane	ND	0.200	--	ND	1.28	--		1
Dodecane	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
1,2,3-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

	Results	**Qualifier**	**Units**	**RDL**	**Dilution Factor**
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT

Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:

Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	94		60-140
Bromochloromethane	97		60-140
chlorobenzene-d5	96		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/24/17 17:55
Analyst: MB

Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.050	--	ND	0.349	--		1
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,3-Butadiene	ND	0.020	--	ND	0.044	--		1
Bromomethane	ND	0.020	--	ND	0.078	--		1
Chloroethane	ND	0.020	--	ND	0.053	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.050	--	ND	0.281	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
Freon-113	ND	0.050	--	ND	0.383	--		1
Halothane	ND	0.050	--	ND	0.404	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Chloroform	ND	0.020	--	ND	0.098	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Benzene	ND	0.100	--	ND	0.319	--		1
Carbon tetrachloride	ND	0.020	--	ND	0.126	--		1
1,2-Dichloropropane	ND	0.020	--	ND	0.092	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Bromodichloromethane	ND	0.020	--	ND	0.134	--		1
1,4-Dioxane	ND	0.100	--	ND	0.360	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
cis-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
1,1,2-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Toluene	ND	0.050	--	ND	0.188	--		1
Dibromochloromethane	ND	0.020	--	ND	0.170	--		1
1,2-Dibromoethane	ND	0.020	--	ND	0.154	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1
1,1,1,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
Chlorobenzene	ND	0.100	--	ND	0.461	--		1
Ethylbenzene	ND	0.020	--	ND	0.087	--		1
p/m-Xylene	ND	0.040	--	ND	0.174	--		1
Bromoform	ND	0.020	--	ND	0.207	--		1
Styrene	ND	0.020	--	ND	0.085	--		1
1,1,2,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
o-Xylene	ND	0.020	--	ND	0.087	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
4-Ethyltoluene	ND	0.020	--	ND	0.098	--		1
1,3,5-Trimethybenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
1,4-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729840
Report Date: 09/19/17

Air Canister Certification Results

Lab ID: L1729840-01
Client ID: CAN 250 SHELF 1
Sample Location:
Date Collected: 08/23/17 16:00
Date Received: 08/24/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Naphthalene	ND	0.050	--	ND	0.262	--		1
1,2,3-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Hexachlorobutadiene	ND	0.050	--	ND	0.533	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	92		60-140
bromochloromethane	96		60-140
chlorobenzene-d5	94		60-140

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1732063
Report Date: 09/19/17

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
N/A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1732063-01A	Canister - 2.7 Liter	N/A	NA			Y	Absent		TO15-LL(30)

Container Comments

L1732063-01A Can#244

*Values in parentheses indicate holding time in days

Project Name:	LOUDON PLAZA	**Lab Number:**	L1732063
Project Number:	Not Specified	**Report Date:**	09/19/17

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A	- Spectra identified as "Aldol Condensation Product".
B	- The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related

Report Format: Data Usability Report

Project Name:	LOUDON PLAZA	**Lab Number:**	L1732063
Project Number:	Not Specified	**Report Date:**	09/19/17

Data Qualifiers

projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

REFERENCES

48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E.**

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

AIR ANALYSIS

PAGE 1 OF 1

CHAIN OF CUSTODY

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

Date Rec'd in Lab: 9/13/17

ALPHA Job #: L1732063

Client Information

Client: Alpine Env. Services
Address: 438 New Karner Rd
Albany NY 12205
Phone: 518-588-2104
Fax:
Email: KimB@AlpineEnv.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Loudon Plaza
Project Location: Albany NY
Project #:
Project Manager: Baines
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)
2063-01	SVE-1@50"	9-8-17	10:55	10:56	-30	-5	SOIL GAS	KB	2.7L			X						

*SAMPLE MATRIX CODES

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

Container Type

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.

Relinquished By:	Date/Time	Received By:	Date/Time:
Robert Haines	9/13/17 9:48	Robert Haines AAL	10:30 9-12-17
	9-12-17 10:30		9/13/17 0155
	9/13/17 0515		9/13/17 0515

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

ANALYTICAL REPORT

Lab Number:	L1731105
Client:	Alpine Environmental 438 New Karner Road Albany, NY 12205
ATTN:	Kim Baines
Phone:	(518) 250-4047
Project Name:	LOUDON PLAZA
Project Number:	Not Specified
Report Date:	09/13/17

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), NJ NELAP (MA015), CT (PH-0141), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-13-00067), USFWS (Permit #LE2069641).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1731105-01	SVE-2 STACK@50"	SOIL_VAPOR	ALBANY, NY	08/30/17 14:25	09/05/17
L1731105-02	SVE-3 STACK@50"	SOIL_VAPOR	ALBANY, NY	08/30/17 15:53	09/05/17

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	LOUDON PLAZA	**Lab Number:**	L1731105
Project Number:	Not Specified	**Report Date:**	09/13/17

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on August 29, 2017. The canister certification results are provided as an addendum.

L1731105-01 and -02: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the samples.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Christopher J. Anderson

Title: Technical Director/Representative Date: 09/13/17

AIR

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-01 D
Client ID: SVE-2 STACK@50"
Sample Location: ALBANY, NY
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 09/13/17 06:30
Analyst: MB

Date Collected: 08/30/17 14:25
Date Received: 09/05/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	278.	--	ND	1370	--		1389
Chloromethane	ND	278.	--	ND	574	--		1389
Freon-114	ND	278.	--	ND	1940	--		1389
Vinyl chloride	ND	278.	--	ND	711	--		1389
1,3-Butadiene	ND	278.	--	ND	615	--		1389
Bromomethane	ND	278.	--	ND	1080	--		1389
Chloroethane	ND	278.	--	ND	734	--		1389
Ethanol	ND	6940	--	ND	13100	--		1389
Vinyl bromide	ND	278.	--	ND	1220	--		1389
Acetone	ND	1390	--	ND	3300	--		1389
Trichlorofluoromethane	ND	278.	--	ND	1560	--		1389
Isopropanol	ND	694.	--	ND	1710	--		1389
1,1-Dichloroethene	ND	278.	--	ND	1100	--		1389
Tertiary butyl Alcohol	ND	694.	--	ND	2100	--		1389
Methylene chloride	ND	694.	--	ND	2410	--		1389
3-Chloropropene	ND	278.	--	ND	870	--		1389
Carbon disulfide	ND	278.	--	ND	866	--		1389
Freon-113	ND	278.	--	ND	2130	--		1389
trans-1,2-Dichloroethene	ND	278.	--	ND	1100	--		1389
1,1-Dichloroethane	ND	278.	--	ND	1130	--		1389
Methyl tert butyl ether	ND	278.	--	ND	1000	--		1389
2-Butanone	ND	694.	--	ND	2050	--		1389
cis-1,2-Dichloroethene	11700	278	--	46400	1100	--		1389
Ethyl Acetate	ND	694.	--	ND	2500	--		1389

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-01 D
Client ID: SVE-2 STACK@50"
Sample Location: ALBANY, NY

Date Collected: 08/30/17 14:25
Date Received: 09/05/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Chloroform	ND	278	--	ND	1360	--		1389
Tetrahydrofuran	ND	694	--	ND	2050	--		1389
1,2-Dichloroethane	ND	278.	--	ND	1130	--		1389
n-Hexane	ND	278.	--	ND	980	--		1389
1,1,1-Trichloroethane	ND	278.	--	ND	1520	--		1389
Benzene	ND	278.	--	ND	888	--		1389
Carbon tetrachloride	ND	278.	--	ND	1750	--		1389
Cyclohexane	ND	278.	--	ND	957	--		1389
1,2-Dichloropropane	ND	278.	--	ND	1280	--		1389
Bromodichloromethane	ND	278.	--	ND	1860	--		1389
1,4-Dioxane	ND	278.	--	ND	1000	--		1389
Trichloroethene	2060	278	--	11100	1490	--		1389
2,2,4-Trimethylpentane	ND	278.	--	ND	1300	--		1389
Heptane	ND	278.	--	ND	1140	--		1389
cis-1,3-Dichloropropene	ND	278.	--	ND	1260	--		1389
4-Methyl-2-pentanone	ND	694.	--	ND	2840	--		1389
trans-1,3-Dichloropropene	ND	278.	--	ND	1260	--		1389
1,1,2-Trichloroethane	ND	278.	--	ND	1520	--		1389
Toluene	ND	278.	--	ND	1050	--		1389
2-Hexanone	ND	278.	--	ND	1140	--		1389
Dibromochloromethane	ND	278.	--	ND	2370	--		1389
1,2-Dibromoethane	ND	278.	--	ND	2140	--		1389
Tetrachloroethene	120000	278	--	814000	1890	--		1389
Chlorobenzene	ND	278.	--	ND	1280	--		1389
Ethylbenzene	ND	278.	--	ND	1210	--		1389
p/m-Xylene	ND	556.	--	ND	2420	--		1389
Bromoform	ND	278.	--	ND	2870	--		1389
Styrene	ND	278.	--	ND	1180	--		1389

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-01 D
Client ID: SVE-2 STACK@50"
Sample Location: ALBANY, NY

Date Collected: 08/30/17 14:25
Date Received: 09/05/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
1,1,2,2-Tetrachloroethane	ND	278.	--	ND	1910	--		1389
o-Xylene	ND	278.	--	ND	1210	--		1389
4-Ethyltoluene	ND	278.	--	ND	1370	--		1389
1,3,5-Trimethylbenzene	ND	278.	--	ND	1370	--		1389
1,2,4-Trimethylbenzene	ND	278.	--	ND	1370	--		1389
Benzyl chloride	ND	278.	--	ND	1440	--		1389
1,3-Dichlorobenzene	ND	278.	--	ND	1670	--		1389
1,4-Dichlorobenzene	ND	278.	--	ND	1670	--		1389
1,2-Dichlorobenzene	ND	278.	--	ND	1670	--		1389
1,2,4-Trichlorobenzene	ND	278.	--	ND	2060	--		1389
Hexachlorobutadiene	ND	278.	--	ND	2970	--		1389

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	94		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	97		60-140

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-02 D
Client ID: SVE-3 STACK@50"
Sample Location: ALBANY, NY
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 09/13/17 07:55
Analyst: MB

Date Collected: 08/30/17 15:53
Date Received: 09/05/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	Results	RL	MDL	Results	RL	MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	111.	--	ND	549	--		555.6
Chloromethane	ND	111.	--	ND	229	--		555.6
Freon-114	ND	111.	--	ND	776	--		555.6
Vinyl chloride	ND	111.	--	ND	284	--		555.6
1,3-Butadiene	ND	111.	--	ND	246	--		555.6
Bromomethane	ND	111.	--	ND	431	--		555.6
Chloroethane	ND	111.	--	ND	293	--		555.6
Ethanol	ND	2780	--	ND	5240	--		555.6
Vinyl bromide	ND	111.	--	ND	485	--		555.6
Acetone	ND	556	--	ND	1320	--		555.6
Trichlorofluoromethane	ND	111.	--	ND	624	--		555.6
Isopropanol	ND	278.	--	ND	683	--		555.6
1,1-Dichloroethene	ND	111.	--	ND	440	--		555.6
Tertiary butyl Alcohol	ND	278.	--	ND	843	--		555.6
Methylene chloride	ND	278	--	ND	966	--		555.6
3-Chloropropene	ND	111.	--	ND	347	--		555.6
Carbon disulfide	ND	111.	--	ND	346	--		555.6
Freon-113	ND	111.	--	ND	851	--		555.6
trans-1,2-Dichloroethene	114	111	--	452	440	--		555.6
1,1-Dichloroethane	ND	111.	--	ND	449	--		555.6
Methyl tert butyl ether	ND	111.	--	ND	400	--		555.6
2-Butanone	ND	278	--	ND	820	--		555.6
cis-1,2-Dichloroethene	22700	111	--	90000	440	--		555.6
Ethyl Acetate	ND	278.	--	ND	1000	--		555.6

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-02 D
Client ID: SVE-3 STACK@50"
Sample Location: ALBANY, NY
Date Collected: 08/30/17 15:53
Date Received: 09/05/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Chloroform	ND	111.	--	ND	542	--		555.6
Tetrahydrofuran	2800	278	--	8260	820	--		555.6
1,2-Dichloroethane	ND	111.	--	ND	449	--		555.6
n-Hexane	ND	111.	--	ND	391	--		555.6
1,1,1-Trichloroethane	ND	111.	--	ND	606	--		555.6
Benzene	ND	111.	--	ND	355	--		555.6
Carbon tetrachloride	ND	111.	--	ND	698	--		555.6
Cyclohexane	ND	111.	--	ND	382	--		555.6
1,2-Dichloropropane	ND	111.	--	ND	513	--		555.6
Bromodichloromethane	ND	111.	--	ND	744	--		555.6
1,4-Dioxane	ND	111.	--	ND	400	--		555.6
Trichloroethene	4880	111	--	26200	597	--		555.6
2,2,4-Trimethylpentane	ND	111.	--	ND	518	--		555.6
Heptane	ND	111.	--	ND	455	--		555.6
cis-1,3-Dichloropropene	ND	111.	--	ND	504	--		555.6
4-Methyl-2-pentanone	ND	278.	--	ND	1140	--		555.6
trans-1,3-Dichloropropene	ND	111.	--	ND	504	--		555.6
1,1,2-Trichloroethane	ND	111.	--	ND	606	--		555.6
Toluene	ND	111.	--	ND	418	--		555.6
2-Hexanone	ND	111.	--	ND	455	--		555.6
Dibromochloromethane	ND	111.	--	ND	946	--		555.6
1,2-Dibromoethane	ND	111.	--	ND	853	--		555.6
Tetrachloroethene	22000	111	--	149000	753	--		555.6
Chlorobenzene	ND	111.	--	ND	511	--		555.6
Ethylbenzene	ND	111.	--	ND	482	--		555.6
p/m-Xylene	ND	222.	--	ND	964	--		555.6
Bromoform	ND	111.	--	ND	1150	--		555.6
Styrene	ND	111.	--	ND	473	--		555.6

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

SAMPLE RESULTS

Lab ID: L1731105-02 D
Client ID: SVE-3 STACK@50"
Sample Location: ALBANY, NY
Date Collected: 08/30/17 15:53
Date Received: 09/05/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
1,1,2,2-Tetrachloroethane	ND	111.	--	ND	762	--		555.6
o-Xylene	ND	111.	--	ND	482	--		555.6
4-Ethyltoluene	ND	111.	--	ND	546	--		555.6
1,3,5-Trimethylbenzene	ND	111.	--	ND	546	--		555.6
1,2,4-Trimethylbenzene	ND	111.	--	ND	546	--		555.6
Benzyl chloride	ND	111.	--	ND	575	--		555.6
1,3-Dichlorobenzene	ND	111.	--	ND	667	--		555.6
1,4-Dichlorobenzene	ND	111.	--	ND	667	--		555.6
1,2-Dichlorobenzene	ND	111.	--	ND	667	--		555.6
1,2,4-Trichlorobenzene	ND	111.	--	ND	824	--		555.6
Hexachlorobutadiene	ND	111.	--	ND	1180	--		555.6

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	92		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	95		60-140

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/12/17 13:22

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG1040959-4								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/12/17 13:22

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG1040959-4								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/12/17 13:22

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG1040959-4								
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG1040959-3								
Chlorodifluoromethane	85		-		70-130	-		
Propylene	105		-		70-130	-		
Propane	87		-		70-130	-		
Dichlorodifluoromethane	86		-		70-130	-		
Chloromethane	95		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	97		-		70-130	-		
Methanol	87		-		70-130	-		
Vinyl chloride	95		-		70-130	-		
1,3-Butadiene	102		-		70-130	-		
Butane	82		-		70-130	-		
Bromomethane	94		-		70-130	-		
Chloroethane	96		-		70-130	-		
Ethyl Alcohol	90		-		70-130	-		
Dichlorofluoromethane	87		-		70-130	-		
Vinyl bromide	94		-		70-130	-		
Acrolein	87		-		70-130	-		
Acetone	96		-		70-130	-		
Acetonitrile	85		-		70-130	-		
Trichlorofluoromethane	96		-		70-130	-		
iso-Propyl Alcohol	101		-		70-130	-		
Acrylonitrile	95		-		70-130	-		
Pentane	86		-		70-130	-		
Ethyl ether	87		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG1040959-3								
1,1-Dichloroethene	96		-		70-130	-		
tert-Butyl Alcohol	91		-		70-130	-		
Methylene chloride	98		-		70-130	-		
3-Chloropropene	102		-		70-130	-		
Carbon disulfide	91		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	95		-		70-130	-		
trans-1,2-Dichloroethene	86		-		70-130	-		
1,1-Dichloroethane	84		-		70-130	-		
Methyl tert butyl ether	87		-		70-130	-		
Vinyl acetate	97		-		70-130	-		
2-Butanone	94		-		70-130	-		
cis-1,2-Dichloroethene	98		-		70-130	-		
Ethyl Acetate	104		-		70-130	-		
Chloroform	98		-		70-130	-		
Tetrahydrofuran	91		-		70-130	-		
2,2-Dichloropropane	89		-		70-130	-		
1,2-Dichloroethane	96		-		70-130	-		
n-Hexane	96		-		70-130	-		
Isopropyl Ether	88		-		70-130	-		
Ethyl-Tert-Butyl-Ether	88		-		70-130	-		
1,1,1-Trichloroethane	94		-		70-130	-		
1,1-Dichloropropene	92		-		70-130	-		
Benzene	92		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG1040959-3								
Carbon tetrachloride	97		-		70-130	-		
Cyclohexane	96		-		70-130	-		
Tertiary-Amyl Methyl Ether	88		-		70-130	-		
Dibromomethane	91		-		70-130	-		
1,2-Dichloropropane	96		-		70-130	-		
Bromodichloromethane	99		-		70-130	-		
1,4-Dioxane	101		-		70-130	-		
Trichloroethene	97		-		70-130	-		
2,2,4-Trimethylpentane	98		-		70-130	-		
Methyl Methacrylate	115		-		70-130	-		
Heptane	98		-		70-130	-		
cis-1,3-Dichloropropene	105		-		70-130	-		
4-Methyl-2-pentanone	100		-		70-130	-		
trans-1,3-Dichloropropene	92		-		70-130	-		
1,1,2-Trichloroethane	100		-		70-130	-		
Toluene	95		-		70-130	-		
1,3-Dichloropropane	90		-		70-130	-		
2-Hexanone	102		-		70-130	-		
Dibromochloromethane	101		-		70-130	-		
1,2-Dibromoethane	98		-		70-130	-		
Butyl Acetate	94		-		70-130	-		
Octane	91		-		70-130	-		
Tetrachloroethene	94		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG1040959-3								
1,1,1,2-Tetrachloroethane	90		-		70-130	-		
Chlorobenzene	97		-		70-130	-		
Ethylbenzene	97		-		70-130	-		
p/m-Xylene	98		-		70-130	-		
Bromoform	101		-		70-130	-		
Styrene	98		-		70-130	-		
1,1,2,2-Tetrachloroethane	103		-		70-130	-		
o-Xylene	101		-		70-130	-		
1,2,3-Trichloropropane	90		-		70-130	-		
Nonane (C9)	92		-		70-130	-		
Isopropylbenzene	92		-		70-130	-		
Bromobenzene	91		-		70-130	-		
o-Chlorotoluene	90		-		70-130	-		
n-Propylbenzene	89		-		70-130	-		
p-Chlorotoluene	88		-		70-130	-		
4-Ethyltoluene	97		-		70-130	-		
1,3,5-Trimethylbenzene	98		-		70-130	-		
tert-Butylbenzene	94		-		70-130	-		
1,2,4-Trimethylbenzene	103		-		70-130	-		
Decane (C10)	92		-		70-130	-		
Benzyl chloride	107		-		70-130	-		
1,3-Dichlorobenzene	99		-		70-130	-		
1,4-Dichlorobenzene	98		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG1040959-3								
sec-Butylbenzene	93		-		70-130	-		
p-Isopropyltoluene	87		-		70-130	-		
1,2-Dichlorobenzene	98		-		70-130	-		
n-Butylbenzene	96		-		70-130	-		
1,2-Dibromo-3-chloropropane	94		-		70-130	-		
Undecane	101		-		70-130	-		
Dodecane (C12)	116		-		70-130	-		
1,2,4-Trichlorobenzene	108		-		70-130	-		
Naphthalene	96		-		70-130	-		
1,2,3-Trichlorobenzene	97		-		70-130	-		
Hexachlorobutadiene	101		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1040959-5 QC Sample: L1731899-01 Client ID: DUP Sample						
1,1-Dichloroethene	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25
cis-1,2-Dichloroethene	9.17	8.69	ppbV	5		25
Benzene	4.80	4.52	ppbV	6		25
Trichloroethene	25.1	23.8	ppbV	5		25
Tetrachloroethene	674	651	ppbV	3		25

Project Name: LOUDON PLAZA

Lab Number: L1731105

Project Number:

Report Date: 09/13/17

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Date Prepared	Bottle Order	Cleaning Batch ID	Can Leak Check	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Controler Leak Chk	Flow Out mL/min	Flow In mL/min	% RPD
L1731105-01	SVE-2 STACK@50"	410	2.7L Can	08/29/17	248245	L1729942-01	Pass	30.0	-5.2	-	-	-	-
L1731105-02	SVE-3 STACK@50"	498	2.7L Can	08/29/17	248245	L1729942-01	Pass	30.0	-5.9	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/25/17 10:03
Analyst: MB

Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Methanol	ND	5.00	--	ND	6.55	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Butane	ND	0.200	--	ND	0.475	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Dichlorofluoromethane	ND	0.200	--	ND	0.842	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acrolein	ND	0.500	--	ND	1.15	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Acetonitrile	ND	0.200	--	ND	0.336	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
Pentane	ND	0.200	--	ND	0.590	--		1
Ethyl ether	ND	0.200	--	ND	0.606	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
2,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
Diisopropyl ether	ND	0.200	--	ND	0.836	--		1
tert-Butyl Ethyl Ether	ND	0.200	--	ND	0.836	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
1,1-Dichloropropene	ND	0.200	--	ND	0.908	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
tert-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Methyl Methacrylate	ND	0.500	--	ND	2.05	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
1,3-Dichloropropane	ND	0.200	--	ND	0.924	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Butyl acetate	ND	0.500	--	ND	2.38	--		1
Octane	ND	0.200	--	ND	0.934	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
1,1,1,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
1,2,3-Trichloropropane	ND	0.200	--	ND	1.21	--		1
Nonane	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
4-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
tert-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Decane	ND	0.200	--	ND	1.16	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2-Dibromo-3-chloropropane	ND	0.200	--	ND	1.93	--		1
Undecane	ND	0.200	--	ND	1.28	--		1
Dodecane	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
1,2,3-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

	Results	**Qualifier**	**Units**	**RDL**	**Dilution Factor**
Tentatively Identified Compounds					
No Tentatively Identified Compounds					

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	93		60-140
Bromochloromethane	99		60-140
chlorobenzene-d5	95		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/25/17 10:03
Analyst: MB

Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.050	--	ND	0.349	--		1
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,3-Butadiene	ND	0.020	--	ND	0.044	--		1
Bromomethane	ND	0.020	--	ND	0.078	--		1
Chloroethane	ND	0.020	--	ND	0.053	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.050	--	ND	0.281	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
Freon-113	ND	0.050	--	ND	0.383	--		1
Halothane	ND	0.050	--	ND	0.404	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Chloroform	ND	0.020	--	ND	0.098	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Benzene	ND	0.100	--	ND	0.319	--		1
Carbon tetrachloride	ND	0.020	--	ND	0.126	--		1
1,2-Dichloropropane	ND	0.020	--	ND	0.092	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Bromodichloromethane	ND	0.020	--	ND	0.134	--		1
1,4-Dioxane	ND	0.100	--	ND	0.360	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
cis-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
1,1,2-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Toluene	ND	0.050	--	ND	0.188	--		1
Dibromochloromethane	ND	0.020	--	ND	0.170	--		1
1,2-Dibromoethane	ND	0.020	--	ND	0.154	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1
1,1,1,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
Chlorobenzene	ND	0.100	--	ND	0.461	--		1
Ethylbenzene	ND	0.020	--	ND	0.087	--		1
p/m-Xylene	ND	0.040	--	ND	0.174	--		1
Bromoform	ND	0.020	--	ND	0.207	--		1
Styrene	ND	0.020	--	ND	0.085	--		1
1,1,2,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
o-Xylene	ND	0.020	--	ND	0.087	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
4-Ethyltoluene	ND	0.020	--	ND	0.098	--		1
1,3,5-Trimethybenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
1,4-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1729942
Report Date: 09/13/17

Air Canister Certification Results

Lab ID: L1729942-01
Client ID: CAN 1740 SHELF 7
Sample Location:
Date Collected: 08/24/17 16:00
Date Received: 08/25/17
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Naphthalene	ND	0.050	--	ND	0.262	--		1
1,2,3-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Hexachlorobutadiene	ND	0.050	--	ND	0.533	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	91		60-140
bromochloromethane	95		60-140
chlorobenzene-d5	94		60-140

Project Name: LOUDON PLAZA
Project Number: Not Specified

Lab Number: L1731105
Report Date: 09/13/17

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
N/A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1731105-01A	Canister - 2.7 Liter	N/A	NA			Y	Absent		TO15-LL(30)
L1731105-02A	Canister - 2.7 Liter	N/A	NA			Y	Absent		TO15-LL(30)

*Values in parentheses indicate holding time in days

Project Name:	LOUDON PLAZA	**Lab Number:**	L1731105
Project Number:	Not Specified	**Report Date:**	09/13/17

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A	- Spectra identified as "Aldol Condensation Product".
B	- The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related

Report Format: Data Usability Report

Project Name:	LOUDON PLAZA	**Lab Number:**	L1731105
Project Number:	Not Specified	**Report Date:**	09/13/17

Data Qualifiers

projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name: LOUDON PLAZA
Project Number: Not Specified
Lab Number: L1731105
Report Date: 09/13/17

REFERENCES

48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E.**

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

AIR ANALYSIS

ALPHA ANALYTICAL — CHAIN OF CUSTODY

PAGE 1 OF 1

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

Date Rec'd in Lab: 9/6/17

ALPHA Job #: L1731105

Client Information

Client: ALPINE ENVIRONMENTAL SERVICES
Address:
Phone: 518-588-2104
Fax:
Email: KimB@ALPINEENV.COM
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Loudon Plaza
Project Location: ALBANY NY
Project #:
Project Manager: BAINES
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 #:
ATTN MARK SCHNITZER

Regulatory Requirements/Report Limits

State/Fed	Program	Res / Comm

Other Project Specific Requirements/Comments:

Project-Specific Target Compound List: ☐

ANALYSIS

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	TO-15	TO-15 SIM	APH Subtract Non-petroleum HCs ☐	Fixed Gases	Sulfides & Mercaptans by TO-15	Sample Comments (i.e. PID)
L105-01	SVE-2 STACK@50"	8-30-17	14:24	14:25	-30	-4	SOIL GAS	KB	2.7L			X					
02	SVE-3 STACK@50"	8-30-17	1552	1553	-30	-5	SOIL GAS	KB	2.7L			X					

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

Container Type

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.

Relinquished By:	Date/Time	Received By:	Date/Time:
	9/5/17 9:54		9/5/17 9:54
	9/7/17 9:54		9/6/17 0115
	9/6/17 0430		9/6/17 430

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

Appendix C:

SVE Design Calculations

Pneumatic Model and Blower Selection

A pneumatic model of the system was developed in order to size and select an appropriate blower for the SVE system. The blower size is determined by the pressure differential required between the inlet and outlet of the blower in order to provide design vacuum levels at the SVE points. The pneumatic model considers the system from a point at the ground surface near the SVE wells to the outlet of the exhaust stack.

Friction loss between the ground surface and the SVE well (i.e. applied SVE point vacuum) was modeled using step test data from the pilot test. Applied vacuum at each pilot test SVE point was plotted against the air flow rate produced by the extraction well.

Friction losses in each piping run between SVE points and the blower inlet manifold were modeled using the Darcy-Weisbach equation (Equation 1 below). The airflow is assumed to behave as an incompressible fluid due to the low velocity in the system. Friction losses due to valves and fittings were modeled using the equivalent length method.

$$h_L = \frac{fLV^2}{2Dg}$$

f - Darcy Friction factor
L - length of pipe
V - air velocity in the pipe
D - diameter of the pipe
g - acceleration due to gravity

Equation 1. – Darcy-Weisbach Equation

Backpressure on the blower outlet must also be included in the blower sizing and selection. The backpressure is equal to the friction losses between the blower outlet and the stack outlet. The pipe, valve, and fitting losses were modeled as described in the preceding paragraph. Losses through the air/ water separator and particulate filter were modeled using available manufacturer's data.

In a parallel pipe system, pressures at the inlet (atmospheric pressure in this case) and outlet (at the blower inlet manifold) are the same for all branches. Pressure drop (resulting from friction losses) in each branch must, therefore, be equal. In order to develop a system curve, various flow rates were entered into the model and the resulting system pressure drop was calculated. Since flow rate controls both mechanical friction losses (pipes, valves, and fittings) and friction losses through soil, flow rate in each piping run was adjusted iteratively until the pressure drop through each branch was equal. Thus, total system pressure drop and applied vacuum at each SVE well are calculated for a given total flow rate.

In order to provide flexibility in balancing the system for optimal contaminant removal, control valves will be provided in each influent pipeline. Control valves usage to achieve lower applied vacuum at SVE-3 were included in the friction loss model.

Once the total system pressure drop is calculated, it is added to the blower outlet backpressure at the given flow rate. This sum is plotted against the system flow rate to form one point on the system curve. Various flow rates are input into the system model and plotted to form the complete system curve. The resulting system curve is then compared to blower vacuum curves provided by the manufacturers. The intersection of the system and blower vacuum curves is the theoretical operating point of a particular blower (i.e. the flow rate that can be expected to be produced by the blower when connected to the system).

An EN656 regenerative blower, manufactured by Rotron Ametek, has been selected for the SVE system operating on a variable frequency drive (VFD) operating at 49 to 54 hertz, depending on filter loading. Operating at 54 hz allows for spare capacity, up to 60 hz, if adjustment is desired. The theoretical operating point of this blower is 84.7 cubic feet per minute at standard conditions (SCFM) at a vacuum of 47.6 inches of water. The pneumatic model predicts that this blower will create vacuums of 33"WC at wells SVE-1 and SVE-2, and 23 "WC at SVE-3.

Due to observed overlap in the areas of influence of the SVE extraction wells during the pilot test, it is expected that the actual flow rate at a given amount of applied vacuum will be lower than predicted by the model. The overlapping areas of influence will reduce the volume of air available to be extracted from each extraction well. At a reduced flow rate, the blower is capable of producing a higher vacuum. The existing soil vapor monitoring points and existing monitoring wells will be used to monitor the SVE system area of influence.

Radial Flow Design Functions

The soil vapor extraction design relies on the mass air flow required to achieve the design pore volume exchange rate, as a function of the soil pore volume between the well radius and the variable outer radius, r. The mass flow needed to meet the design specifications is calculated below.

The Mass Flow Function

The mass flow function was developed to express the air flow required through a target soil volume, as a function of the outer radius of the target volume, r, and the selected pore volume exchange rate, ER. The values for vadose zone thickness, b, total porosity, η, and air density, ρ_{air}, were specified above. The function calculates the minimum flow rate needed to obtain the specified pore volume extraction.

$$Q(r) = \frac{\pi (r^2 - a^2)\, b\, \eta_a}{t}$$

Equation 2. – Mass Flow Equation

Site Specific Values

The value b, for vadose zone thickness in feet.
The value r, the confirmed radius of influence in feet.
The value a, the radius the SVE well including over pack, in feet.

Table C1: Site specific pore volume measurements

Location	b	r	a
SVE-1	23.5	51.3	0.92
SVE-2	23.4	32.1	0.92
SVE-3	23.0	27.9	0.92

Pore Volume Exchange Rate

The pore volume exchange rate determines the air flow which must be applied to any soil volume, to achieve design goals. 1 - 3 Pore Volume Exchanges (PVE) per day is a common SVE system design parameter.

Table C2: Flow rate required to remove one pore volume per day.

Location	Q(r) (cfm)
SVE-1	33.7
SVE-2	13.1
SVE-3	9.7

For the mass flow point estimate, 1.1 - 2 PVE per day were used in this calculation, attempting to balance the single blower system to the system curves of each SVE well while reducing dilution air volume to reduce unnecessary energy consumption.

System Pressure Loss

The data collected during the SVE pilot test have been used to determine the pressure drop in the system.

Table C3: Constants

Density of air	0.00242	$slugs/ft^3$ (50° F and 1 atm)
Gravity	32.2	ft/s^2
Viscosity	0.000000368	$lb \circ s/ft^2$ (50° F and 1 atm)
Soil Air Porosity (η_a)	0.25	Dimensionless
Flow at blower	84.7	SCFM

Table C4: SVE Wells and Piping Pressure Loss

Parameter	SVE-1	SVE-2	SVE-3
Flow (scfm)	50.6	14.7	19.4
Nom. Size (in.)	4	4	4
Pipe Area (ft^2)	0.087	0.087	0.087
Velocity (ft/min)	581.6	150.6	223
L (ft.)	252	167	12
Regular 90° Bend	5	5	2
45° Bend	2	2	0
Ball Valve (open)	1	1	1
Friction Loss ("WC)	0.53	0.03	0.01
Soil Losses ("WC)	32.6	33.1	23.3
Induced Control Valve Losses ("WC)	0.0	0.0	9.8
Total Losses ("WC)	33.1	33.1	33.1

Table C5: Pressure Drop Through Manifold and Exhaust

	Manifold & Connections	Exhaust Stack
Flow (SCFM)	84.7	84.7
Nom. Size (in.)	2" / 6"	6"
Velocity (ft/s)	432.1	432.1
L (ft.)	NA	38
Regular 90°	NA	6
Friction Loss ("WC)	3.1	0.05

Table C6: Pressure Drop Through Air/Water Separator and Air Filter (from manufacturer)

	Air/Water Separator	Filter
Flow (SCFM)	84.7	84.7
Filter Loading Value	NA	5
Friction Loss ("WC)	0.5	0.5 - 5.5

Table C7: Pressure Drop Through Vapor Phase Carbon Treatment (from manufacturer)
2 parallel lines of Cabotrol G-1 drums in series at full design flow of 84.7 cfm.

	Treatment Drums
Flow (SCFM)	42.4*
Friction Loss ("WC)	3.5"-5.25"**

*Flow is split in half over two parallel treatment lines
**Range based on Phase 1 and 2, carbon treatment configurations, dependent on effluent concentration.

Table C8: Pressure Drop for system

Parameter	At full operation
Flow (SCFM)	84.7
Total Soil and SVE Well Friction Losses	33.1
Equipment, Manifolding & Exhaust	4.2- 9.2
Vapor Phase Carbon Treatment	3.5-5.25
Total Friction Loss ("WC)	40.8 - 47.6

Effluent Discharge Contaminant Concentration

A sample was collected from each of the SVE wells during the pilot test using a summa canister with laboratory analysis for VOCs. Contaminant levels present in the ground are expected to diminish steadily over time with the operation of the SVE system. Using the contaminant levels from the pilot test is a conservative approach to estimating effluent discharge levels, and is expected to steadily decrease over the operation time of the system.

Table C9a: SVE1 Effluent Contaminant Mass Flow Rate

SVE 1			
Vapor Phase Constituent	Effluent Concentration (From Pilot Test)	Emission Rate @ 50.6 cfm	Emission Rate @ 14.4 cfm
	$\mu g/m^3$ / lb/ft^3	lb/hr	lb/hr
tetrachloroethylene	7,460,000 / $4.6571E^{-4}$	1.4139	0.4024
trichloroethene	76,900 / $4.80071E^{-6}$	0.0146	0.0041
cis-1,2-Dichloroethene	135,000 / $8.4278E^{-6}$	0.0256	0.0073
toluene	142,000 / $8.8648E^{-6}$	0.0269	0.0077
ethylbenzene	243,000 / $1.5170E^{-5}$	0.0461	0.0131
p/m xylene	847,000 / $5.2876E^{-5}$	0.1605	0.0457
o xylene	191,000 / $1.1924\ E^{-5}$	0.0362	0.0103
1,2,4 trimethylbenzene	28,600 / $1.7854E^{-6}$	0.0054	0.0015
Total	9,123,500 / $5.6956E^{-4}$	1.73 lbs/hr	0.49 lbs/hr

Table C9b: SVE2 Effluent Contaminant Mass Flow Rate

SVE 2		
Vapor Phase Constituent	Effluent Concentration (From Pilot Test)	Emission Rate @ 14.7 cfm
	$\mu g/m^3$ / lb/ft^3	lb/hr
tetrachloroethylene	814,000 / $5.0816E^{-5}$	0.0448
trichloroethene	11,100 / $6.9295\ E^{-7}$	0.00061
cis-1,2-Dichloroethene	46,400 / $2.8967E^{-6}$	0.00004
Total	871,500 / $5.4406E^{-5}$	0.05 lbs/hr

Table C9c: SVE3 Effluent Contaminant Mass Flow Rate

SVE 3		
Vapor Phase Constituent	Effluent Concentration (From Pilot Test)	Emission Rate @ 19.4 cfm
	$\mu g/m^3$ / lb/ft^3	lb/hr
tetrachloroethylene	149,000 / $9.3018E^{-6}$	0.0108
trichloroethene	26,200 / $1.6356E^{-6}$	0.0019
cis-1,2-dichloroethene	90,000 / $5.6185E^{-6}$	0.0065
trans-1,2-dichloroethene	452 / $2.8217E^{-8}$	0.00003
tetrahydrofuran	8,260 / $5.1566E^{-7}$	0.0006
Total	273,912 / $1.7100E^{-5}$	0.02 lbs/hr

Emission concentrations were determined from detected soil gas vapor concentrations collected during the pilot test.
cfm - Cubic feet per minute; $\mu g/m^3$ -micrograms per cubic meter; lb/hr - Pounds per hour.

Table C9d: Total Effluent Contaminant Mass Flow Rate at start up at full design flow

Total Estimated SVE Emission Rate Potential at Start up (untreated)	
	At Start up Emission Rate @ 84.7 cfm
SVE-1	1.73
SVE-2	0.05
SVE-3	0.02
Total	1.8 lbs/hr

Table C9e: Total Effluent Contaminant Mass Flow Rate at Throttled Flow for SVE1

Total Estimated SVE Emission Rate Potential at Start up (untreated)	
	At Start up Emission Rate @ 48.5 cfm
SVE-1	0.49
SVE-2	0.05
SVE-3	0.02
Total	0.56 lbs/hr

The primary VOC contaminant in the effluent stream is tetrachrloroethylene (PCE). PCE is rated as a High Toxicity Air Contaminant (HTAC), limited to 0.1 pounds per hour untreated discharge. Therefore, the effluent stream shall require treatment with granular activated carbon and a minimum of 82.1% reduction of contaminants in the effluent stream.

Estimated Vapor Phase Carbon Usage

An estimate of contaminant mass flow rate was derived using the calculated influent concentration and the nominal flow rate predicted by the pneumatic model for full-scale operation, 84.7 CFM.

The calculated mass flow rate was used to determine expected carbon use and replacement frequency. Vapor phase carbon adsorption table, provided by Carbtrol, manufacturer of the carbon treatment drums, was used to evaluate adsorptive capacity of the individual compounds at their estimated influent concentration. Carbtrol also provided the expected pressure loss through

the treatment drums. The absorption table and pressure loss data follow the calculation summary below. Carbtrol predicts the carbon usage rate to be 83.7 pounds of carbon per day at full design flow rate based on the pilot test initial concentrations of contaminants in the effluent.

The SVE effluent treatment will be accomplished in two configurations, Phase 1 and 2. The initial configuration, Phase 1, will have a higher capacity for contaminant absorption to correspond to the high contaminant levels in the waste stream during the initial stages of operation. Phase 1 will consist of two parallel lines of three carbon drums in series and Phase 2 will consist of two parallel lines of two carbon drums in series. Each drum contains 200 pounds of granular activated carbon (GAC) for a total of 800 pounds in the primary drums and 400 pounds in the secondary drums for Phase 1, and 400 pounds in the primary drums and 400 pounds in the secondary drums for Phase 2.

The carbon use estimate calculation yields a saturation loading of approximately 83.7 pounds per day at the initial contaminant concentration. It would, therefore, take 9.6 days to saturate the 800 pounds of GAC contained in the primary drums. However, complete saturation is not typically achieved before breakthrough of VOCs from a GAC vessel. The effluent of each set of drums shall be monitored for breakthrough weekly at start up, with decreasing frequency as breakthrough time is better established with site specific conditions.

Estimating Carbon Treatment Breakthrough

During operation of the carbon treatment on the SVE system, breakthrough will occur before the carbon is at capacity of contaminant loading. It is useful to have a procedure to determine when breakthrough is beginning to occur, while maximizing the carbon loading, and maintaining discharge limits mandated by the DEC (eg 0.1 pounds per hour). Sample analysis of the waste stream via EPA Method TO-15 is the definitive way to determine effluent contaminant levels, however, there is significant lag time between sample collection and receiving results from the analysis laboratory.

To determine the total VOC concentration in the effluent corresponding to 0.1 pound per hour mass flow rate, it is first assumed the Ideal Gas Laws apply with air at 68 degrees Fahrenheit, 1 atmosphere, with a flow rate of 84.7 SCFM and all VOCs present are PCE.

$$C\,(ppmv) = \frac{\dot{m}\, V_m\, 10^6}{Q\, MW_{PCE}\, 60\ min/hr} = \frac{(0.1\ lb/hr)(385.3\ ft^3/lb\text{-}mole)(1E^6)}{(84.7\ scfm)\,(165.8\ lb/lb\text{-}mole)\,(60\ min/hr)}$$

$$C = 45.7\ ppmv$$

C - contaminant concentration (ppmv)
$\dot{m}$ - mass flow rate (pound/hr) = 0.1 lb/hr
V_m - molar volume = 385.3 ft^3/lb mole
Q - volumetric flow rate (SCFM)
MW_{PCE} - 165.8 lb/lb-mole

Equation 3. – Contaminant Concentration Equation

Under the same assumptions, the effluent corresponding to 0.1 pound per hour mass flow rate, with a throttled flow rate of 48.5 SCFM.

$$C\,(ppmv) = \frac{\dot{m}\, V_m\, 10^6}{Q\, MW_{PCE}\, 60\ min/hr} = \frac{(0.1\ lb/hr)(385.3\ ft^3/lb\text{-}mole)(1E^6)}{(48.5\ scfm)\,(165.8\ lb/lb\text{-}mole)\,(60\ min/hr)}$$

$C = 79.9$ ppmv

An effluent concentration of 45.7 ppm (within the assumptions) at a flow rate of 84.7 cfm and 79.9 ppm at 48.5 cfm, would both correspond to a 0.1 pound per hour discharge rate .

Controlling Carbon Usage

Budgetary constraints limit the amount of carbon that is available each month to no more than 800 pounds. Therefore, the SVE system shall need to be throttled in the initial stages in order to control the amount of carbon used. Throttling will involve reduction of ground derived system airflow through the use of valves, operating frequency adjustment, and/or with the introduction of ambient outside air to the system.

800 pounds of carbon per month (30 days) equates to 26.7 pounds per day. At the initial start up, the estimated carbon loading at full design airflow is estimated to be 83.7 pounds per day.

The treatment of SVE2 and SVE3 are relatively minor contributors to carbon usage and will be started at full design flow of 14.7 and 19.4 cfm, respectively. These extraction wells will contribute 0.07 pounds per hour of contaminants, at start up conditions, to the treated effluent stream, and will remain at full design flow rate until contaminant concentrations reach asymptotic levels for each extraction well. At start up contaminant concentrations, this will result in a carbon usage rate of 4.4 pounds per day, with a budget balance of 22.3 pound of carbon per day for SVE1. This corresponds to a maximum flow rate of SVE1 at initial contaminant concentrations of 14.4 cfm. The SVE1 flow rate shall be increased proportionally to the decrease in the contaminant level until the full design flow rate of 50.6 cfm is obtained.

Table C10ai: Estimated Carbon Usage at Full Design Mass Flow Rates at **SVE1** (50.6 cfm)

Vapor Phase Constituent	Contaminant Emission Rate (lb/day) @ 50.6 cfm	Adsorption Rate	Carbon Usage per Day (pounds)
tetrachloroethylene	33.9336	67.2%	50.496
trichloroethene	0.3504	19.9%	1.761
cis-1,2-Dichloroethene	0.6144	9.6%	6.400
toluene	0.6456	24.7%	2.614
ethylbenzene	1.1064	32.5%	3.404
xylene	4.7208	38.1%	12.391
1,2,4 trimethylbenzene	0.1296	10.6%	1.223
Total	41.5008 lbs/day VOCs		78.289 pounds of carbon/day

Emission concentrations were determined from detected soil gas vapor concentrations collected during the pilot test.
cfm - Cubic feet per minute; lb/day - Pounds per day.

Table C10aii: Estimated Carbon Usage at Flow Rate to maintain carbon usage at 22.3 pound of carbon, **SVE1** (14.4 cfm)

Vapor Phase Constituent	Contaminant Emission Rate (lb/day) @ 14.4 cfm	Adsorption Rate	Carbon Usage per Day (pounds)
tetrachloroethylene	9.6576	67.2%	14.371
trichloroethene	0.0984	19.9%	0.494
cis-1,2-Dichloroethene	0.1752	9.6%	1.825
toluene	0.1848	24.7%	0.748
ethylbenzene	0.3144	32.5%	0.967
xylene	1.3440	38.1%	3.528
1,2,4 trimethylbenzene	0.0360	10.6%	0.340
Total	11.81 lbs/day VOCs		22.273 pounds of carbon/day

Emission concentrations were determined from detected soil gas vapor concentrations collected during the pilot test.
cfm - Cubic feet per minute; lb/day - Pounds per day.

Table C10b: Estimated Carbon Usage at Mass Flow Rate at **SVE2** (14.7 cfm)

Vapor Phase Constituent	Contaminant Emission Rate (lb/day) @ 14.7 cfm	Adsorption Rate	Carbon Usage per Day (pounds)
tetrachloroethylene	1.0752	67.2%	1.600
trichloroethene	0.01464	19.9%	0.074
cis-1,2-Dichloroethene	0.00096	9.6%	0.010
Total	1.09 lbs/day VOCs		1.684 pounds of carbon/day

Emission concentrations were determined from detected soil gas vapor concentrations collected during the pilot test.
cfm - Cubic feet per minute; lb/day - Pounds per day.

Table C10c: Estimated Carbon Usage at Mass Flow Rate at **SVE3** (19.4 cfm)

Vapor Phase Constituent	Contaminant Emission Rate (lb/day) @ 19.4 cfm	Adsorption Rate	Carbon Usage per Day (pounds)
tetrachloroethylene	0.2592	67.2%	0.3857
trichloroethene	0.0456	19.9%	0.2291
cis-1,2-dichloroethene	0.1560	9.6%	1.6250
trans-1,2-dichloroethene	0.0007	1.1%	0.0636
tetrahydrofuran	0.0144	3.8%	0.3789
Total	0.4759 lbs/day VOCs		2.682 pounds of carbon/day

Emission concentrations were determined from detected soil gas vapor concentrations collected during the pilot test.
cfm - Cubic feet per minute; lb/day - Pounds per day.

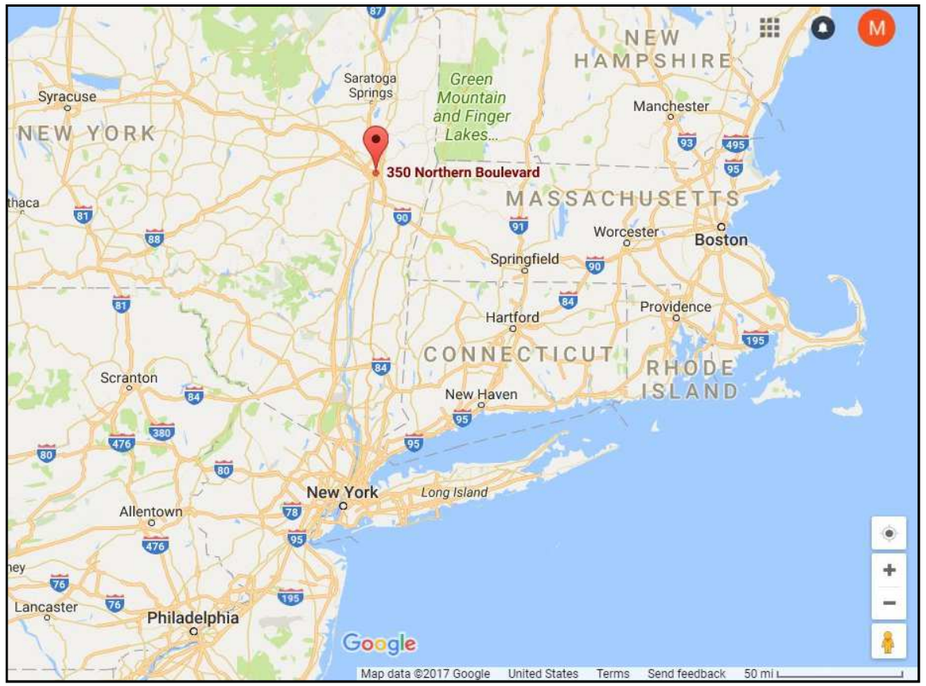
Appendix D:

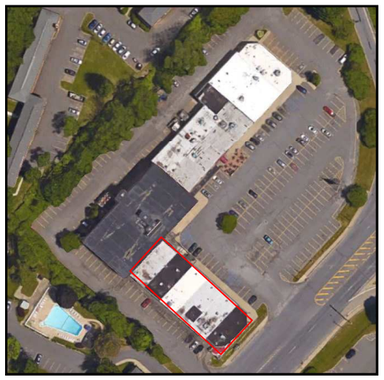
SVE Design Specification

Soil Vapor Extraction System Design

Former Loudon and KEM Cleaners Site

350 Northern Boulevard, Albany, New York





Date:
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Mark Schnitzer, PE

Former Loudon and KEM Cleaner Site
350 Northern Boulevard
Albany, New York

DESCRIPTION	DATE
Final	September 17, 2018

PROJECT NO. 18-100

SHEET NO.

S - Title

SHEET TITLE	Soil Vapor Extraction System Title	
	CHECKED BY:	Mark Schnitzer, PE

PART 1 REFERENCE AND SCHEDULES

1.01 APPLICABLE SPECIFICATIONS, CODES, AND STANDARDS
A. US Army Corp of Engineers EM1110-1-4001 (2002), Soil Vapor Extraction and Bioventing.
B. ASTM D-2665-11 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
C. ASTM D-2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Sys
D. ASTM F-656-10 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

1.02 ABBREVIATIONS
DWV - Drain Waste, and Vent
ft bgs -Feet Below Ground Surface
"WC - Inches of Water Column
lbs/hr -Pounds per hour
PVC -Polyvinyl Chloride
PVE -Pore volume exchanges
ROI -Radius of influence
scfm -Standard cubic feet per minute
SVE -Soil Vapor Extraction
VMP -Vacuum Monitoring Point
VOCs -Volatile Organic Compounds
VMP -Vapor monitoring port
GAC - Granular Activated Carbon

1.03 SCHEDULES

A. Schedule of drawings:

Sheet	Area/Description
S-1a	General Notes 1
S-1b	General Notes 2
S-1c	General Notes 3
S-2	Drawing: SVE System Layout_Plan View
S-3	Drawing: Details 1
S-4	Drawing: Details 2
S-5	Drawing: Process Diagram
S-10	SVE Pilot Test Locations
S-11	SVE Radius of Influence

B. Schedule of equipment Cut Sheets:

Sheet	Manufacturer/Model	Description
CS-01	Rotron Ametek EN656	System Blower
CS-02	Dwyer Magnehelic	Differential Pressure Gauge
CS-03	Solberg CT-235P-400C	Air Filter
CS-04	Rotron Moisture Separator	Moisture Collection Tank
CS-05	Hoffman Hinged Cover	VFD Housing
CS-06	GS2	Variable Frequency Drive
CS-07	Carbtrol	Carbon Treatment Drums

PART 2 MATERIALS

2.01 PIPE, FITTINGS, & VALVES
A. Pipe & Fittings
1. All piping, from extraction wells to the manifold shall be 4" inside diameter schedule 40 PVC.
2. All pipe fittings from extraction wells to the manifold shall be 4" inside diameter schedule 40 PVC with slip connectors suitable for solvent weld to 4" PVC pipe.
3. Piping between the manifold and the blower, shall match the largest size of the component it connects to in schedule 40 PVC pipe with reductions or expansions in between.
4. The system manifold shall be 6-inch nominal inside diameter schedule 40 PVC pipe.
5. The system exhaust stack pipe shall be 6-inch nominal inside diameter stainless steel with insulated jacket.

B. Valves
1. Extraction well line valves shall be 4" brass ball or gate valves, with fit to Schedule 40 PVC pipe.
2. System vacuum relief valve shall be set at or below the maximum vacuum operating pressure for the blower as identified by the blower manufacturer.

2.02 SYSTEM FAN/BLOWER & ACCESSORIES

A. Schedule of System Regenerative Blower & Accessories

Manufacturer	Model	Description
Rotron Ametek	EN656M72	3hp; 3-phase, 220 V , Regenerative Blower
Solberg	CT-235P-400C	4"x 4" inline filter
GS2	GS2-23P0	Variable Frequency Drive blower control Sized for 3hp, 230V, single/three phase output.
Rotron	MS200PS/038519	Moisture Separator with high level switch.

2.03 SYSTEM MONITORING EQUIPMENT

A. Differential Pressure Gauge

1. Dwyer Magnehelic Differential Pressure Gauges shall have a range from zero to fifty inches of water column.

B. Sample Ports

1. Brass, 1/4" diameter threaded ball valves.

2.04 SVE System Enclosure

A. Enclosure shed shall be a steel shipping container or equivelent metal construction.

2.05 Granular Activated Carbon

A. Schedule of Carbon Treatment Vessels

Manufacturer	Model	Description
Carbtrol	G-1S	55 gallon GAC Vapor Phase Treatment Drum (200 pounds/drum)

Alpine Engineering Services LLC
Alpine Engineering Services LLC
Mark Schnitzer, PE

Former Loudon and KEM Cleaner Site
350 Northern Boulevard
Albany, New York

DESCRIPTION	DATE
Final	September 17, 2018

PROJECT NO. 18-100
SHEET NO.
S - 1a

SHEET TITLE	Soil Vapor Extraction System, General Notes 1
	CHECKED BY: Mark Schnitzer, PE

PART 3 EXECUTION

3.01 INSTALLATION

A. Extraction Wells (EW) and Monitoring Ports (VMP).

1. EWs were installed at three locations as part of the pilot testing identified on drawings as SVE-1, SVE-2, and SVE-3. These three wells will comprise all of the extraction wells for this SVE system.
2. VMPs were installed at five locations near each of the SVE wells as part of the pilot testing. These wells will continue to be used, along with several groundwater monitoring wells and sub slab pressure monitoring ports (to be installed), to monitor and balance the SVE system after installation.

B. Pipe System

1. All pipe, fitting, and valve connections shall be solvent welded, with the exception of the blower, moisture separator, and filter connections which are threaded connectors. Teflon tape shall be used on all threaded pipe connections.
2. Horizontal pipe runs shall be sloped toward the extraction wells a minimum of $^1/_8$ inch per foot. No water traps shall be created in any system pipe.
3. Above ground piping shall be supported in accordance with applicable building codes for DWV pipe of the same type and size.
4. Weatherproof fasteners and clamps shall be used for all pipe supports.
5. Approximate routing of pipe to exhaust locations is indicated on the accompanying drawings.
6. An 8-inch verticle discharge vent cap shall be installed on the end of the exhaust.

C. Trenching

1. Pipe connections to SVE wells are to be trenched underground to the system enclosure. See drawing sheet S-2 for the approximate routing of the trenches and drawing sheet S-3 or details of the sub surface trench construction.

D. Blower Installation

1. Install blower in accordance with manufacturer's installation requirements.
2. A blower specified in section 2.02 shall be mounted within the enclosure shed.
3. Exhaust discharge location must be 2 feet above the office building roof (high roof). Additionally, it shall be 2 feet above, or if not 2 feet above, then 10 feet horizontally from any roof opening to the building air or air intake. Extend exhaust stack discharge height as needed to meet this requirement.

E. Monitoring Panel/ Monitoring Equipment

1. A monitoring panel shall be installed inside the system enclosure.
2. The monitoring panel shall include mechanical pressure gauges measuring the real time vacuum in the individual EWs, pre and post moisture separator, pre and post filter and in the exhaust line.
3. Pressure gauges shall be connected to the monitoring location of the system pipe with polyethylene (or equivalent) tubing and a brass barb.

F. Labeling

1. Label all Extraction Wells, inside the curb box, with the number convention identified in Drawing S-2.
2. Label all EW extraction lines below the valve, with the number convention identified in Drawing S-2.
3. Label all components in the enclosure.
4. Label each pressure differential gauge on the monitoring panel inside the system enclosure.

G. Electrical

1. Blower and Alarm panel electrical wiring and connection shall be in accordance with applicable electrical codes.
2. Blower electrical connection shall comply with manufacturer requirements.
3. Electrical shall tie into existing 3-phase, 220 volt service in the adjoining vacant space #2.
4. Blower shall be controlled by a variable frequency drive installed in the control panel inside the enclosure shed. The VFD requires a small cooling fan to be installed in the control panel box and energized.
5. A weather tight electrical disconnect shall be provided within six feet of the blower inside the system enclosure.
6. Blower electrical connection shall be through a dedicated electrical circuit breaker.
7. One 110V electrical outlet shall be installed within the system enclosure.
8. One overhead light with light switch shall be installed into the enclosure.
9. Electrical connection shall be to the existing building electrical panel in the rear of the upper vacant space by an electrician, licensed by the City of Albany, New York.
10. All electrical permits and inspections shall be obtained in accordance to City of Albany Building Code.

H. Carbon Treatment of Effluent

1. Cabon shall be installed in accordance with manufacturer's specifications.
2. The SVE effluent treatment will be accomplished in two configurations, Phase 1 and Phase 2. The initial configuration, Phase 1, will have a higher capacity for contaminant absorption to correspond to the high contaminant levels in the waste stream during the initial stages of operation. Phase 1 will consist of two parallel lines of three carbon drums in series and Phase 2 will consist of two parallel lines of two carbon drums in series. Each drum contains 200 pounds of GAC for a total of 800 pounds in the primary drums and 400 pounds in the secondary drums for Phase 1, and 400 pounds in the primary drums and 400 pounds in the secondary drums for Phase 2.
3. The carbon treatment in Phase 1, consists of two parallel line of three drums, treatment line (TL) A, with drums TLA1, TLA2, and TLA3, and TL B, with drums TLB1, TLB2, and TLB3. TLA2, TLA3, TLB2, and TLB3 are primary treatment drums. TLA1 and TLB1 are secondary treatment drums.

Alpine Engineering Services LLC

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Mark Schnitzer, PE

Former Loudon and KEM Cleaner Site
350 Northern Boulevard
Albany, New York

DESCRIPTION	DATE
Final	September 17, 2018

PROJECT NO. 18-100

SHEET NO.

S - 1b

SHEET TITLE	Soil Vapor Extraction System, General Notes 2	
	CHECKED BY:	Mark Schnitzer, PE

I. Documentation

1. Operations & Maintenance Report

Following the installation of the SVE system, an Operations & Maintenance Report shall be provided in electronic format (PDF). Post Installation Report shall include the Following Items:

a. A written description of the system installed, including make/model of blower, blower serial number, system fan date of manufacture.
b. A chart indicating the pressures and flows in each EW, the pre and post moisture separator and filter readings, and the exhaust line pressure and flow readings with provisions for recording future readings.
c. Manufacturer paperwork (including warranty paperwork) for all blowers, meters, alarms, gauges, switches, etc. installed.
d. Photos with description of system components.
e. As built drawing of the location of fans, system piping, gauges, valves, alarms, and electrical tie in location, etc.
f. Post installation sub surface test data from the VMP, monitoring wells in the vicinity.
g. Troubleshooting table.
h. Provide carbon treatment monitoring schedule.
I. Provide schedule for sampling of effluent with laboratory analysis.
J. Provide inspection criteria and timeline for performing the inspections.

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Albany, New York

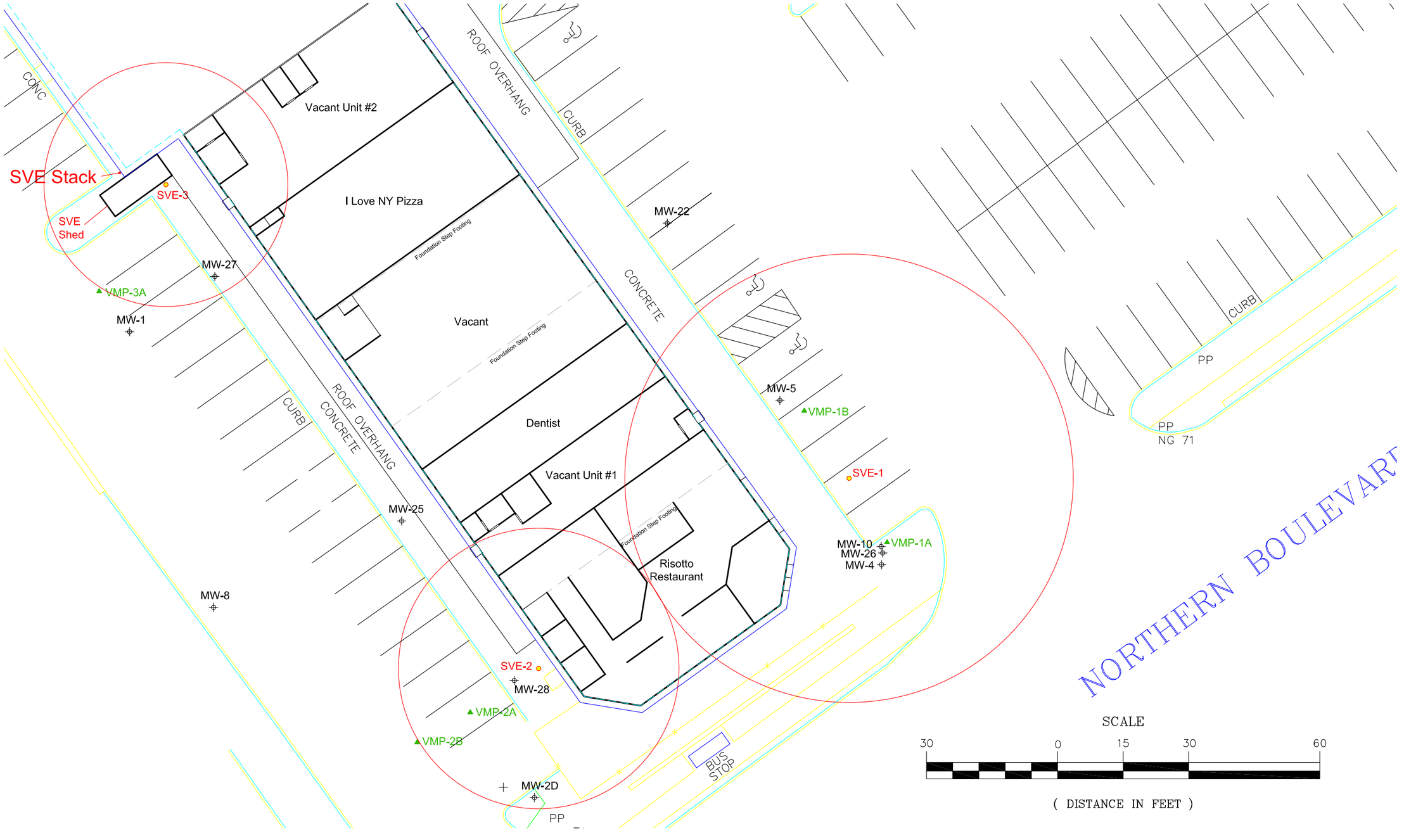
DESCRIPTION	DATE
Final	September 17, 2018

PROJECT NO. 18-100

SHEET NO.

S - 1c

SHEET TITLE	Soil Vapor Extraction System, General Notes 3	
	CHECKED BY:	Mark Schnitzer, PE



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DESCRIPTION:	DATE:
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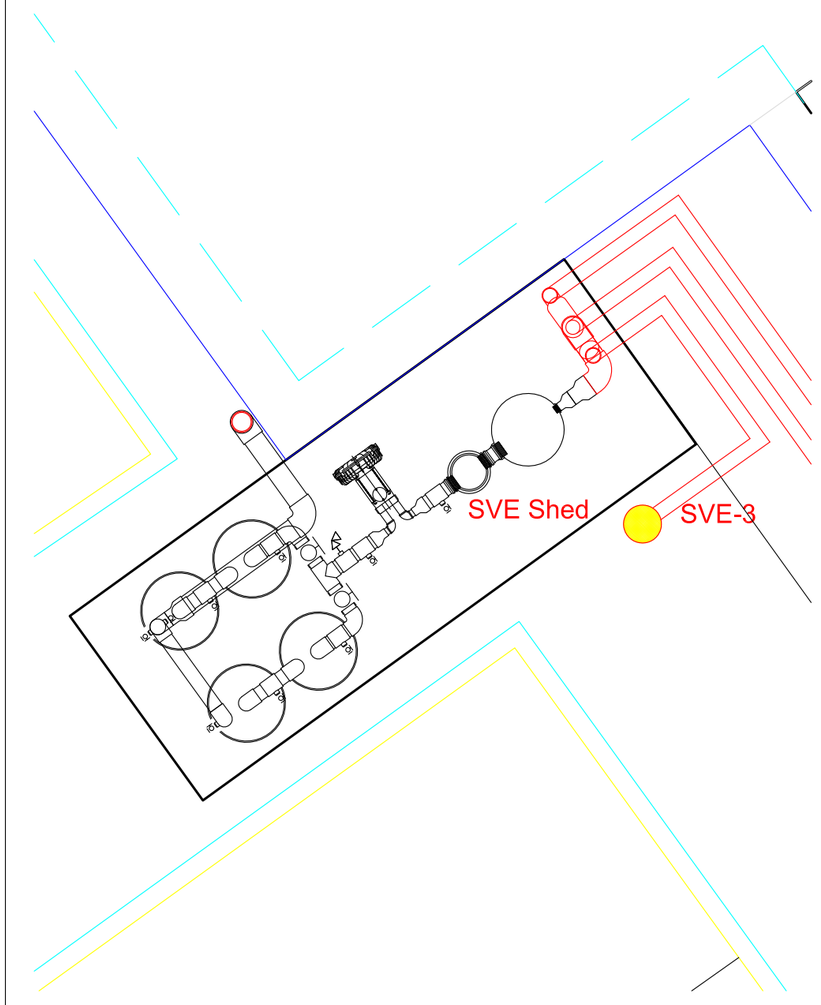
PROJECT NO: 18-100

SHEET NO:

S - 11

SHEET TITLE:	SOIL VAPOR EXTRACTION SYSTEM - SVE RADIUS OF INFLUENCE	
	CHECKED BY:	Mark Schnitzer, PE



The alteration of this material in any way, unless done under the direction of a comparable professional (i.e. Engineer for an Engineer), is a violation of the New York State Education Law and/or regulations and is a Class "A" misdemeanor.

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DESCRIPTION:	Final
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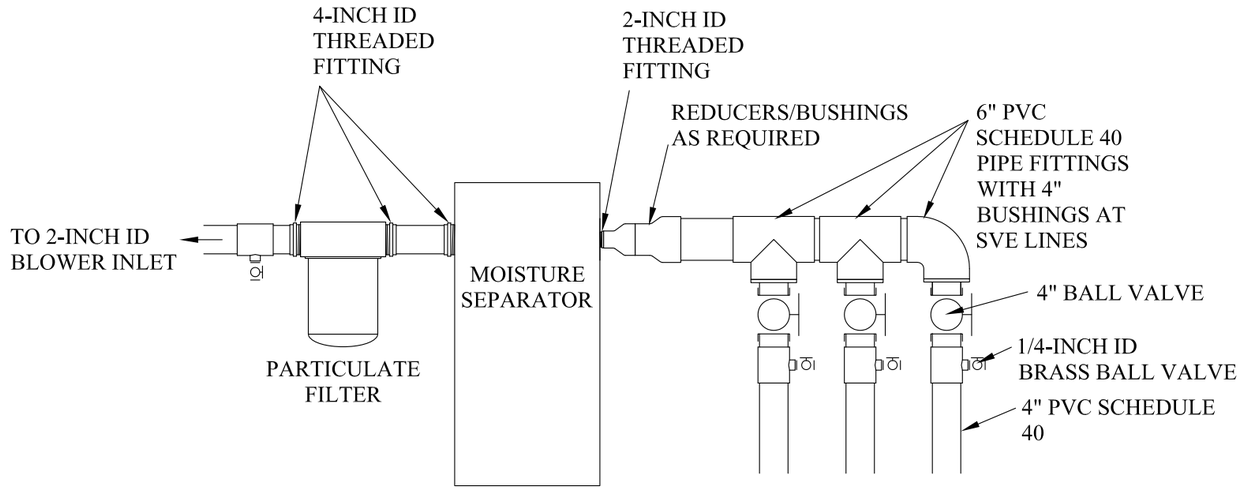
PROJECT NO: 18-100

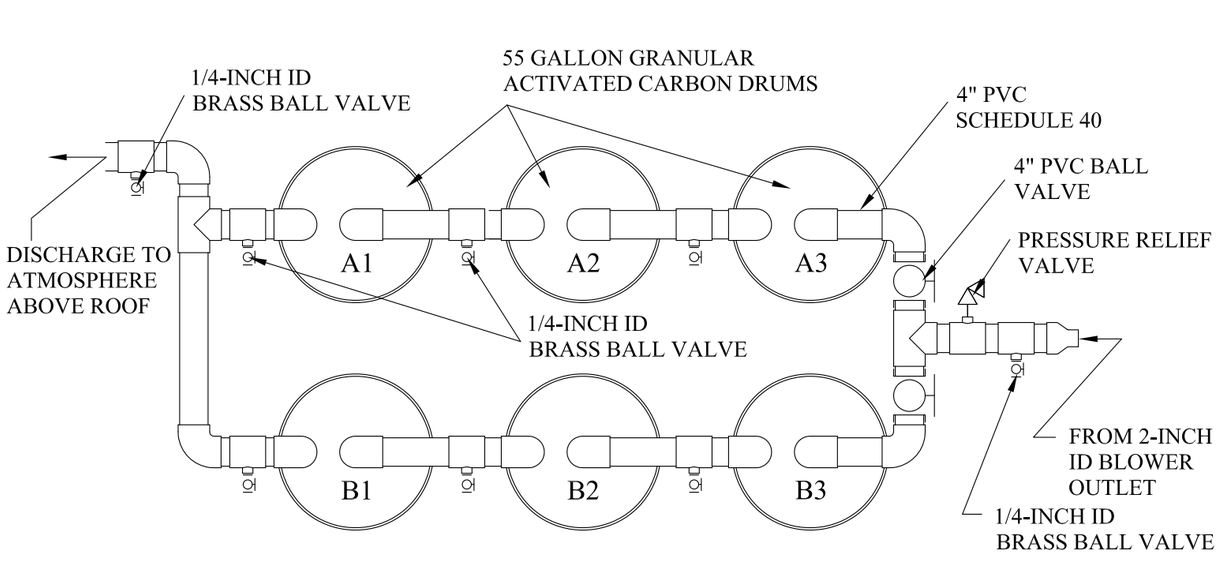
SHEET NO:

S - 2

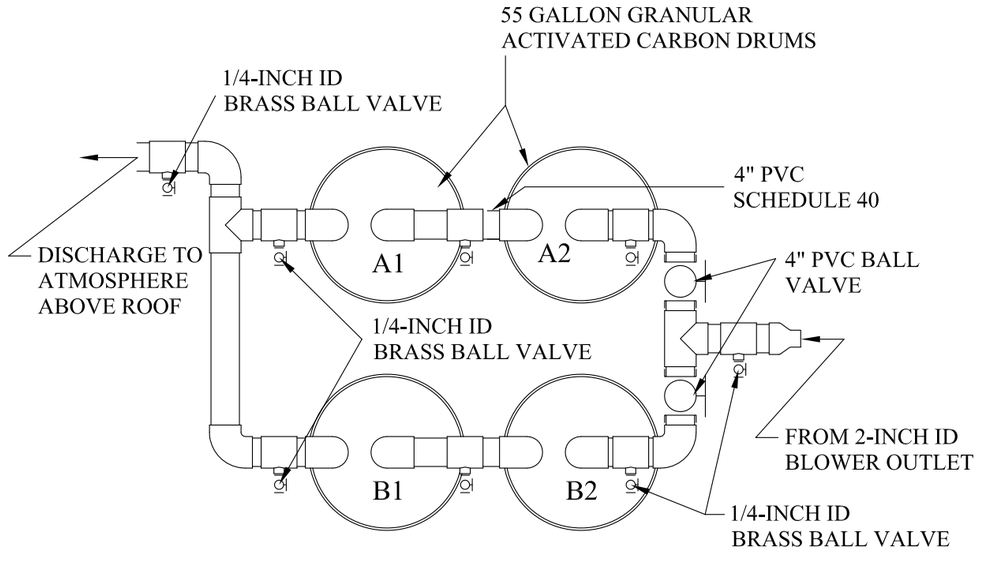
SHEET TITLE:	SOIL VAPOR EXTRACTION SYSTEM - SYSTEM LAYOUT	
	CHECKED BY:	Mark Schnitzer, PE



MANIFOLD DETAIL - INSIDE SHED
NOT TO SCALE



PHASE 1: AIR TREATMENT DETAIL - INSIDE SHED
NOT TO SCALE



PHASE 2: AIR TREATMENT DETAIL - INSIDE SHED
NOT TO SCALE

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DESCRIPTION:	DATE:
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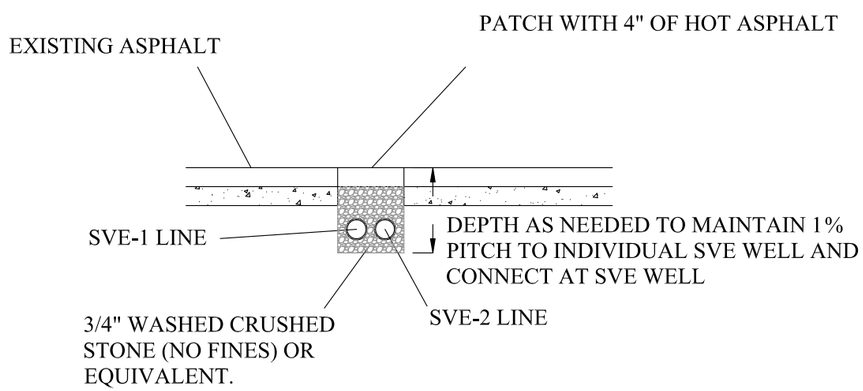
PROJECT NO: 18-100

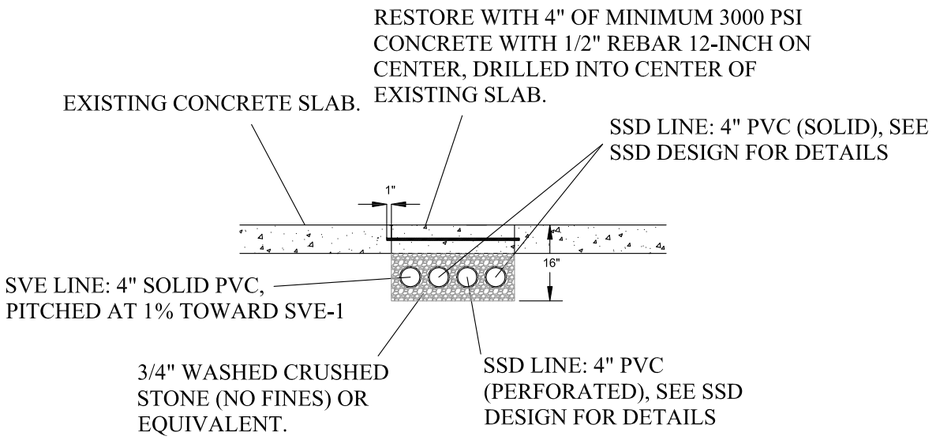
SHEET NO:

S - 3

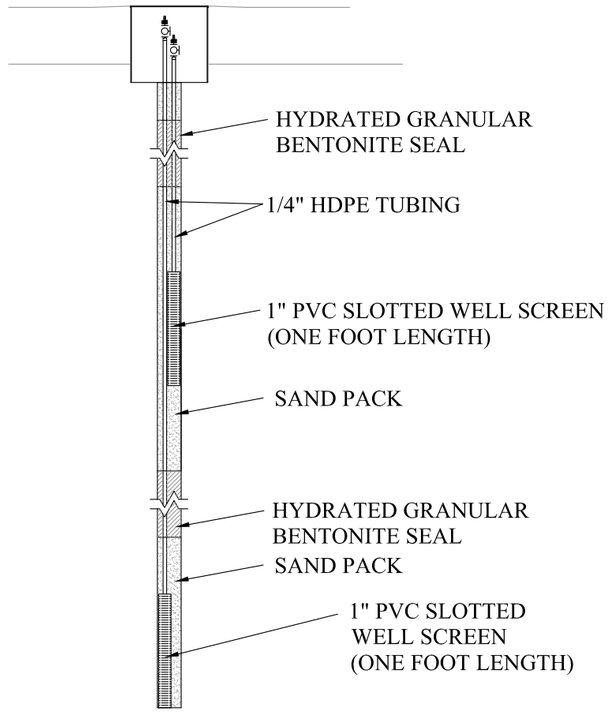
SHEET TITLE:	SOIL VAPOR EXTRACTION - DETAILS 1: MANIFOLD, CARBON CANISTERS	
	CHECKED BY:	Mark Schnitzer, PE



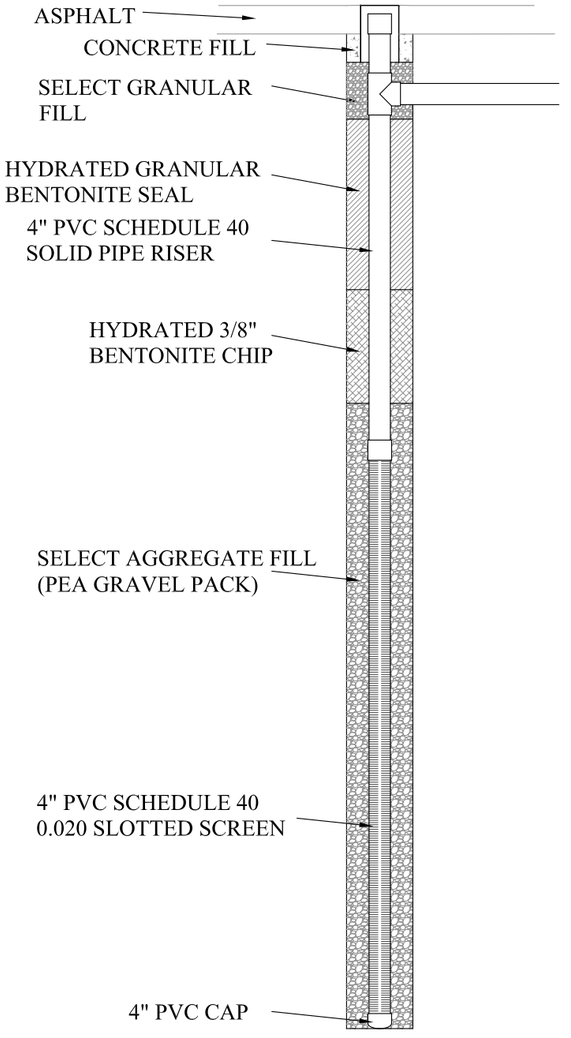
TRENCH DETAIL - OUTSIDE BUILDING - END VIEW
NOT TO SCALE



TRENCH DETAIL - INSIDE BUILDING - END VIEW
NOT TO SCALE



SOIL VAPOR EXTRACTION TEST POINT
NOT TO SCALE



SOIL VAPOR EXTRACTION WELL
NOT TO SCALE

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DESCRIPTION:	DATE:
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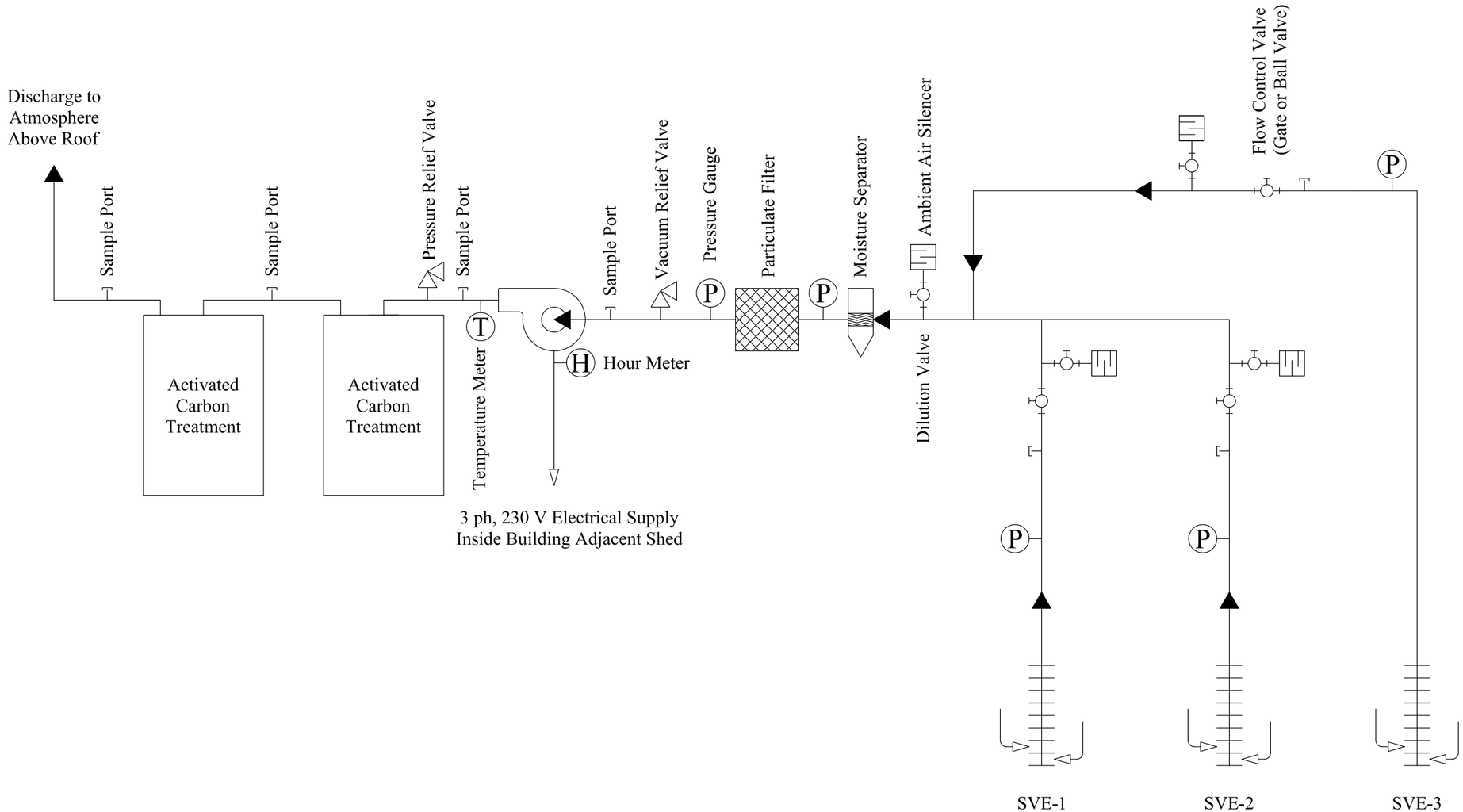
PROJECT NO: 18-100

SHEET NO:

S - 4

SHEET TITLE:	SOIL VAPOR EXTRACTION SYSTEM - DETAILS 2: WELL, TEST POINT, TRENCHES	
	CHECKED BY:	Mark Schnitzer, PE



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DESCRIPTION:	DATE:
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PROJECT NO: 18-100

SHEET NO:

S - 5

SHEET TITLE:	SOIL VAPOR EXTRACTION SYSTEM - PROCESS FLOW DIAGRAM	
	CHECKED BY:	Mark Schnitzer, PE

Appendix E:

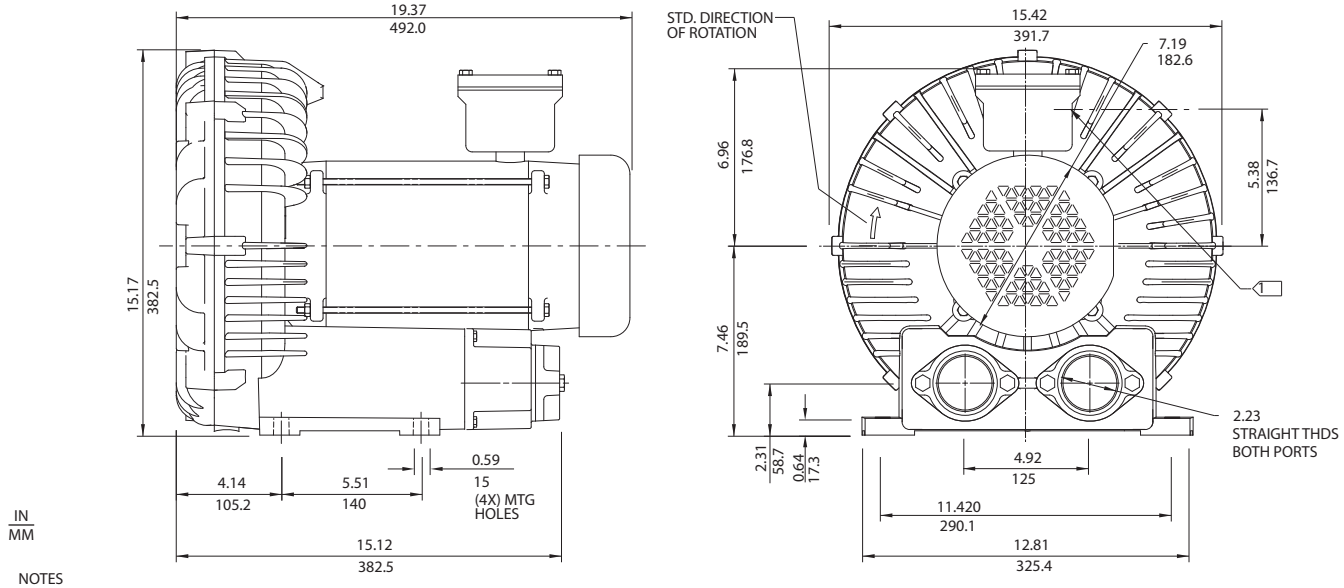
SVE Design Equipment Cut Sheets

Environmental / Chemical Processing Blowers

EN 656 & CP 656

ROTRON®

3.0 HP Sealed Regenerative w/Explosion-Proof Motor



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

		Part/Model Number			
		EN656M5XL	EN656M72XL	EN656M86XL	CP656FU72XLR
Specification	Units	080060	080059	080058	080142
Motor Enclosure - Shaft Mtl.	-	3	3	3	3
Horsepower	-	Explosion-proof-CS	Explosion-proof-CS	Explosion-proof-CS	Chem XP-SS
Phase - Frequency	-	Single-60 hz	Three-60 hz	Three-60 hz	Three-60 hz
Voltage	AC	208-230	208-230/460	575	208-230/460
Motor Nameplate Amps	Amps (A)	15.5-14.5	7.4/3.7	3.0	7.4/3.7
Max. Blower Amps	Amps (A)	17	10/5	4.1	10/5
Inrush Amps	Amps (A)	95-86	54/27	21.6	54/27
Service Factor	-	1	0/0	0	0/0
Starter Size	-	1.0	1.0	1.0	1.0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	142	117	117	117
	Kg	64.4	53.1	53.1	53.1

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

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

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

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

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Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK® TECHNICAL & INDUSTRIAL PRODUCTS

EN 656 & CP 656

ROTRON®

3.0 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 212 SCFM
- Maximum pressure: 75 IWG
- Maximum vacuum: 73 IWG
- Standard motor: 3.0 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

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

BLOWER OPTIONS

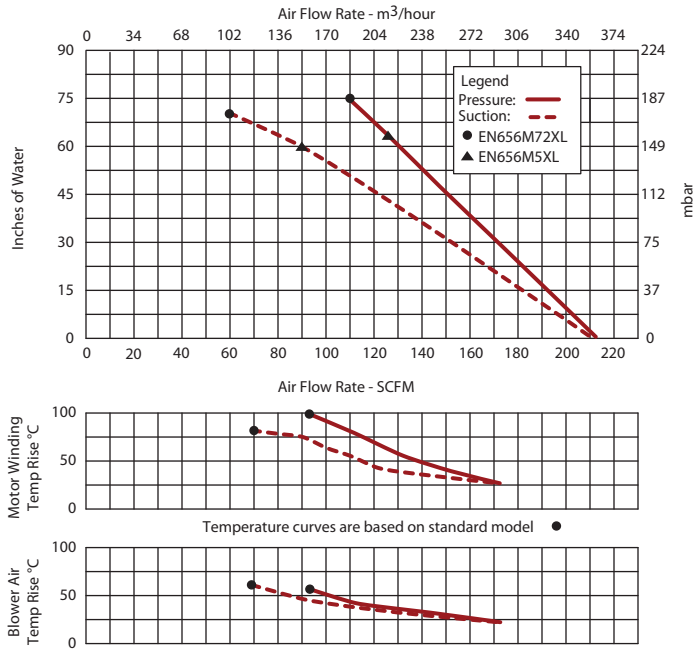
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

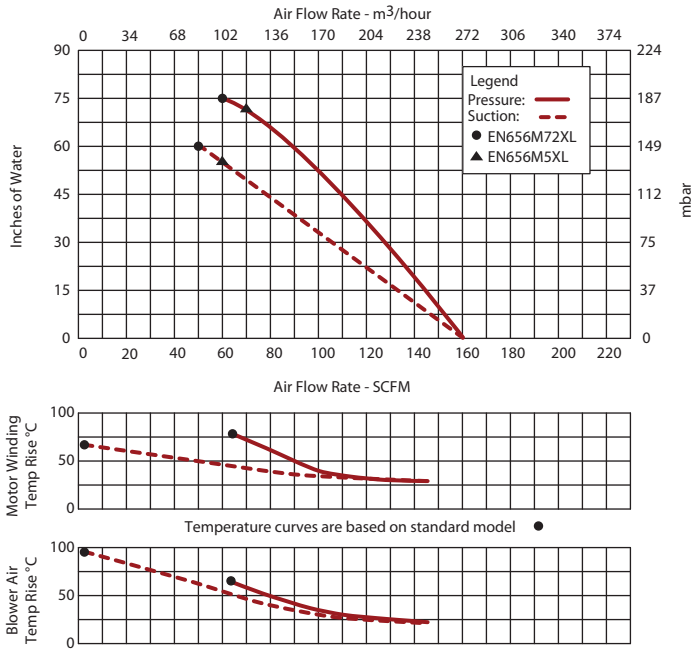
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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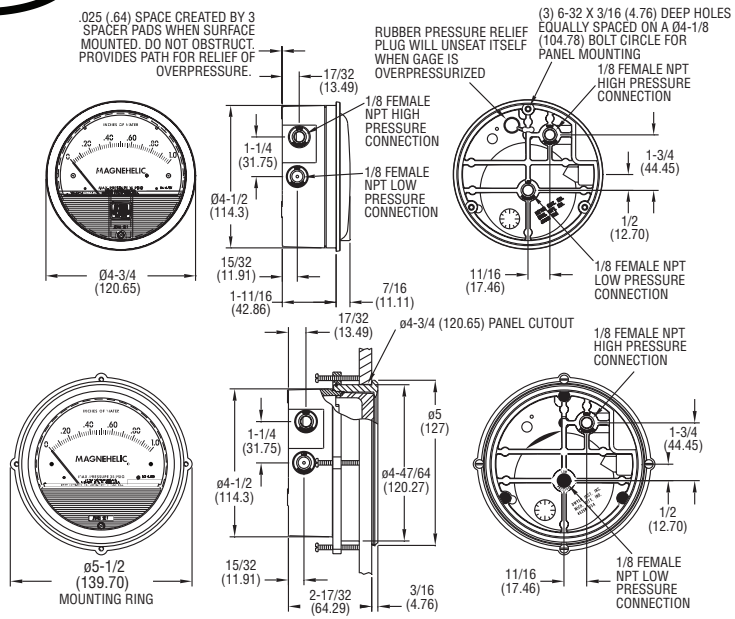
AMETEK®
TECHNICAL & INDUSTRIAL PRODUCTS

Bulletin A-27

Magnehelic® Differential Pressure Gage



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES: Two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023″ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20″ Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4″ (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8″ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Agency Approvals: RoHS.

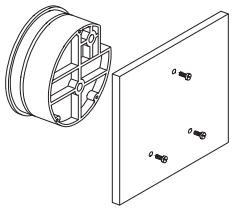
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

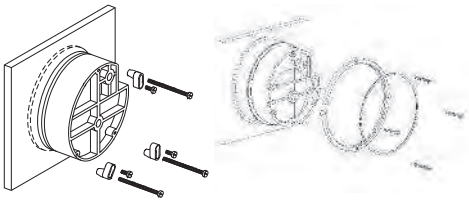
Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

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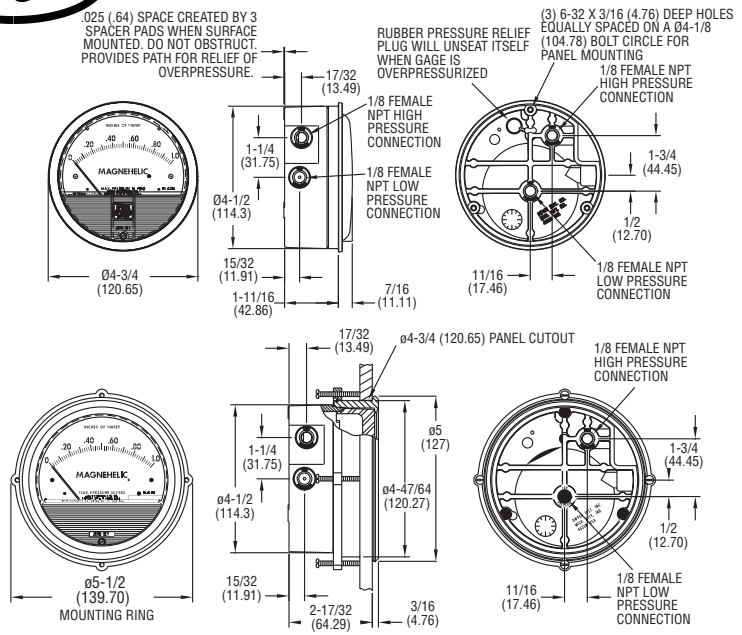
Magnehelic® Differential Pressure Gage
INSTRUCCIONES Y LISTA DE PARTES



(El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicona para el diafragma.)

Accesorios: Tapones 1/8" NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8" NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Accesorios para Los Modelos MP y HP: El anillo de montaje y el retensor del anillo de presión son substituidos por 3 adaptadores, accesorios de compresión de 1/4" remplazan a los adaptadores de rosca 1/8" a tubo de goma.

Protección Para Sobrepresión: Los Manómetros Diferenciales Magnehelic Estándar están clasificados para una presión máxima de 15 psi y no se deberían de usar donde el límite puede excederse. Los modelos emplean un tapón de goma en el trasero que funciona como una válvula de alivio desmontándose y ventilando el interior del instrumento cuando la sobrepresión alcanza aproximadamente 25 psig. (Los modelos MP y HP son excluidos) Para proveer un camino libre para el alivio de presión, el instrumento viene con rodilleras que mantienen un espacio de .023" cuando el instrumento es montado en superficie. No bloque el espacio creado por estas rodilleras.

† Para aplicaciones con alto ciclo de velocidad dentro de la clasificación de presión total del instrumento, la próxima clasificación mas alta es recomendada. Vea las opciones de media y alta presión.

El instrumento puede ser usado con hidrogeno cuando se ordena con diafragma de Buna-N. La presion tiene que ser menos de 35 psi.

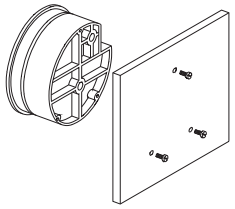
ESPECIFICACIONES

Servicio: aire y gases no combustibles, gases compatibles. (ópcion disponible para uso con gas natural).
Materiales Mojados: Consulte con la fábrica.
Carcasa: Caja y anillo de retención de aluminio fundido a presión con tapadera de acrílico. (El modelo MP tiene la tapadera de policarbonato.)
Exactitud: ±2% de fondo de escala a 21 °C
Mod. 2000-0 ±3%; Mod. 2000-00 ±4%
Límite de Presión: -20 Hg. a 15 psig. † (-0.677 bar a 1,034 bar); opción MP: 35 psig (2.41 bar), opción HP: 80 psig (5.52 bar).
Sobrepresión: El tapón de alivio se abre aproximadamente a los 25 psig, modelos estandard únicamente. El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicio para el diafragma.
Límite de Temperatura: -6.67 a 60ºC. * Modelos de baja temperatura disponibles como opción especial.
Dimensiones: diám. 120,65 mm x 55,6 prof.
Orientación de Montaje: El diafragma debe ser usado solo en posición vertical. Consulte con la fábrica para otras orientaciones de posición.
Conexiones: 1/8" NPT para alta y baja presión, duplicadas (atrás, a los lados).
Peso: 510 g, MP y HP 963 g.
Aprobación de la agencia: RoHS.

Instalacion

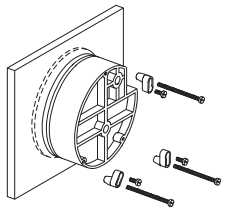
Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.
Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

Montaje alineado



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los.

Montaje Sobre Pipa

Para montar el instrumento sobre pipas de 32 a 50 mm de diám., ordene el adaptador opcional A-610.

Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.
Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.
Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacío) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adapta dores para rosca de tubo de 1/89 a tubo flexible, y conecte a proceso mediante una tubería de goma, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior.

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo.
El instrumento de Serie 2000 no puede ser re parado en el campo y debería de ser regresado si reparos son necesarios (Reparos en el campo no deben de ser intentados y pueden cancelar la garantía.). Asegurarse de incluir una descripción breve del problema más cualquier notas pertinentes a la aplicación para devolución de productos antes de enviar el instrumento.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*
1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

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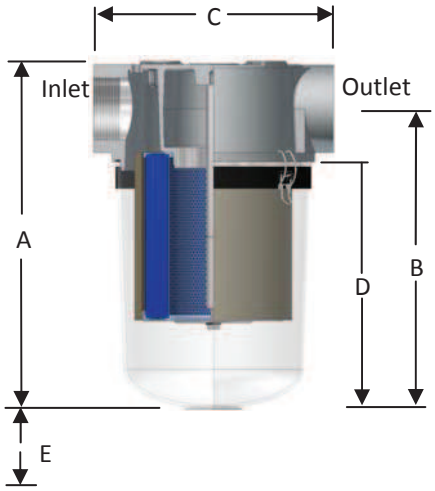
"T" Style Vacuum Filters
ST/CT Series 1" – 6" FPT



General Features

- Compact design for space restrictions; min. service area
- Inlet above element for extended element life & maintenance intervals
- Cast, corrosion resistant aluminum top with machined connections: - Integrated baffle design
  - 4 M12 taps for mounting brackets: 2" to 6"
- "T" style design minimizes piping requirements
- 1/4" differential gauge ports: 2" to 6"

ST Series Specifications

- See-through bucket made from polycarbonate material
- Bucket has a high tensile strength for dimensional stability
- Temp ratings: - Complete assembly max: 220°F (104°C)
  - See-through bucket only max: 257°F (125°C)
- Increased holding capacity

Technical Specifications

- Vacuum Rating: Gas tight seal
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 15-20" H2O over initial Δ P
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron

Options

- Swing bolts for heavy duty environments
- 1" to 1-1/2" housings have dimples for optional gauge ports & mounting bracket taps
- Epoxy coated housings
- Drain ports
- Spool piece extender on select models
- ISO flange connections: NW25, NW40 (select models)

FPT Inlet & Outlet	Assembly SCFM Rating	Assembly Part Number		Dimensions - inches				Suggested Service HT.	Approx. Weight	Replacement Element Part No.		Element SCFM
		Polyester	Paper	A	B	C	D	E	lbs.	Polyester	Paper	Rating
1"	40	ST-897-100C	ST-896-100C	13 3/8	11 15/16	7	10 3/8	9	11	897	896	115
1-1/4"	60	ST-897-125C	ST-896-125C	13 3/8	11 15/16	7	10 3/8	9	11	897	896	115
1-1/2"	80	ST-897-150C	ST-896-150C	13 3/8	11 15/16	7	10 3/8	9	10	897	896	115
2"	175	ST-851/1-200C	ST-850/1-200C	16 1/4	14 1/4	9	12 1/2	9	15	851/1	850/1	290
2-1/2"	210	ST-851/1-250C	ST-850/1-250C	16 1/4	14 1/4	9	12 1/2	9	14	851/1	850/1	290
3"	300	ST-235P-300C	ST-234P-300C	19 3/4	17	13 1/2	14	9	29	235P	234P	570
4"	520	ST-235P-400C	ST-234P-400C	19 3/4	17	13 1/2	14	9	25	235P	234P	570

Dimension tolerance ± 1/4"

CT Series Specifications

- Carbon steel black enamel drop down bucket
- Swing bolts standard on 6" housings

FPT Inlet & Outlet	Assembly SCFM Rating	Assembly Part Number		Dimensions - inches				Suggested Service HT.	Approx. Weight	Replacement Element Part No.		Element SCFM
		Polyester	Paper	A	B	C	D	E	lbs.	Polyester	Paper	Rating
1"	40	CT-897-100C	CT-896-100C	13 3/8	11 13/16	7	10 3/8	9	12	897	896	115
1-1/4"	60	CT-897-125C	CT-896-125C	13 3/8	11 13/16	7	10 3/8	9	12	897	896	115
1-1/2"	80	CT-897-150C	CT-896-150C	13 3/8	11 13/16	7	10 3/8	9	11	897	896	115
2"	175	CT-851-200C	CT-850-200C	13	10 7/8	9	9	9	16	851	850	290
2-1/2"	210	CT-851-250C	CT-850-250C	13	10 7/8	9	9	9	15	851	850	290
3"	300	CT-235P-300C	CT-234P-300C	18 5/8	16 1/8	13 1/2	13	9	30	235P	234P	570
4"	520	CT-235P-400C	CT-234P-400C	18 5/8	16 1/8	13 1/2	13	9	26	235P	234P	570
6"	1100	CT-275P-600C	CT-274P-600C	18 1/4	14 1/2	19	9 7/8	10	45	275P	274P	1100

Note CT 2" & 2-1/2" models: Element seals on the base of the housing.

See Vacuum Filter Technical Data section for sizing guidelines.

Note: Model offerings and design parameters may change without notice. See www.solbergmfg.com for most current offering.

Accessories

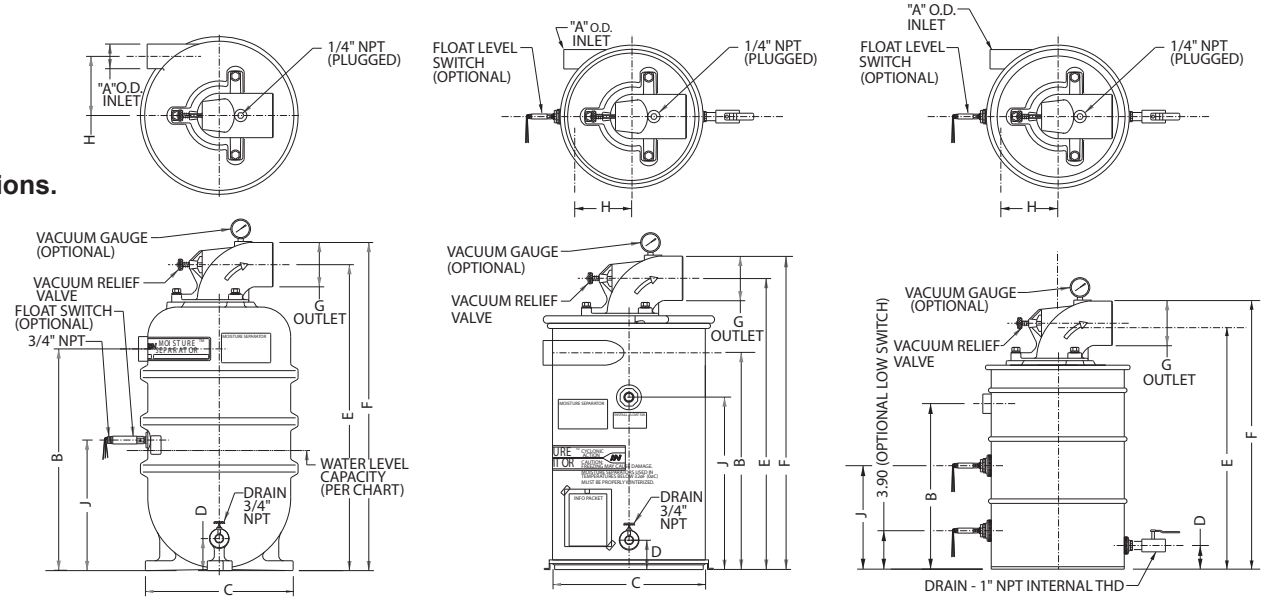
Filtration - Moisture Separator

ROTRON®

By separating and containing entrained liquids, ROTRON'S™ moisture separator helps protect our regenerative blowers and the end treatment system from corrosion and mineralization damage. Recommended for all soil vacuum extraction Applications.

SPECIFICATIONS:
SEPARATION METHOD – High Effciency Cyclonic
RELIEF VALVE MATERIAL – Brass & Stainless Steel
FLOAT MATERIAL – Copper
FLOAT SWITCH – SPDT, Explosion-proof NEMA 7&9, 5 Amp max.

applications.



PLASTIC "P" DESIGN | METAL "D" DESIGN | METAL "B" DESIGN

Specification	Units	Part/Model Number MS200PS 038519	MS300PS 038520	MS350BS 038357	MS500BS 080660	MS600BS 080659	MS1000BS 038914
Dimension A	Inches	2.38	2.88	3.25	3.25	4.00	6.00
	mm	60.5	73.2	82.6	82.6	101.6	152.4
CFM Max.	CFM	200	300	350	500	600	1000
	m3/hr	340	510	595	850	1020	1700
Dimension B	Inches	22.46	22.46	28.00	28.00	27.00	31.00
	mm	570.5	570.5	711.2	711.2	685.8	787.4
Dimension C	Inches	16.00	16.00	23.00	23.00	23.00	27.00
	mm	406.4	406.4	584.2	584.2	584.2	685.8
Dimension D	Inches	3.25	3.25	4.00	4.00	4.00	4.00
	mm	82.6	82.6	101.6	101.6	101.6	101.6
Dimension E	Inches	31.05	31.05	37.25	37.37	37.37	47.32
	mm	788.7	788.7	946.2	949.2	949.2	1201.9
Dimension F	Inches	33.30	33.30	39.50	54.50	54.50	51.70
	mm	845.8	845.8	1003.3	1384.3	1384.3	1313.2
Dimension H	Inches	6	6.00	9.75	9.75	9.25	10.00
	mm	152.4	152.4	247.7	247.7	235	254
Dimension G	Inches	4.50 OD	4.50 D	4.50 OD	6.63 ID	6.63 ID	8.62 OD
	mm	114.3	114.3	114.3	168.4	168.4	218.9
Dimension J	Inches	13.25	13.25	17.50	17.50	17.50	19.88
	mm	336.6	336.6	444.5	444.5	444.5	505
Drain Internal Thd	-	3/4	3/4	1	1	1	1
Shipping Weight	Lbs	42	42	82	95	96	150
	Kg	19.1	19.1	37.2	43.1	43.5	68

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2.0 Moisture Separator™ Specifications

2.1 Duty

The moisture separator shall be designed for use in a soil vapor extraction system capable of continuous operation with a pressure drop of less than six inches of water at the rated flow of _____ SCFM. The separator shall be capable of operation under various inlet conditions randing from a fine mist to slugs of water with high efficiency.

2.2 Principle of Operation

The moisture separator shall incorporate cyclonic separation to remove entrained water. The separator must protect against an overflow by fail safe mechanical means. An electrical switch or contact(s) alone is not an acceptable means of protection against overflow, but is a good backup.

2.3 Construction

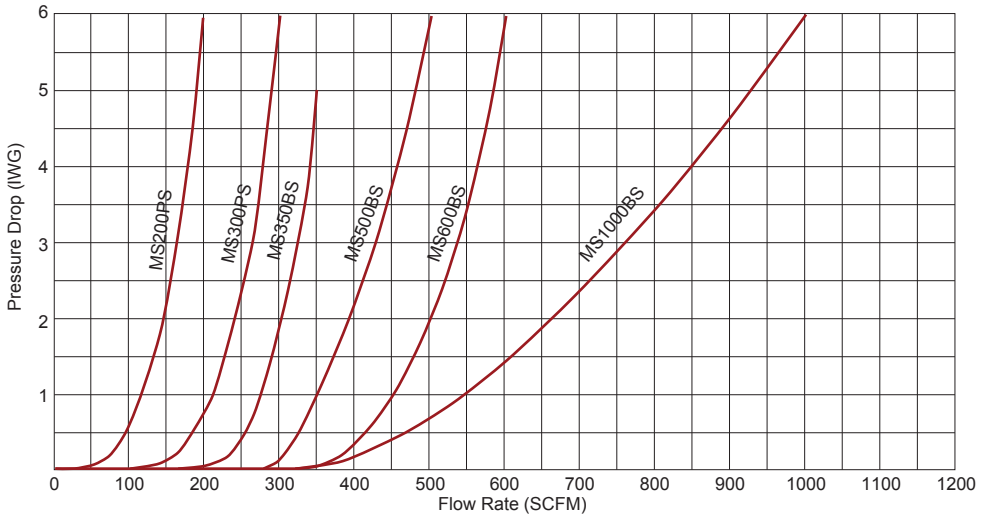
The body of the moisture separator shall be constructed of heavy wall plastic or heavy gauge cold rolled steel. The steel interior and exterior shall be epoxy (powder) coated to resist abrasion, corrosion, and chipping that might expose the surface. The inlet shall be tangentially located and welded to the body. The outlet port shall be constructed of PVC or cast aluminum alloy, flanged and sealed to the center of the top of the separator. The separator shall incorporate a non-sparking copper float ball and an adjustable relief valve to protect against overflow and overheating the blower.

2.4 Capacity and Dimension

The moisture separator must have a liquid capacity of _____ gallons. The inlet shall be _____ inch OD slip-on type. The outlet shall be _____ inch OD slip-on type.

For DR/EN/CP Blower Model	Selector Moisture Separator Model	Liquid-holding Capacity (gallons)	Inlet (OD)	Outlet	Max Vacuum Allow (IHG)
404 454 505 513 523 555 633 833	MS200PS	7	2.38	4.5 OD	12
656 6 757	MS300PS	7	2.88		
808	MS350BS	40	3.25	6.63 ID	22
858 1233	MS500BS				
909	MS600BS		4.0		
979 14	MS1000BS	65	6.0	8.62 OD	

2.5 Pressure Drop



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Hinged-Cover Junction Boxes

CS-05

Continuous Hinge with Clamps, Type 12

Specifications

- 16 gauge or 14 gauge steel (see table)
- Seams continuously welded and ground smooth
- Continuous hinge
- External screw clamps are quick and easy to operate
- Bonding provision on door
- External wall-mounting brackets
- Oil-resistant gasket
- Weldnuts provided for mounting optional panels and terminal block kits in size 6.00 x 4.00 in. (152 x 102 mm) and larger

Finish

ANSI 61 gray polyester powder paint inside and out

Accessories

See also Accessories.
Clamp Kits
Fast-Operating Clamp-Cover Junction Box Clamp
Lock Kit for Clamp Cover Junction Boxes
Panels for Junction Boxes
Junction Box and Wall-Mount Enclosure Swing Out Panel Kit

Industry Standards

UL 50, 50E Listed; Type 12, 13; File No. E27567
cUL Listed per CSA 22.2 No. 94; Type 12, 13; File No. E27567
UL 508A Listed; Type 12, 13; File No. E61997
cUL Listed per CSA 22.2 No. 94; Type 12, 13; File No. E61997

NEMA/EEMAC Type 12 and 13
CSA, File No. 42184: Type 12
IEC 60529, IP65

Application

This easy-to-open, continuous hinge enclosure features screw-down clamps for secure closure and can be used in a wide variety of applications.

Modification and Customization

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

Bulletin: A51CH

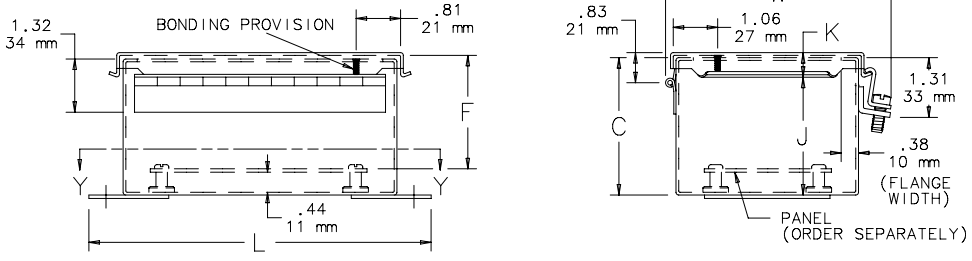
Standard Product

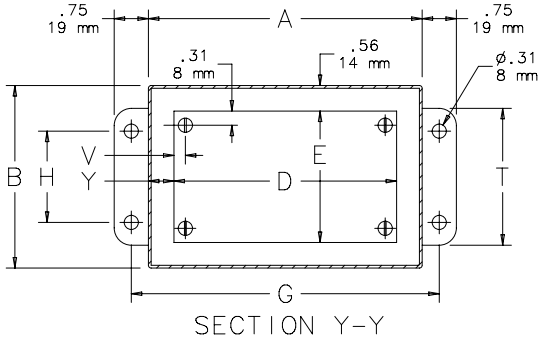
Catalog Number	AxBxC in./mm	Gauge	UL Listed	Panel	Conductive Panel	Panel Size D x E in./mm	Mounting G x H in./mm	Overall L x W in./mm	F in./mm	J in./mm	J in. mm/in.	K mm/in.	P mm/in.	T mm/in.	V mm/in.	Y mm/in.
A404CH	4.00 x 4.00 x 3.00	16	508A	No Panel	No Panel	No Panel	4.75 x 2.00	5.50 x 4.94	—	2.62	66	14	35	76	—	—
	102 x 102 x 76					No Panel	121 x 51	140 x 125	—		0.54	1.38	3.00	—	—	
A604CH	6.00 x 4.00 x 3.00	16	508A	A6P4	A6P4G	4.88 x 2.88	6.75 x 2.00	7.50 x 4.94	2.53	2.62	66	14	60	76	8	14
	152 x 102 x 76					124 x 73	171 x 51	191 x 125	64		0.54	2.38	3.00	0.31	0.56	
A806CH	8.00 x 6.00 x 3.50	14	50, 50E	A8P6	A8P6G	6.75 x 4.88	8.75 x 4.00	9.50 x 6.94	3.03	3.12	79	14	25	127	6	16
	203 x 152 x 89					171 x 124	222 x 102	241 x 176	77		0.56	1.00	5.00	0.25	0.62	
A4044CH	4.00 x 4.00 x 4.00	16	508A	No Panel	No Panel	No Panel	4.75 x 2.00	5.50 x 4.94	—	3.62	92	14	35	76	—	—
	102 x 102 x 102					No Panel	121 x 51	140 x 125	—		0.54	1.38	3.00	—	—	
A6044CH	6.00 x 4.00 x 4.00	16	508A	A6P4	A6P4G	4.88 x 2.88	6.75 x 2.00	7.50 x 4.94	3.53	3.62	92	14	60	76	8	14
	152 x 102 x 102					124 x 73	171 x 51	191 x 125	90		0.54	2.38	3.00	0.31	0.56	
A606CH	6.00 x 6.00 x 4.00	16	50, 50E	A6P6	A6P6G	4.88 x 4.88	6.75 x 4.00	7.50 x 6.94	3.53	3.62	92	14	60	127	8	14
	152 x 152 x 102					124 x 73	171 x 102	191 x 176	90		0.54	2.38	5.00	0.31	0.56	
A808CH	8.00 x 8.00 x 4.00	14	50, 50E	A8P8	A8P8G	6.75 x 6.88	8.75 x 6.00	9.50 x 8.94	3.53	3.62	92	14	25	178	6	16
	203 x 203 x 102					171 x 175	222 x 152	241 x 227	90		0.56	1.00	7.00	0.25	0.62	
A1008CH	10.00 x 8.00 x 4.00	14	50, 50E	A10P8	A10P8G	8.75 x 6.88	10.75 x 6.00	11.50 x 8.94	3.53	3.62	92	14	25	178	6	16
	254 x 203 x 102					222 x 175	273 x 152	292 x 227	90		0.56	1.00	7.00 (178)	0.25	0.62	
A1008CHS	10.00 x 8.00 x 4.00	14	50, 50E	A10P8	A10P8G	8.75 x 6.88	10.75 x 6.00	11.50 x 8.94	3.53	3.62	92	14	25	178	6	16
	254 x 203 x 102					222 x 175	273 x 152	292 x 227	90		0.56	1.00	7.00 (178)	0.25	0.62	
A12064CH	12.00 x 6.00 x 4.00	14	50, 50E	A12P6	A12P6G	10.75 x 4.88	12.75 x 4.00	13.50 x 6.94	3.53	3.62	92	14	25	127	6	16
	305 x 152 x 102					273 x 124	324 x 102	343 x 176	90		0.56	1.00	5.00	0.25	0.62	
A1210CH	12.00 x 10.00 x 5.00	14	50, 50E	A12P10	A12P10G	10.75 x 8.88	12.75 x 8.00	13.50 x 10.94	4.53	4.62	117	14	25	229	6	16
	305 x 254 x 127					273 x 226	324 x 203	343 x 278	115		0.56	1.00	9.00	0.25	0.62	
A1210CHS	12.00 x 10.00 x 5.00	14	50, 50E	A12P10	A12P10G	10.75 x 8.88	12.75 x 8.00	13.50 x 10.94	4.53	4.62	117	14	25	229	6	16
	305 x 254 x 127					273 x 226	324 x 203	343 x 278	115		0.56	1.00	9.00	0.25	0.62	
A8066CH	8.00 x 6.00 x 6.00	14	50, 50E	A8P6	A8P6G	6.75 x 4.88	8.75 x 4.00	9.50 x 6.94	5.53	5.62	143	14	25	127	6	16
	203 x 152 x 152					171 x 124	222 x 102	241 x 176	140		0.56	1.00	5.00	0.25	0.62	
A10086CH	10.00 x 8.00 x 6.00	14	50, 50E	A10P8	A10P8G	8.75 x 6.88	10.75 x 6.00	11.50 x 8.94	5.53	5.62	143	14	25	178	6	16
	254 x 203 x 152					222 x 175	273 x 152	292 x 227	140		0.56	1.00	7.00	0.25	0.62	
A10106CH	10.00 x 10.00 x 6.00	14	50, 50E	A10P10	A10P10G	8.75 x 8.88	10.75 x 8.00	11.50 x 10.94	5.53	5.62	143	14	25	229	6	16
	254 x 254 x 152					222 x 226	273 x 203	292 x 278	140		0.56	1.00	9.00	0.25	0.62	
A1212CH	12.00 x 12.00 x 6.00	14	50, 50E	A12P12	A12P12G	10.75 x 10.88	12.75 x 10.00	13.50 x 12.94	5.53	5.62	143	14	25	279	6	16
	305 x 305 x 152					273 x 276	324 x 254	343 x 329	140		0.56	1.00	11.00	0.25	0.62	
A14086CH	14.00 x 8.00 x 6.00	14	50, 50E	A14P8	A14P8G	12.75 x 6.88	14.75 x 6.00	15.50 x 8.94	5.53	5.62	143	14	25	178	6	16
	356 x 203 x 152					324 x 175	375 x 152	394 x 227	140		0.56	1.00	7.00	0.25	0.62	
A1412CH	14.00 x 12.00 x 6.00	14	50, 50E	A14P12	A14P12G	12.75 x 10.88	14.75 x 10.00	15.50 x 12.94	5.53	5.62	143	14	25	279	6	16
	356 x 305 x 152					324 x 276	375 x 254	394 x 329	140		0.56	1.00	11.00	0.25	0.62	
A1412CHS	14.00 x 12.00 x 6.00	14	50, 50E	A14P12	A14P12G	12.75 x 10.88	14.75 x 10.00	15.50 x 12.94	5.53	5.62	143	14	25	279	6	16
	356 x 305 x 152					324 x 276	375 x 254	394 x 329	140		0.56	1.00	11.00	0.25	0.62	

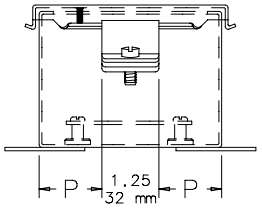
Hinged-Cover Junction Boxes

Catalog Number	AxBxC in./mm	Gauge	UL Listed	Panel	Conductive Panel	Panel Size D x E in./mm	Mounting G x H in./mm	Overall L x W in./mm	F in./mm	J in./mm	J in. mm/in.	K mm/in.	P mm/in.	T mm/in.	V mm/in.	Y mm/in.
A16106CH	16.00 x 10.00 x 6.00	14	50, 50E	A16P10	A16P10G	14.75 x 8.88	16.75 x 8.00	17.50 x 10.94	5.53	5.62	143	14	25	229	6	16
	406 x 254 x 152					375 x 226	425 x 203	445 x 278	140		0.56	1.00	9.00	0.25	0.62	
A1614CH	16.00 x 14.00 x 6.00	14	50, 50E	A16P14	A16P14G	14.75 x 12.88	16.75 x 12.00	17.50 x 14.94	5.53	5.62	143	14	25	330	6	16
	406 x 356 x 152					375 x 327	425 x 305	445 x 379	140		0.56	1.00	13.00	0.25	0.62	
A1614CHS	16.00 x 14.00 x 6.00	14	50, 50E	A16P14	A16P14G	14.75 x 12.88	16.75 x 12.00	17.50 x 14.94	5.53	5.62	143	14	25	330	6	16
	406 x 356 x 152					375 x 327	425 x 305	445 x 379	140		0.56	1.00	13.00	0.25	0.62	
A12108CH	12.00 x 10.00 x 8.00	14	50, 50E	A12P10	A12P10G	10.75 x 8.88	12.75 x 8.00	13.50 x 10.94	7.53	7.62	194	14	25	229	6	16
	305 x 254 x 203					273 x 226	324 x 203	343 x 278	191		0.56	1.00	9.00	0.25	0.62	
A14128CH	14.00 x 12.00 x 8.00	14	50, 50E	A14P12	A14P12G	12.75 x 10.88	14.75 x 10.00	15.50 x 12.94	7.53	7.62	194	14	25	279	6	16
	356 x 305 x 203					324 x 276	375 x 254	394 x 329	191		0.56	1.00	11.00	0.25	0.62	
A16148CH	16.00 x 14.00 x 8.00	14	50, 50E	A16P14	A16P14G	14.75 x 12.88	16.75 x 12.00	17.50 x 14.94	7.53	7.62	194	14	25	330	6	16
	406 x 356 x 203					375 x 327	425 x 305	445 x 379	191		0.56	1.00	13.00	0.25	0.62	
A161410CH	16.00 x 14.00 x 10.00	14	50, 50E	A16P14	A16P14G	14.75 x 12.88	16.75 x 12.00	17.50 x 14.94	9.53	9.62	244	14	25	330	6	16
	406 x 356 x 254					375 x 327	425 x 305	445 x 379	242		0.56	1.00	13.00	0.25	0.62	

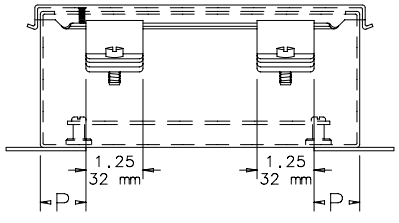
Catalog numbers ending in "S" are hinged on short side.
Purchase panels separately. Optional stainless steel, conductive, composite and aluminum panels are available for most sizes.







View showing clamp end of box when one clamp is used.



View showing clamp end of box when two clamps are used. When A=8.00 (203mm) or more, use two clamps.

GS2 Series - Introduction

GS2 Series Drives									
Motor Rating	Hp	0.25	0.5	1	2	3	5	7.5	10
	kW	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Single-Phase Input 115V Class		✔	✔	✔					
Single/Three-Phase Input 230V Class			✔	✔	✔	✔			
Three-Phase 230V Class							✔	✔	
Three-Phase 460V Class				✔	✔	✔	✔	✔	✔
Three-Phase 575V Class				✔	✔	✔	✔	✔	✔

Overview

The GS2 series of AC drives offers all of the features of our GS1 drive plus dynamic braking, PID and a removable keypad. The drive can be configured using the built-in digital keypad or with the standard RS-232/RS-485 serial communications port. The standard keypad allows you to configure the drive, set the speed, start and stop the drive, command forward and reverse direction of motor shaft, and monitor specific parameters during operation. Each GS2 features one analog and six programmable digital inputs, and one analog and two programmable relay outputs.

Features

- Simple Volts/Hertz control
- Sinusoidal Pulse Width Modulation (PWM)
- 1-12 kHz carrier frequency
- IGBT technology
- Starting torque: 125% at 0.5 Hz/150% at 5 Hz
- 150% rated current for one minute
- Electronic overload protection
- Stall prevention
- Adjustable accel and decel ramps
- S-curve settings for acceleration and deceleration
- Automatic torque compensation
- Automatic slip compensation
- Dynamic braking circuit
- DC braking
- Three skip frequencies
- Trip history
- Programmable jog speed
- Integral PID control
- Removable keypad with speed potentiometer
- Programmable analog input
- Programmable analog output
- Six programmable digital inputs
- Two programmable relay outputs
- RS-232/485 Modbus communications up to 38.4 Kbps.
- Optional Ethernet communications
- Two-year warranty
- UL/cUL/CE* listed
  * GS2-5xxx 575V drives NOT CE compliant

Accessories

- AC line reactors
- EMI filters
- RF filter
- Braking resistors
- Fuse kits and replacement fuses
- DIN rail mounting adapter (see "Accessories" table for applicability)
- Replacement keypads
- Keypad cables in 1, 3, and 5-meter lengths
- Ethernet interface
- Four and eight-port serial communication breakout boards
- KEP***Direct*** I/O or OPC Server
- Serial communication cables available for creating plug and play RS-232/RS-485 networks with AutomationDirect PLCs. See the comm cable matrix on page 92
- GSoft drive configuration software
- USB-485M – USB to RS-485 PC adapter (see "Communications Products" chapter for detailed information)

Detailed descriptions and specifications for GS accessories are available in the "GS/DURAPULSE Accessories" section.

Typical Applications

- Conveyors
- Fans
- Pumps
- Compressors
- HVAC
- Material handling
- Mixing
- Shop tools

GS2 series part numbering system

GS2- 4 7P5

Applicable Motor Capacity

0P2: 0.25HP	0P5: 0.5HP
1P0: 1.0HP	2P0: 2.0HP
3P0: 3.0HP	5P0: 5.0HP
7P5: 7.5HP	010: 10HP

Input Voltage

1: 100-120VAC
2: 200-240VAC
4: 380-480VAC
5: 500-600VAC

Series Name

GS2 Series Specifications

115V CLASS GS2 SERIES				
Model		GS2-10P2	GS2-10P5	GS2-11P0
Price		$156.00	$166.00	$186.00
Motor Rating	**HP**	1/4hp	1/2hp	1hp
	kW	0.2kW	0.4kW	0.75kW
Rated Output Capacity (kVA)		0.6	1.0	1.6
Rated Input Voltage		Single-phase : 100 to 120 VAC ±10% 50/60 Hz ±5%		
Rated Output Voltage		Three-phase, two times proportion to input voltage		
Rated Input Current (A)		6	9	16
Rated Output Current (A)		1.6	2.5	4.2
DC Braking		Frequency 60–0 Hz, 0–100% rated current, start time 0.0–5.0 seconds, Stop Time 0.0–25.0 seconds		
Watt Loss @ 100% I (W)		24	34	46
Weight (lb)		3.5	3.6	3.7
Dimensions* (HxWxD) (mm [in])**		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]		
Accessories				
Line Reactor	**Input side of drive (1 Phase)***	LR-10P2-1PH	LR-10P5-1PH	LR-11P0-1PH
	Output side of drive (3 Phase)*	LR-20P5		LR-21P0
Braking Resistor		GS-20P5-BR	GS-20P5-BR	GS-21P0-BR
EMI Filter		20DRT1W3S		
RF Filter		RF220X00A		
Fuse Kit	**Single Phase****	GS-10P2-FKIT-1P	GS-10P5-FKIT-1P	GS-11P0-FKIT-1P
Replacement Fuses	**Single Phase****	GS-10P2-FUSE-1P	GS-10P5-FUSE-1P	GS-11P0-FUSE-1P
DIN Rail Mounting Adapter		GS2-DR02		
Spare Keypad, GS2 Series Drive		GS2-KPD		
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L		
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L		
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L		
Ethernet Communications module for GS Series Drives (DIN rail mounted)		GS-EDRV100		
USB to RS232 PC Communication Adapter		USB-RS232		
RS-232 Serial Cable, GS2 Drive to DL05/06, CLICK, D2-250/260, D4-450, P3-550		GS-RJ12-CBL-2		
USB to RS-485 PC Communication Adapter		USB-485M		
RS-485 Communication Distribution Module (for creating plug and play RS-485 networks)		ZL-CDM-RJ12X4 / ZL-CDM-RJ12X10		
RS-485 Serial Cable, GS Drive to DL06/D2-260		GS-485HD15-CBL-2		
RS-485 Serial Cable, GS Drive to ZIPLink CDM Module		GS-485RJ12-CBL-2		
Software		GSoft / KEP*Direct*		
OPC Server		KEP*Direct*		

Note: GS2-1xxx drives require 115V class input line reactors and 230V class output line reactors.

****Note: Single phase fuse kits and fuses are used only with GS2-1xxx drives.***

*****Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.***

GS2 Series Specifications

230V CLASS GS2 SERIES							
Model		GS2-20P5	GS2-21P0	GS2-22P0	GS2-23P0	GS2-25P0	GS2-27P5
Price		$158.00	$177.00	$251.00	$309.00	$363.00	$465.00
Motor Rating	**HP**	1/2hp	1hp	2hp	3hp	5hp	7.5hp
	kW	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW
Rated Output Capacity (kVA)		1.0	1.9	2.7	3.8	6.5	9.5
Rated Input Voltage		Single/Three-phase : 200/208/220/230/240 VAC ±10%; 50/60Hz ±5%				Three-phase : 200/208/220/230/240 VAC ±10%; 50/60 Hz ±5%	
Rated Output Voltage		Three-phase : Corresponds to input voltage					
Rated Input Current (A)		6.3/2.9	11.5/6.3	15.7/8.8	27.0/12.5	19.6	28
Rated Output Current (A)		2.5	5.0	7.0	10	17	25
DC Braking		Frequency 60–0 Hz, 0–100% rated current, start time 0.0–5.0 seconds, Stop Time 0.0–25.0 seconds					
Watt Loss @ 100% I (W)		34	57	77	111	185	255
Weight (lb)		3.5	3.6	3.7	8.5	8.5	8.5
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor	**Single-Phase**	LR-20P5-1PH	LR-21P0-1PH	LR-22P0-1PH	LR-23P0-1PH	n/a	n/a
	Three-Phase	LR-20P5	LR-21P0	LR-22P0	LR-23P0	LR-25P0	LR-27P5
Braking Resistor		GS-20P5-BR	GS-21P0-BR	GS-22P0-BR	GS-23P0-BR	GS-25P0-BR	GS-27P5-BR
EMI Filter (single phase input)		20DRT1W3S			32DRT1W3C	40TDS4W4B	
RF Filter		RF220X00A					
Fuse Kit	**Single-Phase**	GS-20P5-FKIT-1P	GS-21P0-FKIT-1P	GS-22P0-FKIT-1P	GS-23P0-FKIT-1P	N/A	N/A
	Three-Phase	GS-20P5-FKIT-3P	GS-21P0-FKIT-3P	GS-22P0-FKIT-3P	GS-23P0-FKIT-3P	GS-25P0-FKIT-3P	GS-27P5-FKIT
Replacement Fuses	**Single-Phase**	GS-20P5-FUSE-1P	GS-21P0-FUSE-1P	GS-22P0-FUSE-1P	GS-23P0-FUSE-1P	N/A	N/A
	Three-Phase	GS-20P5-FUSE-3P	GS-21P0-FUSE-3P	GS-22P0-FUSE-3P	GS-23P0-FUSE-3P	GS-25P0-FUSE	GS-27P5-FUSE
DIN Rail Mounting Adapter		GS2-DR02			n/a		
Spare Keypad, GS2 Series Drive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications module for GS Series Drives (DIN rail mounted)		GS-EDRV100					
USB to RS232 PC Communication Adapter		USB-RS232					
RS-232 Serial Cable, GS2 Drive to DL05/06, CLICK, D2-250/260, D4-450, P3-550		GS-RJ12-CBL-2					
USB to RS-485 PC Communication Adapter		USB-485M					
RS-485 Communication Distribution Module (for creating plug and play RS-485 networks)		ZL-CDM-RJ12X4 / ZL-CDM-RJ12X10					
RS-485 Serial Cable, GS Drive to DL06/D2-260		GS-485HD15-CBL-2					
RS-485 Serial Cable, GS Drive to ZIPLink CDM Module		GS-485RJ12-CBL-2					
Software		GSoft / KEP*Direct*					
OPC Server		KEP*Direct*					

Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.

GS2 Series Specifications

460V CLASS GS2 SERIES							
Model		GS2-41P0	GS2-42P0	GS2-43P0	GS2-45P0	GS2-47P5	GS2-4010
Price		$261.00	$303.00	$357.00	$410.00	$586.00	$725.00
Motor Rating	**HP**	1hp	2hp	3hp	5hp	7.5hp	10hp
	kW	0.8kW	1.5kW	2.2kW	4kW	5.5kW	7.5kW
Rated Output Capacity (kVA)		2.3	3.1	3.8	6.2	9.9	13.7
Rated Input Voltage		Three-phase: 380/400/415/440/460/480 VAC ±10%; 50/60 Hz ±5%					
Rated Output Voltage		Corresponds to input voltage					
Rated Input Current (A)		4.2	5.7	6.0	8.5	14	23
Rated Output Current (A)		3.0	4.0	5.0	8.2	13	18
DC Braking		Frequency 60–0 Hz, 0–100% rated current, Start Time 0.0–5.0 seconds, Stop Time 0.0–25.0 seconds					
Watt Loss @ 100% I (W)		73	86	102	170	240	255
Weight (lb)		3.5	3.6	3.7	8.5	8.5	8.5
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor		LR-41P0	LR-42P0	LR-43P0	LR-45P0	LR-47P5	LR-4010
Braking Resistor		GS-41P0-BR	GS-42P0-BR	GS-43P0-BR	GS-45P0-BR	GS-47P5-BR	GS-4010-BR
EMI Filter		11TDT1W4S			17TDT1W44		26TDT1W4B4
RF Filter		RF220X00A					
Fuse Kit		GS-41P0-FKIT	GS-42P0-FKIT	GS-43P0-FKIT	GS-45P0-FKIT	GS-47P5-FKIT	GS-4010-FKIT
Replacement Fuses		GS-41P0-FUSE	GS-42P0-FUSE	GS-43P0-FUSE	GS-45P0-FUSE	GS-47P5-FUSE	GS-4010-FUSE
DIN Rail Mounting Adapter		GS2-DR02			n/a		
Spare Keypad, GS2 Series Microdrive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications Module for GS Series Drives (DIN rail mounted)		GS-EDRV100					
USB to RS232 PC Communication Adapter		USB-RS232					
RS-232 Serial Cable, GS2 Drive to DL05/06, CLICK, D2-250/260, D4-450, P3-550		GS-RJ12-CBL-2					
USB to RS-485 PC Communication Adapter		USB-485M					
RS-485 Communication Distribution Module (for creating plug and play RS-485 networks)		ZL-CDM-RJ12X4 / ZL-CDM-RJ12X10					
RS-485 Serial Cable, GS Drive to DL06/D2-260		GS-485HD15-CBL-2					
RS-485 Serial Cable, GS Drive to ZIPLink CDM Module		GS-485RJ12-CBL-2					
Software		GSoft / KEP*Direct*					
OPC Server		KEP*Direct*					

***Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.**

GS2 Series Specifications

575V CLASS GS2 SERIES							
Model		GS2-51P0	GS2-52P0	GS2-53P0	GS2-55P0	GS2-57P5	GS2-5010
Price		$279.00	$319.00	$378.00	$491.00	$721.00	$812.00
Motor Rating	**HP**	1hp	2hp	3hp	5hp	7.5hp	10hp
	kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW
Rated Output Capacity (kVA)		1.7	3.0	4.2	6.6	9.9	12.2
Rated Input Voltage		Three-phase: 500 to 600 VAC -15/+10%; 50/60 Hz ±5%					
Rated Output Voltage		Corresponds to input voltage					
Rated Input Current (A)		2.4	4.2	5.9	7.0	10.5	12.9
Rated Output Current (A)		1.7	3.0	4.2	6.6	9.9	12.2
DC Braking		Frequency 60-0 Hz, 0-100% rated current, Start Time 0.0-5.0 seconds, Stop Time 0.0-25.0 seconds					
Watt Loss @ 100% I (W)		30	58	83	132	191	211
Weight (lb)		3.3	3.3	4.4	7.0	7.0	7.3
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor		LR-51P0	LR-52P0	LR-53P0	LR-55P0	LR-5010	
Braking Resistor		GS-42P0-BR		GS-42P0-BR x (2) in parallel			GS-4010-BR x (2) in series
EMI Filter		not available					
RF Filter		RF220X00A					
Fuse Block (Edison 3-pole part #)		BC6033PQ or CHCC3D or CHCC3DI					
Replacement Fuses (Edison Fuse part #)		HCLR6 (10 fuses per pack)	HCLR10 (10 fuses per pack)	HCLR15 (10 fuses per pack)		HCLR20 (10 fuses per pack)	HCLR30 (10 fuses per pack)
DIN Rail Mounting Adapter		GS2-DR02			n/a		
Spare Keypad, GS2 Series Microdrive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications Module for GS Series Drives (DIN rail mounted)		GS-EDRV100					
USB to RS232 PC Communication Adapter		USB-RS232					
RS-232 Serial Cable, GS2 Drive to DL05/06, CLICK, D2-250/260, D4-450, P3-550		GS-RJ12-CBL-2					
USB to RS-485 PC Communication Adapter		USB-485M					
RS-485 Communication Distribution Module (for creating plug and play RS-485 networks)		ZL-CDM-RJ12X4 / ZL-CDM-RJ12X10					
RS-485 Serial Cable, GS Drive to DL06/D2-260		GS-485HD15-CBL-2					
RS-485 Serial Cable, GS Drive to ZIPLink CDM Module		GS-485RJ12-CBL-2					
Software		GSoft / KEP*Direct*					
OPC Server		KEP*Direct*					

Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.

GS2 Series — General Specifications

General Specifications			
Control Characteristics			
Control System			Sinusoidal Pulse Width Modulation, carrier frequency 1kHz–12kHz
Output Frequency Resolution			0.1 Hz
Overload Capacity			150% of rated current for 1 minute
Torque Characteristics			Includes auto-torque boost, auto-slip compensation, starting torque 125% @ 0.5Hz/150% @ 5.0Hz
Braking Torque			20% without dynamic braking resistor, 125% with optional braking resistor
DC Braking			Operation frequency 60–0 Hz, 0–100% rated current. Start time 0.0–5.0 seconds. Stop time 0.0–0 25.0 seconds
Acceleration/Deceleration Time			0.1 to 600 seconds (linear or non-linear acceleration/deceleration), second acceleration/deceleration available
Voltage/Frequency Pattern			V/F pattern adjustable. Settings available for Constant Torque - low and high starting torque, Variable Torque - low and high starting torque, and user configured
Stall Prevention Level			20 to 200% or rated current
Operation Specifications			
Inputs	**Frequency Setting**	**Keypad**	Setting by <UP> or <DOWN> buttons or potentiometer
		External Signal	Potentiometer - 3k to 5kΩ/2W, 0 to 10VDC (input impedance 10kΩ), 0 to 20mA / 4 to 20 mA (input impedance 250Ω), Multi-speed inputs 1 to 3, Serial Communication RS232 and RS485 (Modbus RTU)
	Operation Setting	**Keypad**	Setting by <RUN>, <STOP> buttons
		External Signal	Forward/Stop, Reverse/Stop (run/stop, fwd/rev), 3-wire control, Serial Communication RS232 and RS485 (Modbus RTU)
	Input Terminals	**Digital**	6 user-programmable: FWD/STOP, REV/STOP, RUN/STOP, REV/FWD, Run momentary (N.O.), STOP momentary (N.C.), External Fault (N.O./N.C.), External Reset, Multi-Speed Bit (1-3), Jog, External Base Block (N.O./N.C.), Second Accel/Decel Time, Speed Hold, Increase Speed, Decrease Speed, Reset Speed to Zero, PID Disable (N.O.), PID Disable (N.C.), Input Disable
		Analog	1 user-configurable, 0 to 10VDC (input impedance 10k Ω) or 0 to 20mA / 4 to 20mA (input impedance 250Ω), 10 bit resolution Frequency setpoint or PID process variable PV
Outputs	**Output Terminals**	**Digital**	2 user-programmable; Inverter Running, Inverter Fault, At Speed, Zero Speed, Above Desired Frequency, Below Desired Frequency, At Maximum Speed, Over Torque Detected, Above Desired Current, Below Desired Current, PID Deviation Alarm
		Analog	1 user-programmable: 0 to 10VDC (max load 2mA), 8 bit resolution frequency, current, process variable PV
	Operating Functions		Automatic voltage regulation, voltage/frequency characteristics selection, non-linear acceleration/deceleration, upper and lower frequency limiters, 7-stage speed operation, adjustable carrier frequency (1 to 12 kHz), PID control, skip frequencies, analog gain & bias adjustment, jog, electronic thermal relay, automatic torque boost, trip history, software protection
Protective Functions			Electronic Thermal, Overload Relay, Auto Restart after Fault, Momentary Power Loss, Reverse Operation Inhibit, Auto Voltage Regulation, Over-Voltage Trip Prevention, Auto Adjustable Accel/Decel, Over-Torque Detection Mode, Over-Torque Detection Level, Over-Torque Detection Time, Over-Current Stall Prevention during Acceleration, Over-Current Stall Prevention during Operation
Operator Interface	**Operator Devices**		8-key, 4-digit, 7-segment LED, 14 status LEDs, potentiometer
	Programming		Parameter values for setup and review, fault codes
	Status Display		Actual Operating Frequency, RPM, Scaled Frequency, Amps, % Load, Output Voltage, DC Bus Voltage, Process Variable, Set-point Frequency
	Key Functions		RUN, STOP/RESET, FWD/REV, PROGRAM, DISPLAY, <UP>, <DOWN>, ENTER
Environment	**Enclosure Rating**		Protected chassis, IP20
	Ambient Temperature		-10° to 50°C (14°F to 122°F) -10° to 40°C (14°F to 104°F) For models 7.5 hp (5.5 kW) and higher
	Storage Temperature		-20° to 60 °C (-4°F to 140°F) - during short-term transportation period
	Ambient Humidity		20 to 90% RH (non-condensing)
	Vibration		9.8 m/s^2 (1G), less than 10Hz; 5.9 m/s^2 (0.6G) 10 to 60 Hz
	Installation Location		Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust
Options			Noise filter, input AC reactor, output AC reactor, cable for remote operator, programming software (GSOFT), Dynamic braking resistor, input fuses, ethernet interface (GS-EDRV100), EMI filters

GS2 Specifications — Installation

Understanding the installation requirements for your GS2 drive will help to ensure that it operates within its environmental and electrical limits.

Note: Never use only this catalog for installation instructions or operation of equipment; refer to the user manual, GS2-M.

Environmental Specifications	
Protective Structure [1]	IP20
Ambient Operating Temperature [2]	-10 to 50°C (14°F to 122°F) -10 to 40°C (14°F to 104°F) for models 7.5HP and higher
Storage Temperature [3]	-20 to 60°C (-4°F to 140°F)
Humidity	To 90% (no condensation)
Vibration [4]	5.9 m/s² (0.6g), 10 to 55 Hz
Location	Altitude 1,000 m or less, indoors (no corrosive gases or dust)

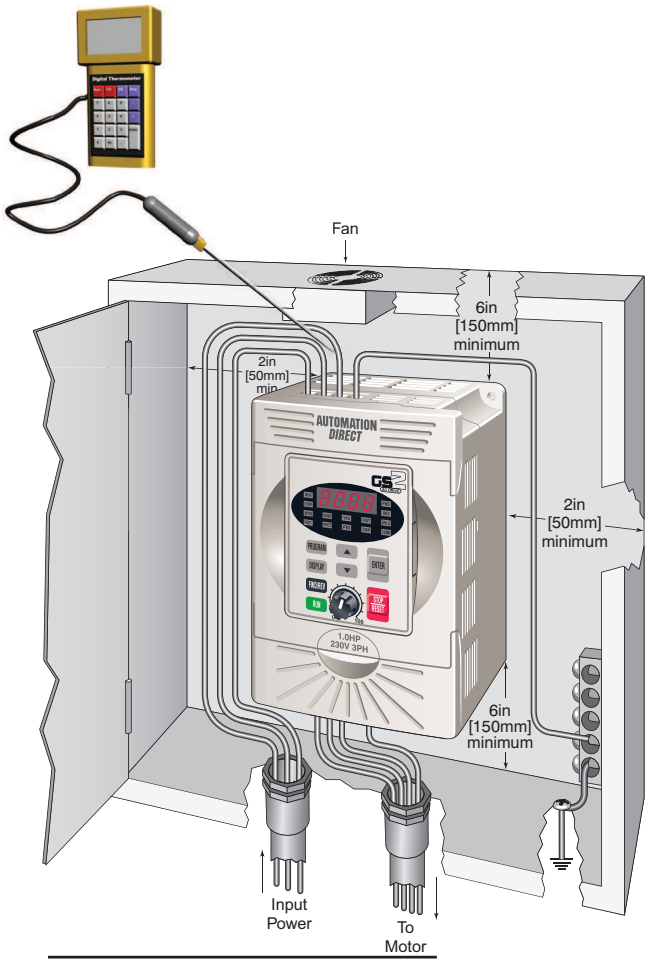
1: Protective structure is based upon EN60529

2: The ambient temperature must be in the range of -10° to 40° C. If the range will be up to 50° C, you will need to set the carrier frequency to 2.1 kHz or less and derate the output current to 80% or less. See our Web site for derating curves.

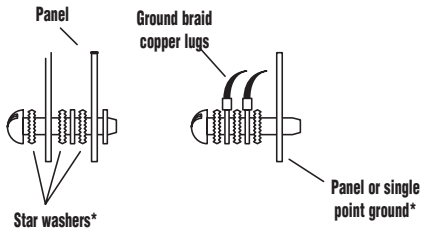
3: The storage temperature refers to the short-term temperature during transport.

4: Conforms to the test method specified in JIS CO911 (1984)

Watt-loss Chart	
GS2 Drive Model	***At full load***
GS2-10P2	24
GS2-10P5	34
GS2-11P0	46
GS2-20P5	34
GS2-21P0	57
GS2-22P0	77
GS2-23P0	111
GS2-25P0	185
GS2-27P5	255
GS2-41P0	73
GS2-42P0	86
GS2-43P0	102
GS2-45P0	170
GS2-47P5	240
GS2-4010	255
GS2-51P0	30
GS2-52P0	58
GS2-53P0	83
GS2-55P0	132
GS2-57P5	191
GS2-5010	211



Warning: Maximum ambient temperatures must not exceed 50°C (122°F), or 40°C (104°F) for models 7.5 hp (5.5 kW) and higher!

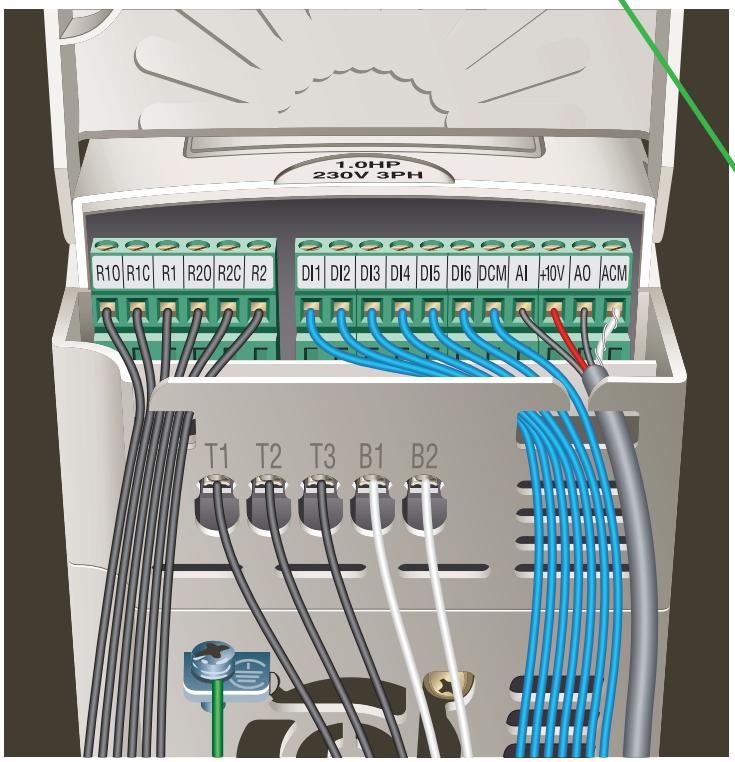


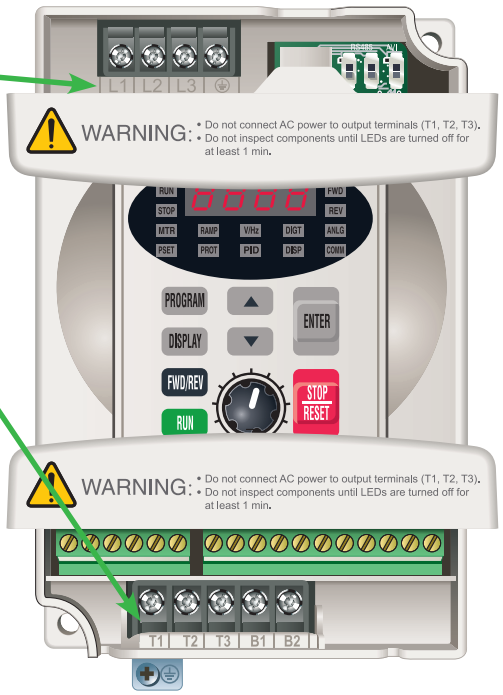
** FOR PAINTED SUB-PANELS, SCRAPE THE PAINT FROM UNDERNEATH THE STAR WASHERS BEFORE TIGHTENING THEM.*

Warning: AC drives generate a large amount of heat which may damage the AC drive. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.

GS2 Specifications — Terminals

Main Circuit Wiring	
Terminal	***Description***
L1, L2, L3	Input power
T1, T2, T3	AC drive output
B1, B2	DB resistor input
⏚	Ground





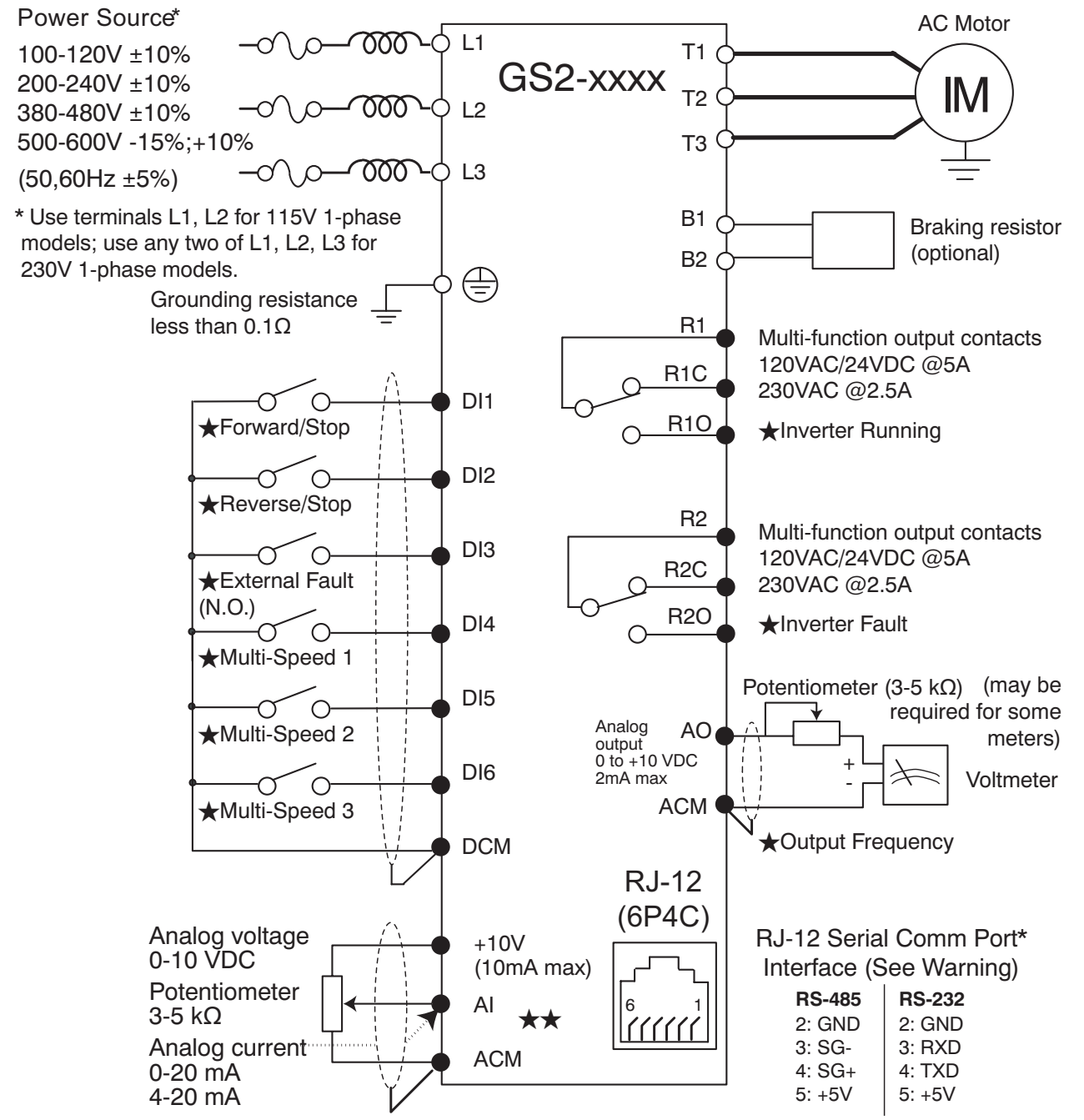
Control Circuit Terminals	
Terminal Symbol	***Description***
R1O	Relay output 1 normally open
R1C	Relay output 1 normally closed
R1	Relay output 1 common
R2O	Relay output 2 normally open
R2C	Relay output 2 normally closed
R2	Relay output 2 common
DI1	Digital input 1
DI2	Digital input 2
DI3	Digital input 3
DI4	Digital input 4
DI5	Digital input 5
DI6	Digital input 6
DCM	Digital common
AI	Analog input
+10V	Internal power supply (DC 10V) @ 10 mA
AO	Analog output
ACM	Analog common

Note: ***Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should only be connected at the drive. Do not connect shield wire on both ends.***

GS2 Specifications — Basic Wiring Diagram

Note: Users MUST connect wiring according to the circuit diagram shown below. (Refer to user manual GS2-M for additional specific wiring information.)

Note: Please refer to the following catalog pages in the Drives section* of our catalog for explanations and information regarding line reactors, braking resistors, EMI and RF filters, and fuses: 49, 68, 73, 79, 80.



★Factory default setting

Optional ZIPLink serial communication cables available for plug and play connectivity to AutomationDirect PLCs. See the comm cable selection matrix on page 92.

This module can be used with ZIPLink CONNECTION SYSTEMS

★★Factory default source of frequency command is via the keypad potentiometer

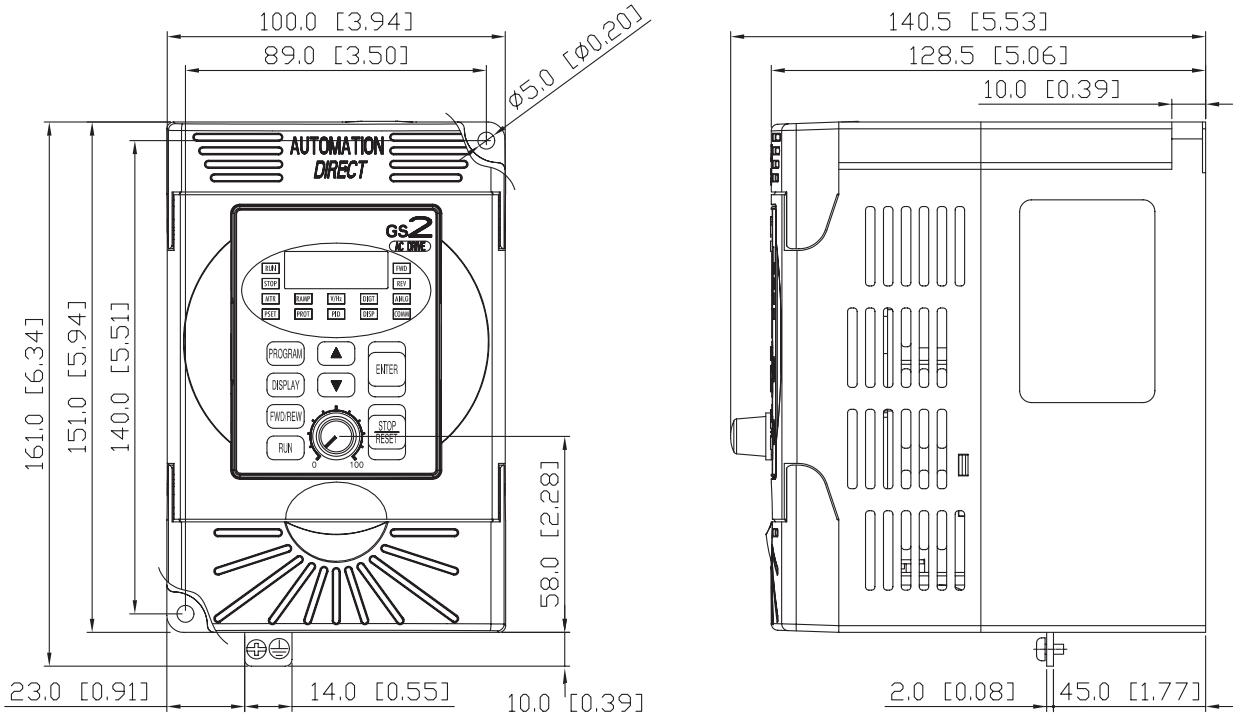
○ Main circuit (power) terminals ● Control circuit terminal ⏚ Shielded leads

WARNING: Do not plug a modem or telephone into the GS2 RJ-12 Serial Comm Port, or permanent damage may result. Terminals 2 and 5 should not be used as a power source for your communication connection.

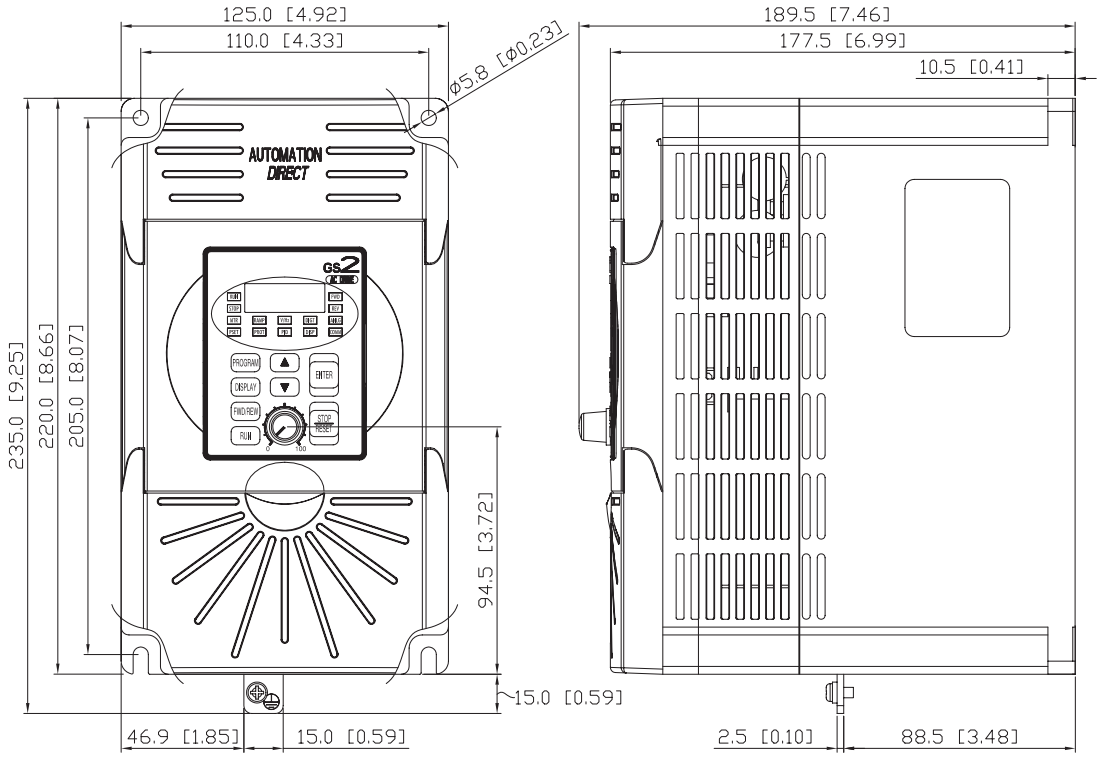
The Drives section is in Book 2 of current version of our catalog, or you can download PDF of section here.

GS2 Specifications — Dimensions

GS2-10P2, GS2-10P5, GS2-11P0; GS2-20P5, GS2-21P0, GS2-22P0;
GS2-41P0, GS2-42P0, GS2-43P0; GS2-51P0, GS2-52P0, GS2-53P0



GS2-23P0, GS2-25P0, GS2-27P5;
GS2-45P0, GS2-47P5, GS2-4010; GS2-55P0, GS2-57P5, GS2-5010



CARBTROL®

AIR PURIFICATION CANISTERS 140-200 LB. ACTIVATED CARBON

G-1
G-2
G-3

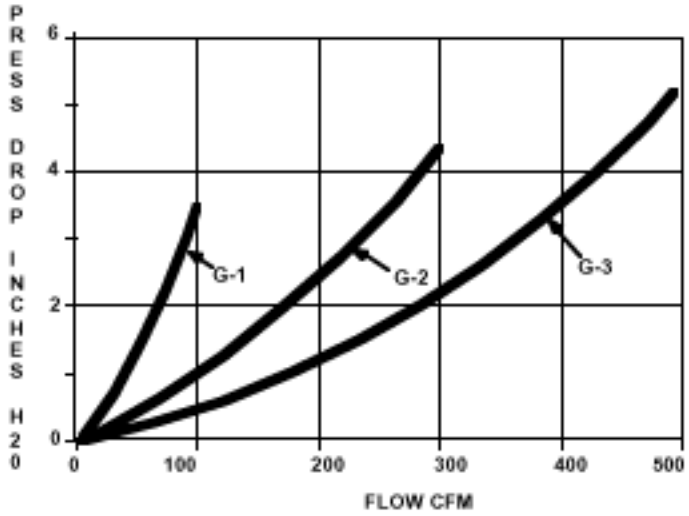
The CARBTROL "G" Canisters handles flows up to 500 CFM.

FEATURES

- High activity carbon.
- Epoxy lined steel or polyethylene construction.
- Acceptable for transport of hazardous spent carbon.
- Side drain for removal of accumulated condensate.
- Low pressure drop.
- PVC internal piping.
- High temperature (180°F) steel units available.

APPLICATIONS

- Soil vapor remediation
- Air stripper exhausts
- Tank vents
- Exhaust hoods
- Work area purification
- Sewage plant odor control



AT-116/#1

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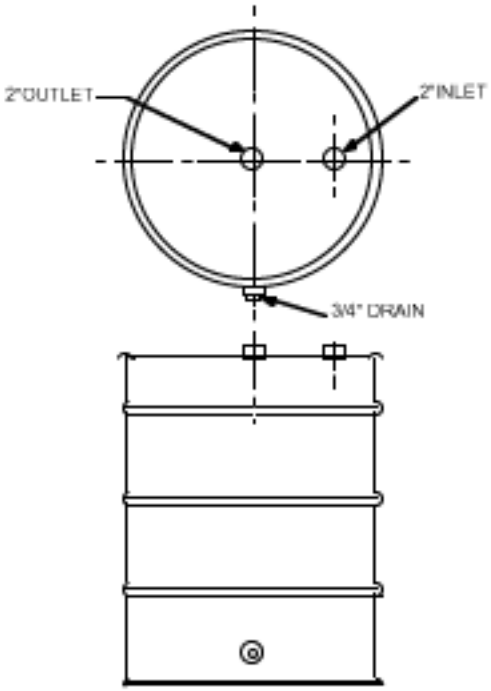
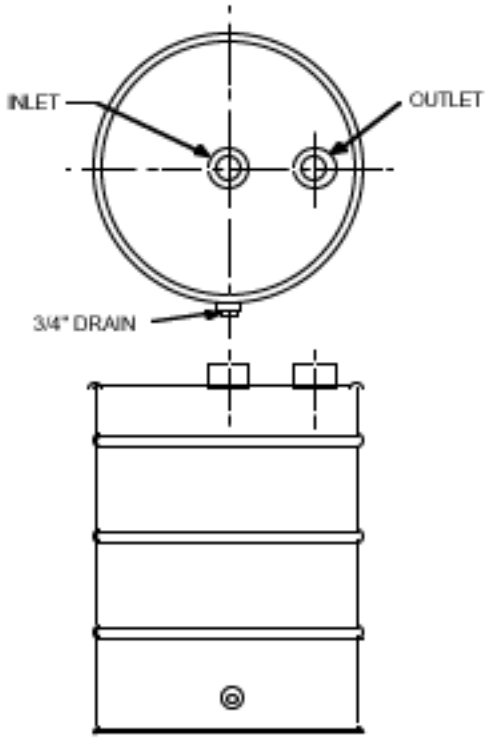
AIR PURIFICATION CANISTERS 140-200 LB. ACTIVATED CARBON

G-1
G-2
G-3



MODEL G-1



MODEL G-2,G-3

SPECIFICATIONS

MODEL	DIAMETER/HEIGHT	CARBON WEIGHT	INLET/OUTLET	MAXIMUM RATED FLOW	APPROXIMATE SHIP WEIGHT
G-1*	24"/36"	200 lbs.	2"/2"	100 CFM	250 lbs.
G-2*	24"/36"	170 lbs.	4"/4"	300 CFM	220 lbs.
G-3P	24"/36"	140 lbs.	6"/6"	500 CFM	190 lbs.
G-3S	24"/34"	140 lbs.	4"/4"	500 CFM	180 lbs.

* Specify: Polyethylene (P) or Epoxy Lined Steel (S)

SAFETY

Certain chemical compounds in the presence of activated carbon may oxidize, decompose or polymerize. This could result in temperature increases sufficient to cause ignition of the activated carbon or adsorbed material. If a compounds reaction with activated carbon is unknown, appropriate tests should be considered.

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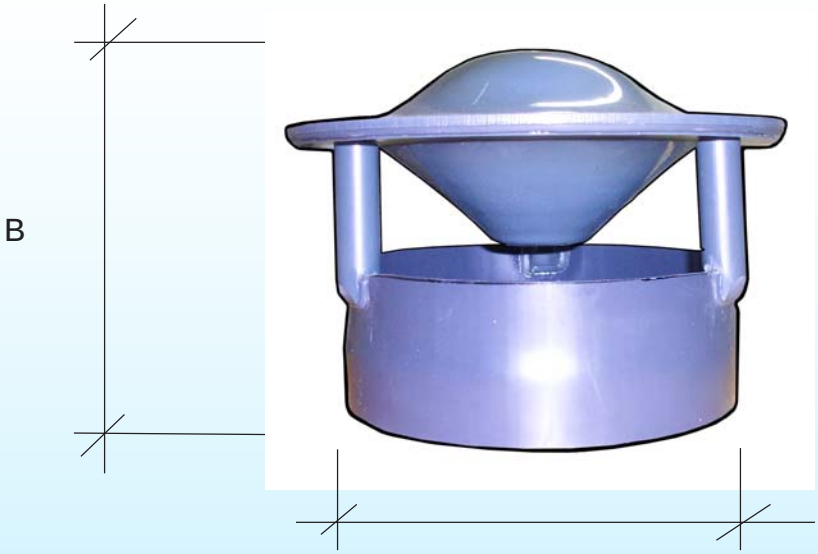
Rain Cap

-fanAm-



Model	A	B
CBI JET 250	8	8
CBI JET 315/355	11	11
CBI JET 450	11	14

*Dimensions measured in inches

Features:

- Rigid PVC Welded contruction
- Corrosion Resistant
- Light-weight

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Sarasota, FL 34237
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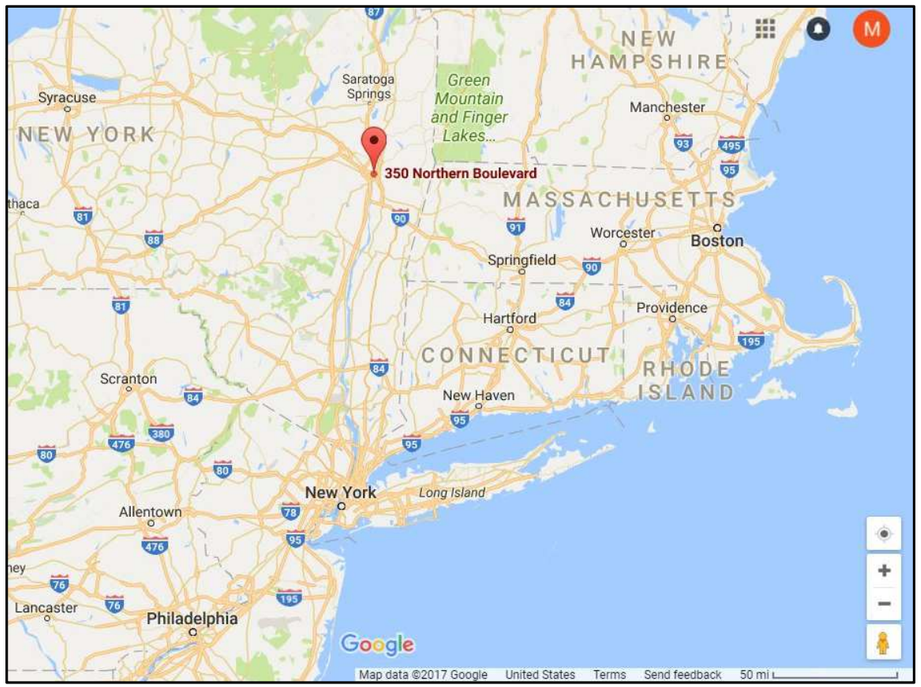
Appendix F:

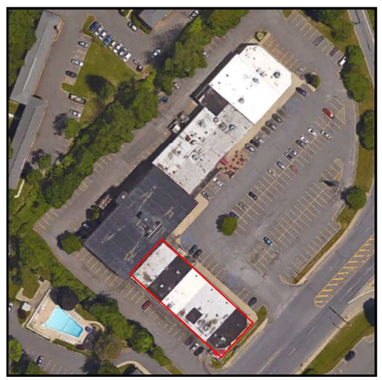
Vapor Mitigation Design Specification

Vapor Mitigation System Design

Former Loudon and KEM Cleaners Site

350 Northern Boulevard, Albany, New York





Date:
January 5, 2018

Prepared for:
DF Acquisitions, LLC
27 Burton Lane
Albany, NY 12011

Prepared by:
Alpine Environmental Services, Inc.
438 New Karner Road
Albany, New York 12205

Alpine Inc. ENVIRONMENTAL SERVICES

DATE:
January 2018

Former Loudon and KEM Cleaner Site
350 Northern Boulevard
Albany, New York

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Final	January 5, 2018
	October 30, 2017

PROJECT NO. 16-19856-R

SHEET NO.

V - 1

SHEET TITLE	Title & Location		
DRAWN BY	PS	CHECKED BY	MS

PART 1 REFERENCE AND SCHEDULES

1.01 APPLICABLE SPECIFICATIONS, CODES, AND STANDARDS

A. OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor sources to Indoor Air, US EPA Publication No. 9200.2-154 (2015)
B. ANSI/AARST RMS-LB 2014, Radon Mitigation Standards for Schools and Large Buildings.
C. ASTM E2121-13, Standard Practice for Installing Radon Mitigation Systems in Low-Rise Residential Buildings
D. ASTM D-2665-11 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
E. ASTM D-2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
F. ASTM F-656-10 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

1.02 DEFINITIONS & ABBREVIATIONS

AOI - Area of Influence: The area to be covered by the vapor mitigation system.
cfm - cubic feet per minute
DWV - Drain Waste, and Vent
PMP - Pressure monitoring port.
PC- Performance Criteria : The minimal acceptable sub slab to room vacuum pressure induced by the vapor mitigation system in the AOI (-0.004"WC).
ROI- Radius of Influence: The radius extending out from an extraction point where the PC is met or exceeded.
SP- Subject Property, 350 Northern Boulevard, Albany, New York.
SSD- Sub Slab Depressurization: Creation of a vacuum (negative differential pressure) under the ground floor slab with respect to the room above.
VM - Vapor Mitigation: Measures to interrupt the contaminant vapor migration pathway from the sub surface into indoor air.
"WC - Inches of Water Column

1.03 SCHEDULES

A. Schedule of Vapor Mitigation drawings:

Sheet	Area/Description
V-1	Title
V-2a	General Notes 1
V-2b	General Notes 2
V-2c	General Notes 3
V-2d	General Notes 4
V-3	Drawing: Area of Influence of Vapor Mitigation System
V-4a	Drawing: Vapor Mitigation System Layout, Plan View_Sub System 1
V-4b	Drawing: Vapor Mitigation System Layout, Plan View_Sub System 2
V-4c	Drawing: Vapor Mitigation System Layout, Plan View_Sub System 3
V-4d	Drawing: Vapor Mitigation System Layout, Plan View_Sub System 4
V-4e	Drawing: Vapor Mitigation System Layout, Plan View_Roof
V-5a	Drawing: Details 1, Extraction Points and Trenches
V-5b	Drawing: Details 2, Fan mounting, Manifolds, and Monitoring Ports and Panels
V-10	Drawing: Pilot Testing Locations & Data, Upper Vacant Space
V-11	Drawing: Pilot Testing Locations & Data, Lower Vacant Space
V-12	Drawing: Pilot Testing Locations during SVE Testing, Lower Vacant Space

B. Schedule of Vapor Mitigation System Cut Sheets:

Sheet	Manufacturer/Model	Description
CS-01	Radonaway HS5000	System Fan
CS-02	Dwyer Instruments Magnehelic	Differential Pressure Gauge
CS-03	Cox Colvin Monitoring Pin	Sub Slab Pressure Monitoring Port
CS-04	Radonaway Checkpoint IIA	Low Pressure Alarm
CS-05	Leviton 47605	Monitoring Panel

1.04 AREA OF INFLUENCE

The Area of Influence, the area to be covered by the vapor mitigation system, has been delineated as the southern wing of the Subject Property (SP) Building . See drawing sheet V-3 for the AOI and the sub system covering each sub AOI.

1.05 BASIS FOR DESIGN

The vapor mitigation design was developed utilizing the following:

A. Area of influence: The southern wing of the SP Building.

B. Performance Criteria: The minimal acceptable sub slab to room vacuum pressure induced by the vapor mitigation system in the AOI is -1 Pascal (-0.004 "WC). This is a boundary target, and all other areas covered by the system shall meet or exceed it.

C. Pilot testing was performed in the SP in September 2017. Fans with different characteristics were operated on test extraction holes at representative areas with the SP footprint. Fan operating pressures and sub slab floor vacuum readings were measured and recorded. Results of the pilot testing are located on drawing sheet V-10, V-11, and V-12. Access to the Dental office and Pharmacy were not provided during the pilot testing. These design documents assume the sub slab conditions of all spaces in the AOI are similar to that of the spaces where the pilot testing was performed.

PART 2 MATERIALS

2.01 PIPE, FITTINGS, & VALVES

A. Pipe & Fittings
1. All piping, from extraction points up to the fan inlet connection shall be 4" inside diameter PVC.
2. All pipe fittings shall be 4" inside diameter PVC with slip connectors suitable for solvent weld to 4" PVC pipe, with the exception of fan connectors.
3. Fan connectors shall be flexible PVC fittings with screw tightened clamps (Ferncos or equivalent) sized to connect the piping to the fan connection points.
4. All exhaust stack pipes above the Radonaway HS5000 fans shall be 3-inch nominal inside diameter PVC pipe.

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PROJECT NO. 16-19856-R

SHEET NO.

V - 2a

SHEET TITLE	General Notes 1		
DRAWN BY	PS	CHECKED BY	MS

B. Valves
1. Extraction point valves shall be 4" PVC ball or gate valves, with slip connections acceptable for airtight solvent weld to Schedule 40 PVC pipe.

2.02 SYSTEM FAN/BLOWER & ACCESSORIES

A. Schedule of System Fans (or acceptable equivalents):

Quantity	Manufacturer/Model	Description
4	Radonaway HS5000	High Suction Mitigation Fan

B. All fan strut fasteners, exterior pipe clamps, and exterior mounted items shall be rated for exterior use.

2.03 SYSTEM MONITORING EQUIPMENT

A. Differential Pressure Gauge
1. Dwyer Magnehelic (www.dwyer-inst.com) Differential Pressure Gauges on Radonaway HS5000 sub systems shall have a range from zero to forty inches of water column. (Quantity: 4)

B. Differential Pressure Alarm
1. Radonaway Checkpoint IIA Mitigation System Alarm (Quantity: 4)
2. Set Alarm to activate at 0.25 inches of water column.

C. Sub Slab Pressure Monitoring Port (PMP)
1. Cox Colvin Vapor Monitoring Pin (Quantity: 6)
2. Aluminum Locking Cover

PART 3 EXECUTION

3.01 INSTALLATION

A. Extraction Points (EPs).

EPs shall be installed at seven locations throughout the footprint of the SP building, two in the upper vacant unit, three in the SP Pharmacy Tenant space, and two in the Risotto Restaurant tenant space. Extraction points shall be installed at locations identified on Sheets V-4a, V-4b, and 4d. See Sheet V-5a for installation details.

EPs shall be installed through a five-inch hole through the concrete floor with approximately 1 cubic foot of soils removed and extend at least 12 inches below the slab surface. The 4-inch diameter PVC pipe shall be secured within the concrete extraction hole by inserting a PVC fitting or collar which fits tight in the hole. Urethane caulking shall be installed in the annulus between the concrete slab and the pipe fitting/collar to flush with the interior floor surface, following the urethane manufacturer's installation instructions. The pipe shall also be secured to walls at the specified intervals. Each sub slab extraction point shall be fitted with a ball or gate valve, equal in size to the size of the pipe used for the extraction point. All valves shall be installed in a vertical position.

Extraction points are to be installed at locations shown on Drawing Sheet V-4a to 4d. Column footings may be encountered under the concrete floor slab close to these columns and may extend out beyond the column, and may be immediately under the concrete slab. If the column footing prevents installation of the EPs within one foot of the nearest edge of the column and the footing is immediately under the concrete floor slab (ie no soils between the footing and the concrete floor), the extraction point shall be installed as a "Trenched Extraction Point". See 3.01B below and Drawing Sheet V-5a for details.

B. Trenched Extraction Points

1. A Trenched Extraction Point is a trench cut into the concrete floor and the concrete footing below to allow for the extraction point piping to be run beyond the edge of the footing and extract from a cavity created at the edge of the footing without further encroachment into the retail space. See Drawing Sheet V-5a for details.

C. Trenched Extraction Lines (ELs)

1. Trenched Extraction Lines shall be installed in the lower vacant space. The trench shall run from rear to front of the entire space with two perpendicular trenches cut toward the Dental office tenant space. Three separate extraction lines shall be run in the trench, connected to perforated pipe sections distributed throughout the trenches. The ELs shall transition to solid pipe outside of the area the EL is intended to cover. The three ELs shall rise above the floor of the space along the rear interior wall. Each EL shall be fitted with a ball or gate valve at the rear wall, equal in size to the size of the pipe used for the extraction line. All valves shall be installed in a vertical position. Concrete shall be replaced over the extraction trenches using a minimum 3000 psi concrete and rebar as specified on the drawings. See Sheet V-4c for locations of ELs. See Drawing Sheet V-5a for details.

D. Pipe System

1. Steps will be taken to ensure that foreign materials are not left or drawn into the system piping or fans which might later interfere with VM system performance.
2. All above slab and below slab pipe, fitting, and valve connections shall be solvent welded, with the exception of the fan connections.
3. Horizontal pipe runs, including sub slab ELs, shall be sloped toward the sub slab extraction points or terminal end a minimum of $^1/_8$ inch per foot. No water traps shall be created in any vapor mitigation system pipe.
4. Horizontal and vertical runs of vapor mitigation system piping shall be supported in accordance with applicable building codes for DWV pipe of the same type and size.
5. Approximate routing of pipe to exhaust locations is indicated on the accompanying drawings. Field adjustments shall be made to avoid conflicts with current service, access, or use requirements of the space.
6. A 3"x 3" x 3" "T" fitting shall be installed on the end of each exhaust pipe on all Radonaway HS5000 fans with the two openings in a horizontal orientation.

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SHEET NO.

V - 2b

SHEET TITLE	General Notes 2		
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E. Fan Installation

1. Install fans in accordance with manufacturer's installation requirements.
2. Fan specified in section 1.03B, CS-01, shall be side wall mounted at the location designated on Sheets V-4a, V-4b, V-4c, and V-4d.
3. Fan connections to pipe shall be with appropriately sized flexible PVC couplings (Fernco or equivalent).
4. Provide support strut to anchor fan to building sidewall. See Sheet V-5b for details.
5. Exhaust discharge shall continue above fan and penetrate the rear overhang roof. The exhaust location must be at least 10 feet above ground level. Additionally, it shall be 2 feet above, or if not 2 feet above then 10 feet horizontally from any opening to the building air or air intake. Extend exhaust stack discharge height as needed to meet this requirement.
6. Any roof penetrations shall be sealed weather tight.

Figure 3.01C: Example of sidewall mounted fan with exhaust stack.

F. Monitoring Panel/ Monitoring Equipment

1. Monitoring panels shall be installed at locations indicated on Sheets V-4a, V-4b, V-4c, and V-4d.
2. The monitoring panel shall include a mechanical pressure gauge for each sub system (ie fan) measuring the real time pressure in the exhaust stack pipe, after all EPs or ELs have manifolded to one common line.
3. Pressure gauges shall be connected to the monitoring location of the system pipe with polyethylene (or equivalent) tubing and a brass barb.
4. See Figure 3.01F for an example of a monitoring panel and drawing sheet V-5b for details.

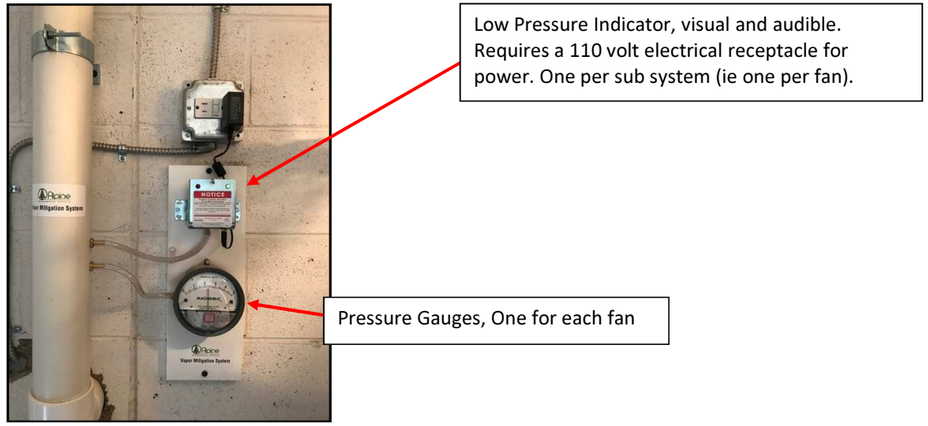

Figure 3.01F: Example of Monitoring Panel

G. Labeling

1. Label the EPs within above the suspended ceiling on each the extraction point with permanent stick on labels, below the valve, with the number convention identified in Sheets V-4a, V-4b. V-4c, and V-4d.
2. Label above slab piping at least once every 20 feet, at least once per room, at least once on every floor, and on the roof. Label shall read "Vapor Mitigation System" and shall be readable from a distance of three feet.
3. Circuit breaker(s) in the electric panel serving the vapor mitigation system fans shall be labeled as " Vapor Mitigation Fan(s)".

H. Electrical

1. Fans and Alarm panel electrical wiring and connection shall be in accordance with applicable electrical codes.
2. Fan electrical connections shall comply with manufacturer requirements.
3. A weather tight electrical disconnect shall be provided within six feet of each fan on the roof of the building.
4. Fan electrical connections shall be through a dedicated electrical circuit breaker, although multiple fans can be on the same circuit, provided the circuit has sufficient capacity. Connect electric to nearest electrical circuit panel with sufficient capacity and space.
5. One 110V electrical outlet shall be installed within 3 feet of the monitoring panel location identified in V-4a, V-4b. V-4c, and 4-d. A dedicated circuit is not required; however, it shall not be the same circuit that the mitigation system fans are connected to.

I. System Controls

1. The mitigation fan is operated as on or off as controlled by a manual electrical disconnect adjacent to the fans and by the electrical circuit breaker inside the building. Adjustment to the ROI is controlled by manual adjustment of the EP valves. All valves on a sub system should never be fully closed simultaneously.

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SHEET NO.

V - 2c

SHEET TITLE	General Notes 3		
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J. Sub Slab Pressure (Vacuum) Monitoring Port

1. A pressure monitoring port (PMP) will be constructed of a Cox Colvin vapor pin and located at six locations identified (approximately)on drawing Sheets V-4a to V-4d. Exact location to be determined in the field. See cut sheet CS03 and drawing sheet V-5b for details and installation instructions.

3.02 TESTING & BALANCING

A. Testing & Balancing

Following the installation of the VM system, the following tests shall be performed to verify the system is operating optimally. The post installation testing shall include the following:
1. Verify system fan is operating within manufacturer's specifications (i.e. not exceeding maximum operating pressure, etc.).
2. Verify system switches and gauges are operating correctly by turning off system fans observing results.
3. Perform sub slab to room differential pressure testing with a digital micro manometer to verify pressure field extension throughout the AOI.
4. Adjust valves to balance the sub slab vacuum in the AOI.
5. The VM system shall be considered successful when the sub slab to room vacuum within the AOI is at least -0.004"WC and can be continuously demonstrated.

3.03 DOCUMENTATION

A. Operations & Maintenance Report

Following the installation of the VM system, an Operations & Maintenance Report shall be provided in electronic format (PDF). Post Installation Report shall include the Following Items:

1. A written description of the system installed, including make/model of fans, fan serial numbers (if any), system fan date of manufacture.
2. A chart indicating the pressure in each sub system with provisions for recording future readings.
3. Manufacturer paperwork (including warranty paperwork) for all fans, meters, alarms, gauges, switches, etc. installed.
4. Photos with description of system components.
5. As built drawing of the location of fans, system piping, gauges, valves, switches, and electrical tie in location, etc.
6. Post installation sub slab pressure test data on drawing indicating test locations demonstrating system meets or exceeds the Performance Criteria.
7. Troubleshooting table.
8. Provide inspection criteria and timeline.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: January 2018

Former Loudon and KEM Cleaner Site
350 Northern Boulevard
Albany, New York

DESCRIPTION	DATE
Final	January 5, 2018
	October 30, 2017

PROJECT NO. 16-19856-R

SHEET NO.

V - 2d

SHEET TITLE	General Notes 4			
DRAWN BY	PS	CHECKED BY	MS	

SCALE

30 0 15 30 60

(DISTANCE IN FEET)

AREA COVERED BY SSD SYSTEM #1

AREA COVERED BY SSD SYSTEM #2

AREA COVERED BY SSD SYSTEM #3

AREA COVERED BY SSD SYSTEM #4

PERMANENT SUB-SLAB VACUUM MONITORING POINTS (COX COLVIN). EXACT LOCATIONS TO BE DETERMINED IN FIELD.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

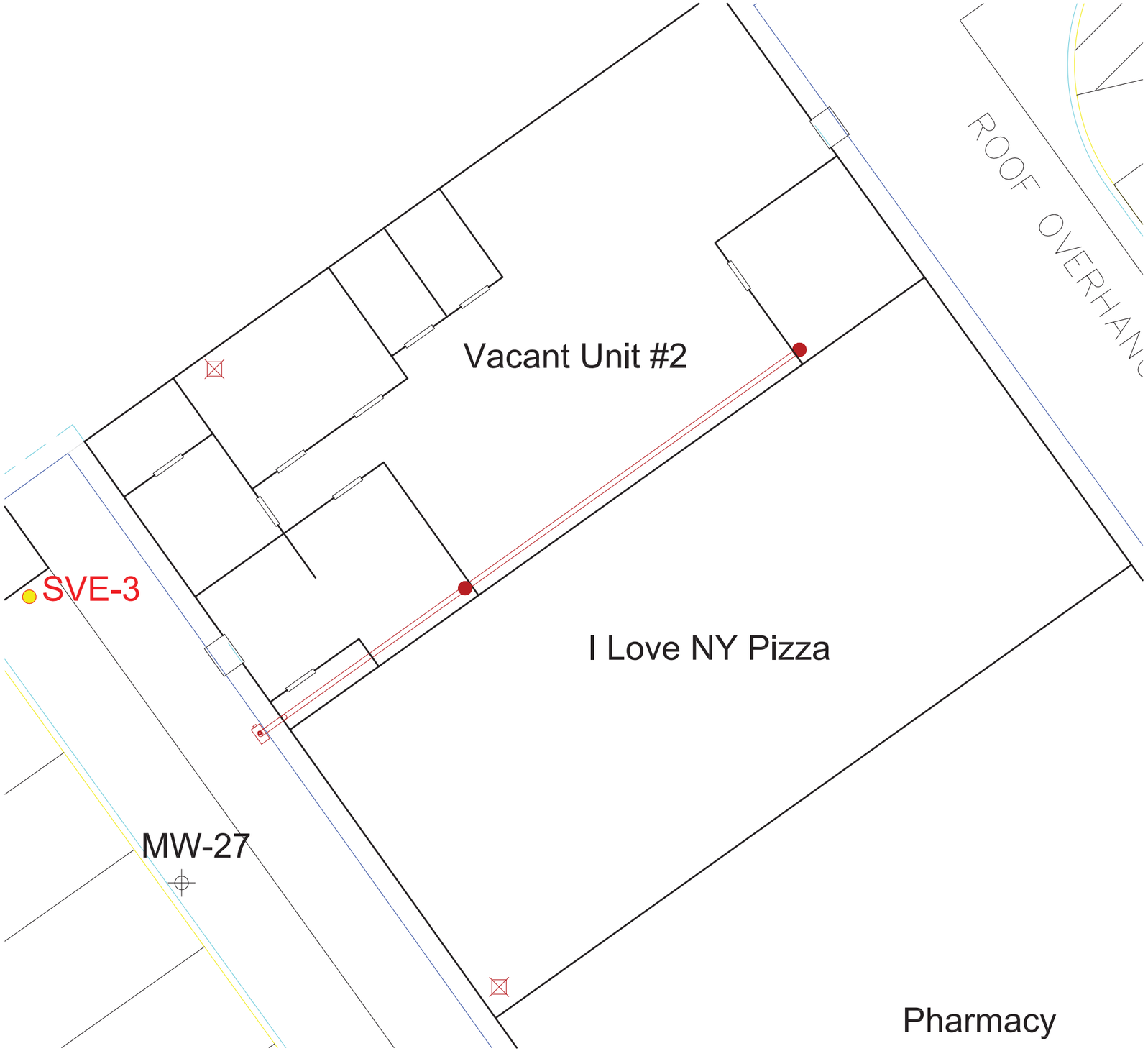
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 3

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - AREA OF INFLUENCE		
DRAWN BY:	BG	CHECKED BY:	MS



SCALE

0 5 10 15 20

(DISTANCE IN FEET)

SSD SYSTEM #1

- EXTRACTION POINT
- SOLID SCHEDULE 40 PVC PIPING
- VAPOR MITIGATION FAN
- PERMANENT SUB-SLAB VACUUM MONITORING POINTS (COX COLVIN). EXACT LOCATIONS TO BE DETERMINED IN FIELD.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 4a

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - SYSYEM 1 LAYOUT			
DRAWN BY:	BG	CHECKED BY:	MS	

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 4b

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - SYSYEM 2 LAYOUT			
DRAWN BY:	BG	CHECKED BY:	MS	

SCALE

0 5 10 15 20

(DISTANCE IN FEET)

SSD SYSTEM #3

SOLID SCHEDULE 40 PVC PIPING

PERFORATED SCHEDULE 40 PVC PIPING

VAPOR MITIGATION FAN

PERMANENT SUB-SLAB VACUUM MONITORING POINTS (COX COLVIN). EXACT LOCATIONS TO BE DETERMINED IN FIELD.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

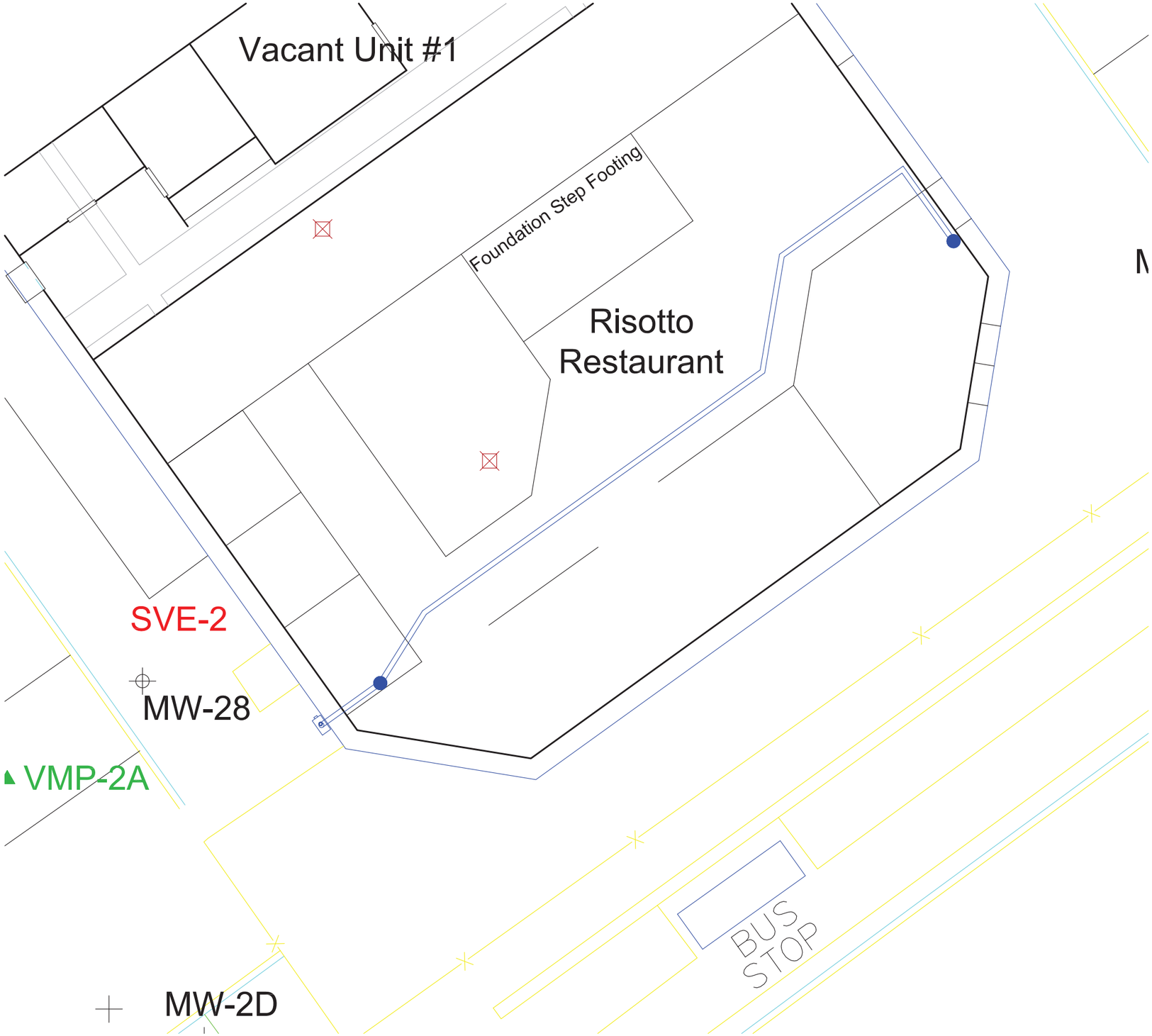
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 4c

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - SYSYEM 3 LAYOUT		
DRAWN BY:	BG	CHECKED BY:	MS



SCALE

0 5 10 15 20

(DISTANCE IN FEET)

SSD SYSTEM #4

SOLID SCHEDULE 40 PVC PIPING

VAPOR MITIGATION FAN

PERMANENT SUB-SLAB VACUUM MONITORING POINTS (COX COLVIN). EXACT LOCATIONS TO BE DETERMINED IN FIELD.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

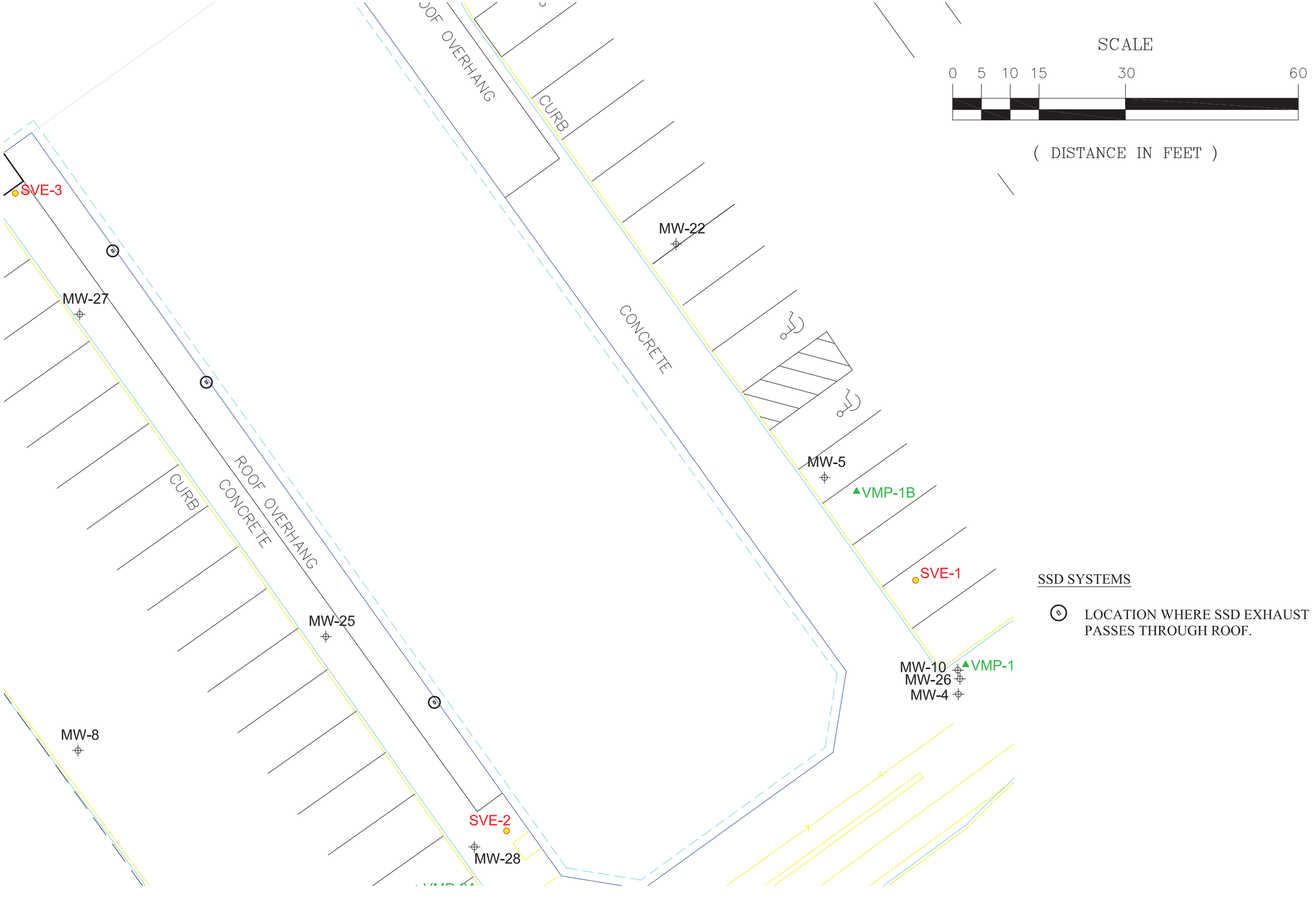
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 4d

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - SYSYEM 4 LAYOUT			
DRAWN BY:	BG	CHECKED BY:	MS	



SCALE

0 5 10 15 30 60

(DISTANCE IN FEET)

SSD SYSTEMS

① LOCATION WHERE SSD EXHAUST PASSES THROUGH ROOF.

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

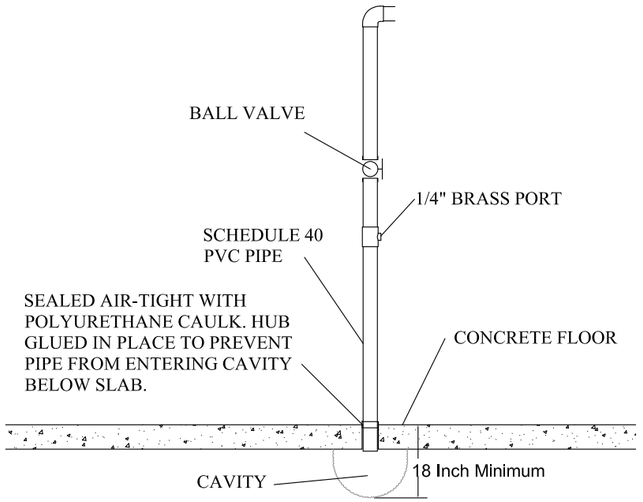
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

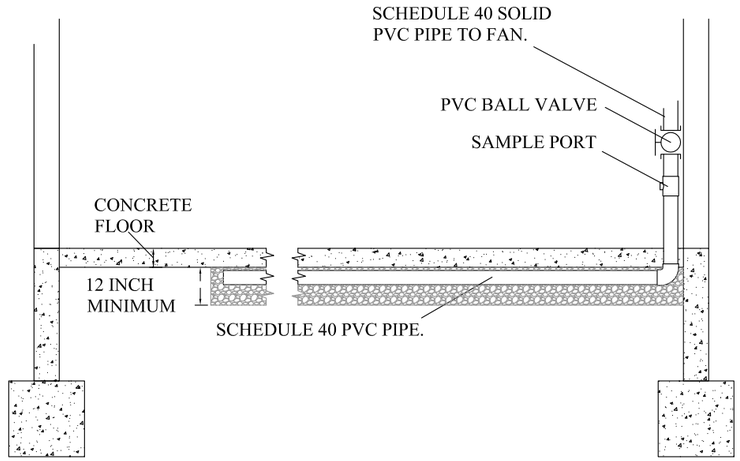
SHEET NO:

V - 4e

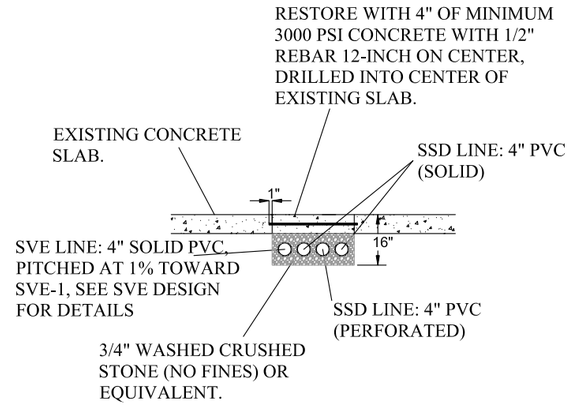
SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - ROOF		
DRAWN BY:	BG	CHECKED BY:	MS



EXTRACTION POINT DETAIL
NOT TO SCALE



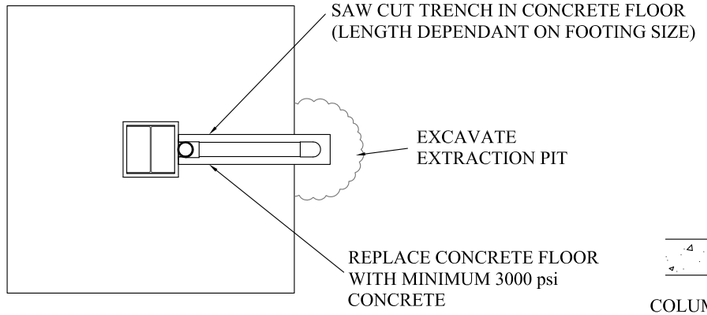
TRENCH DETAIL - SIDE VIEW
NOT TO SCALE



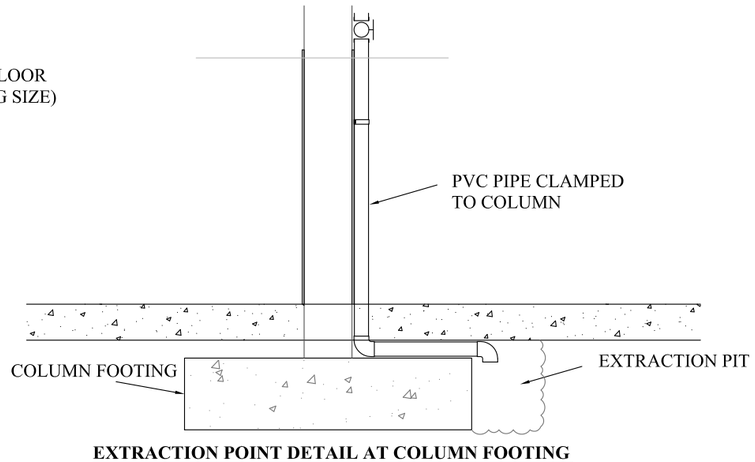
SCHEDULE 40 PERFORATED PVC PIPE. PERFORATED PIPE SHALL HAVE 12 5/8-INCH HOLES PER LINEAR FOOT, EQUALLY DISTRIBUTED BETWEEN EACH SIDE AND THE BOTTOM OF THE PIPE, WITH HOLES POSITIONED AT 90 DEGREES (3 O'CLOCK), 180 DEGREES (6 O'CLOCK), AND 270 DEGREES (9 O'CLOCK) AT FINAL INSTALLATION. ALL HOLES WILL REMAIN IN CONTACT WITH THE BACKFILL STONE.

TRENCH DETAIL - INSIDE BUILDING - END VIEW
NOT TO SCALE

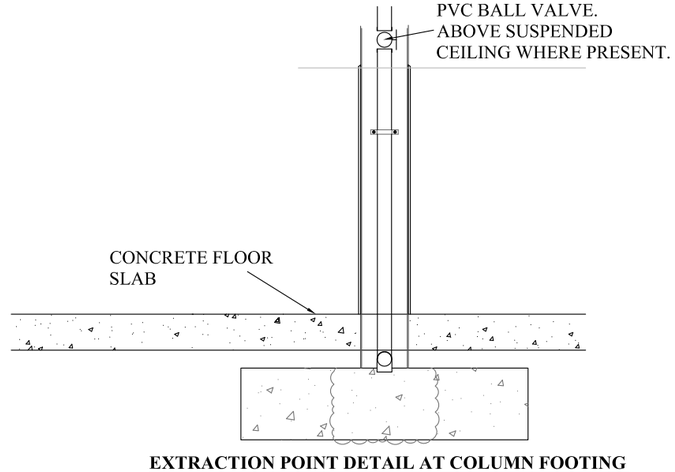
TRENCHED EXTRACTION POINT



EXTRACTION POINT DETAIL AT COLUMN FOOTING
TOP VIEW
NOT TO SCALE



EXTRACTION POINT DETAIL AT COLUMN FOOTING
SIDE VIEW
NOT TO SCALE



EXTRACTION POINT DETAIL AT COLUMN FOOTING
END VIEW
NOT TO SCALE

Alpine Inc. ENVIRONMENTAL SERVICES

DATE:
October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

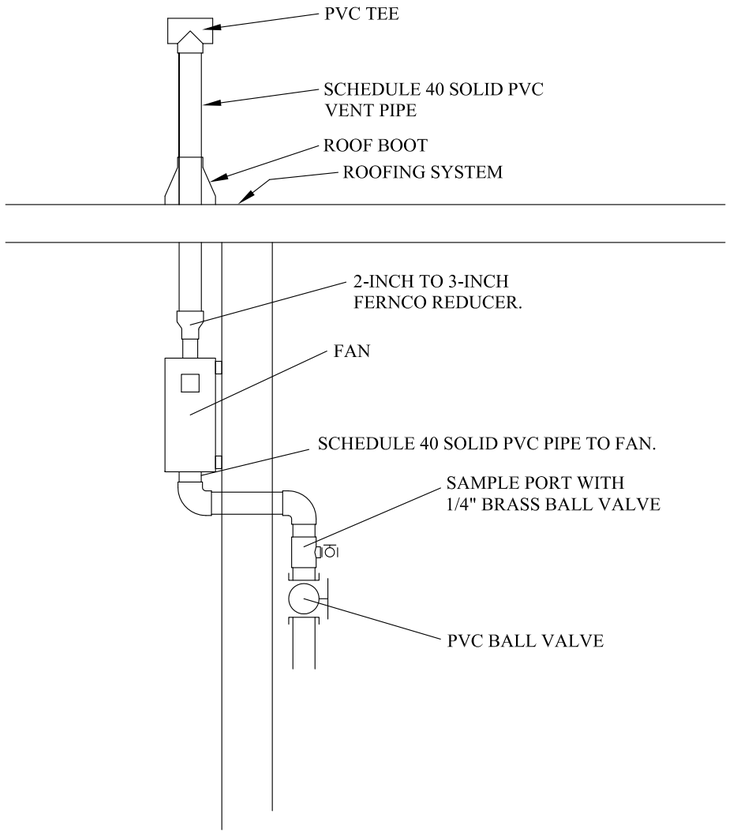
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

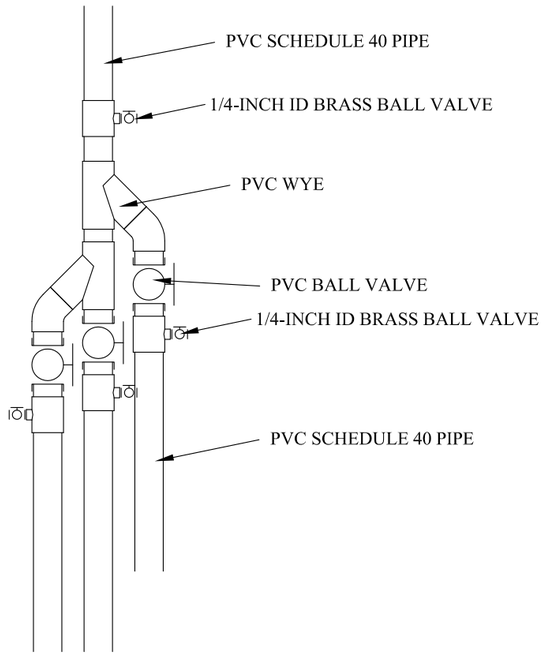
SHEET NO:

V - 5a

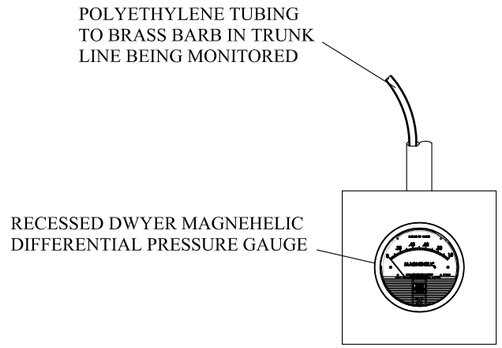
SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - DETAILS 1			
DRAWN BY:	BG	CHECKED BY:	MS	

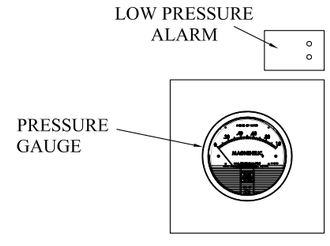


FAN MOUNTING DETAIL
WALL MOUNT - SIDE VIEW
NOT TO SCALE

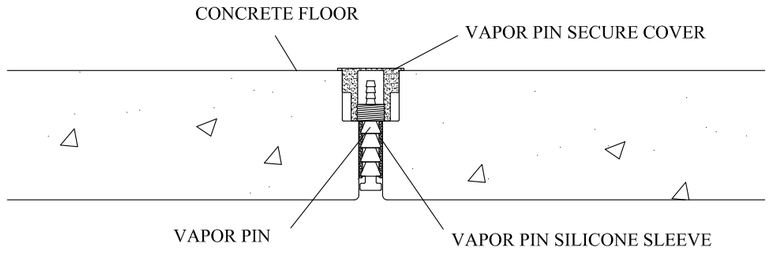


MANIFOLD DETAIL
NOT TO SCALE





MONITORING PANEL
NOT TO SCALE



SUB-SLAB VACUUM MONITORING POINT DETAIL
NOT TO SCALE

Alpine Inc. ENVIRONMENTAL SERVICES

DATE:
October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

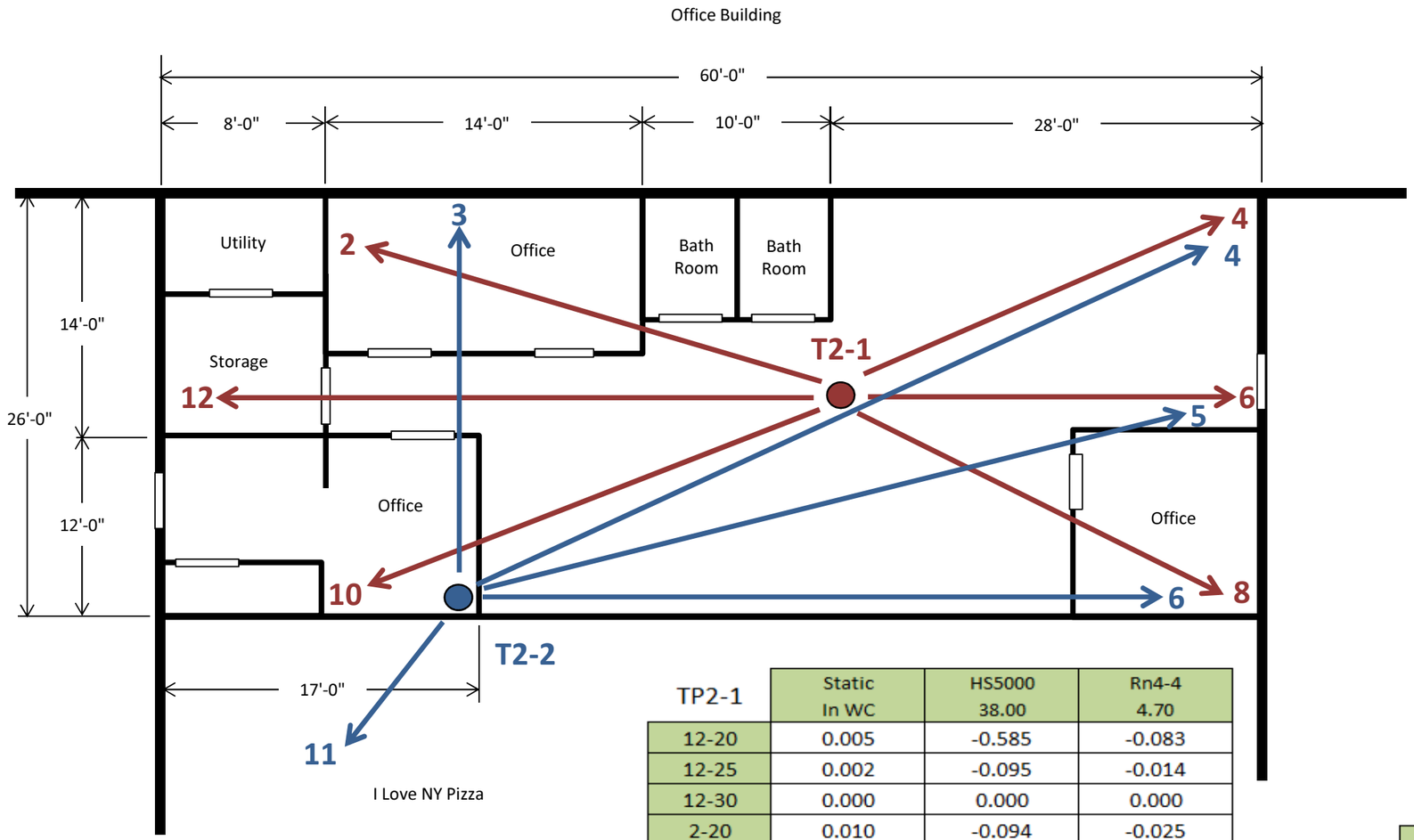
DESCRIPTION:	DATE:
	10/18/2017

PROJECT NO:

SHEET NO:

V - 5b

SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - DETAILS 2			
DRAWN BY:	BG	CHECKED BY:	MS	



Legend

Orientation/Direction (6 oclock)

Test point ID 4-20

Distance (feet)

Test ExtactionPoint

TP2-1	Static In WC	HS5000 38.00	Rn4-4 4.70
12-20	0.005	-0.585	-0.083
12-25	0.002	-0.095	-0.014
12-30	0.000	0.000	0.000
2-20	0.010	-0.094	-0.025
2-25	0.002	-0.023	0.000
4-20	0.003	-0.160	-0.018
4-25	0.001	-0.012	0.000
6-20	0.002	-0.145	-0.017
6-25	0.000	-0.025	-0.004
8-20	0.000	-0.135	-0.016
8-25	0.000	-0.062	-0.007
10-25	0.000	-0.084	-0.009
10-30	0.000	-0.001	0.000

TP2-2	Static In WC	HS5000	Rn4-4
3-23	0.002	-0.057	-0.012
4-40	0.003	-0.021	-0.004
4-45	0.001	-0.002	0.000
5-39	0.000	-0.062	-0.014
5-43	0.000	-0.016	-0.004
6-34	0.000	-0.353	-0.091
6-37	0.000	-0.159	-0.041
11-10	0.000	-0.431	n/a

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: September 2017

Loudon Plaza
350 Northern Blvd.
Albany, NY

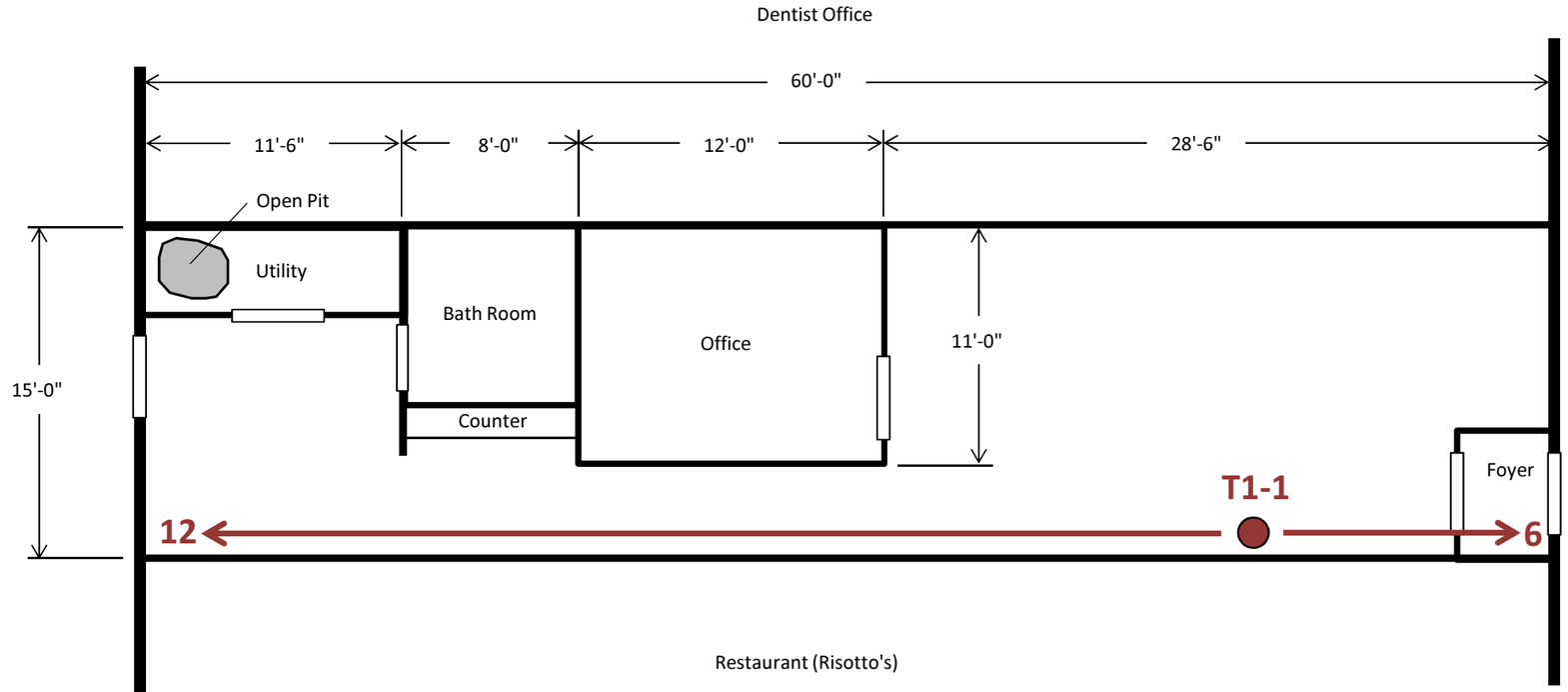
DESCRIPTION	DATE
	October 18, 2017

PROJECT NO.

SHEET NO.

V - 10

SHEET TITLE	VM PILOT TEST LOCATIONS, UPPER VACANT		
DRAWN BY	PS	CHECKED BY	MS



Legend

Orientation/Direction (6 oclock)

Test point ID 6-15

Distance (feet)

Test ExtactionPoint

TP1-1	Static In WC	GP501 -3.80	Rn4-4 -4.80	HS5000 -37.00
12-10	0.003	-0.086	-0.110	-0.864
12-15	0.003	-0.048	-0.056	-0.437
12-20	0.001	-0.030	-0.034	-0.252
12-25	0.000	-0.014	-0.011	-0.121
12-30	0.000	-0.004	-0.004	-0.030
12-35	0.000	0.000	0.000	-0.001
12-40	0.000	0.001	0.000	0.000
6-10	0.000	-0.028	-0.030	-0.158
6-15	0.000	0.000	0.000	-0.005

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: September 2017

Loudon Plaza
350 Northern Blvd.
Albany, NY

DESCRIPTION	DATE
	October 18, 2017

PROJECT NO.

SHEET NO.

V - 11

SHEET TITLE	VM PILOT TEST LOCATIONS, LOWER VACANT		
DRAWN BY	PS	CHECKED BY	MS

A SSD Pilot Test Points and Point Identification.

SCALE

0 5 10 15 20

(DISTANCE IN FEET)

Alpine Inc. ENVIRONMENTAL SERVICES

DATE: October 2017

Loudon Plaza
350 Northern Boulevard
Albany, New York

DESCRIPTION:	DATE:

PROJECT NO:

SHEET NO:

V - 12

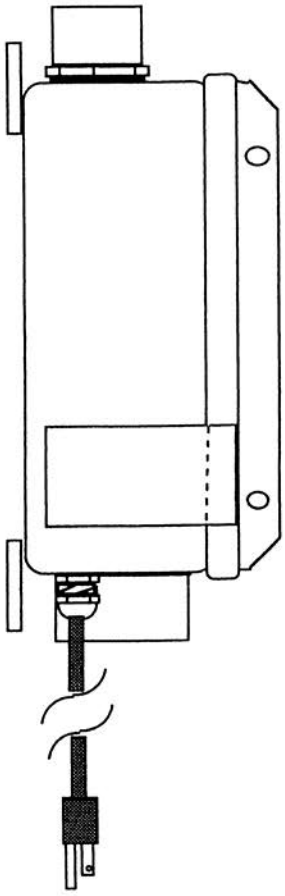
SHEET TITLE:	SUBSLAB DEPRESSURIZATION SYSTEM - TEST POINTS		
DRAWN BY:	BG	CHECKED BY:	MS

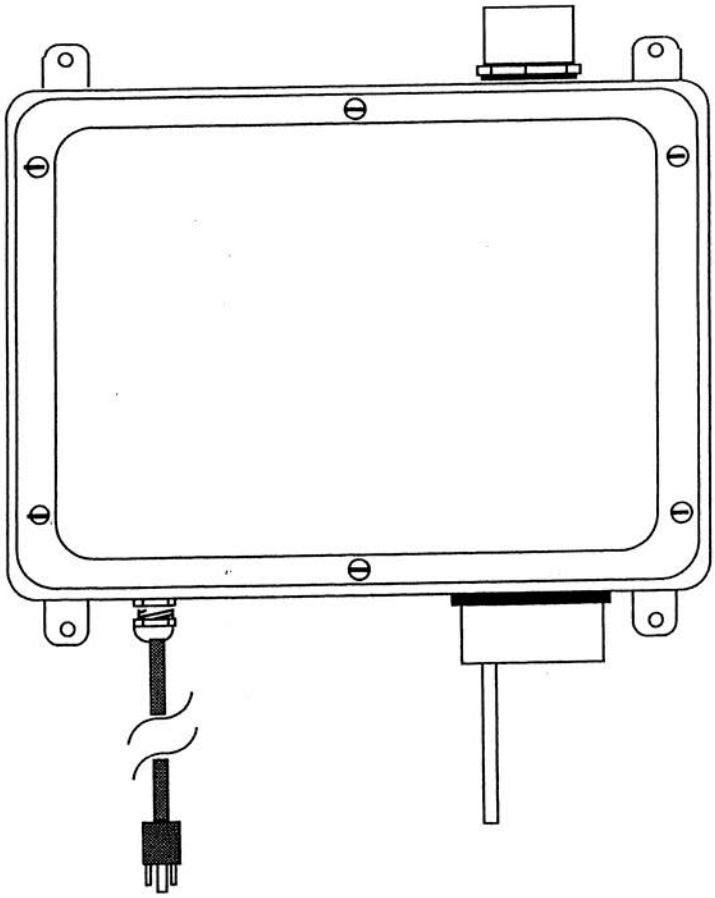
Appendix G:

Vapor Mitigation Design Equipment Cut Sheets

HS SERIES INSTALLATION INSTRUCTIONS

BY RadonAway™





RadonAway, Inc. Ward Hill, MA. P/N IN007 Rev F

RadonAway Ward Hill, MA.

HS Series Fan Installation Instructions

Please Read and Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician..

7. **WARNING!** In the event that the fan is immersed in water, return unit to factory for service before operating.

8. **WARNING!** Do not twist or torque fan inlet or outlet piping as Leakage may result.

9. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

INSTALLATION INSTRUCTIONS (Rev F)
for DynaVac High Suction Series
HS2000 p/n 23004-1
HS3000 p/n 23004-2
HS5000 p/n 23004-3

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac is intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of the DynaVac. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The DynaVac is designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the DynaVac should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F. The DynaVac is thermally protected such that it will shut off when the internal temperature is above 104 degrees F. Thus if the DynaVac is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 104 degrees F.

1.3 ACOUSTICS

The DynaVac, when installed properly, operates with little or no noticable noise to the building occupants. There are, however, some considerations to be taken into account in the system design and installation. When installing the DynaVac above sleeping areas, select a location for mounting which is as far away as possible from those areas. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Insure a solid mounting for the DynaVac to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, the "rushing" sound of the outlet air can be disturbing. The system design should incorporate a means to slow and quiet the outlet air. The use of the RadonAway Exhaust Muffler, p/n 24001, is strongly recommended.

1.4 GROUND WATER

Under no circumstances should water be allowed to be drawn into the inlet of the DynaVac as this may result in damage to the unit. The DynaVac should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the DynaVac with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the DynaVac. The lack of cooling air will result in the DynaVac cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the DynaVac be disconnected until the water recedes allowing for return to normal operation.

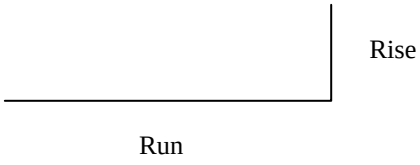
1.5 CONDENSATION & DRAINAGE

(WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the DynaVac).

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation.

The use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and at sufficient velocity it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For DynaVac inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system condition. Use this chart to size piping for a system.

Pipe Diam.	Minimum Rise per Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4"	1/32 "	3/32 "	3/8 "
3"	1/8 "	3/8 "	1 1/2 "



*Typical operational flow rates:

HS3000, or HS5000	20 - 40 CFM
HS2000	50 - 90 CFM

All exhaust piping should be 2" PVC.

1.6 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A Magnehelic pressure gauge is recommended for this purpose. The indicator should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables.

1.7 SLAB COVERAGE

The DynaVac can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (2 to 10 gallons in size) be created below the slab at each suction hole.

1.8 ELECTRICAL WIRING

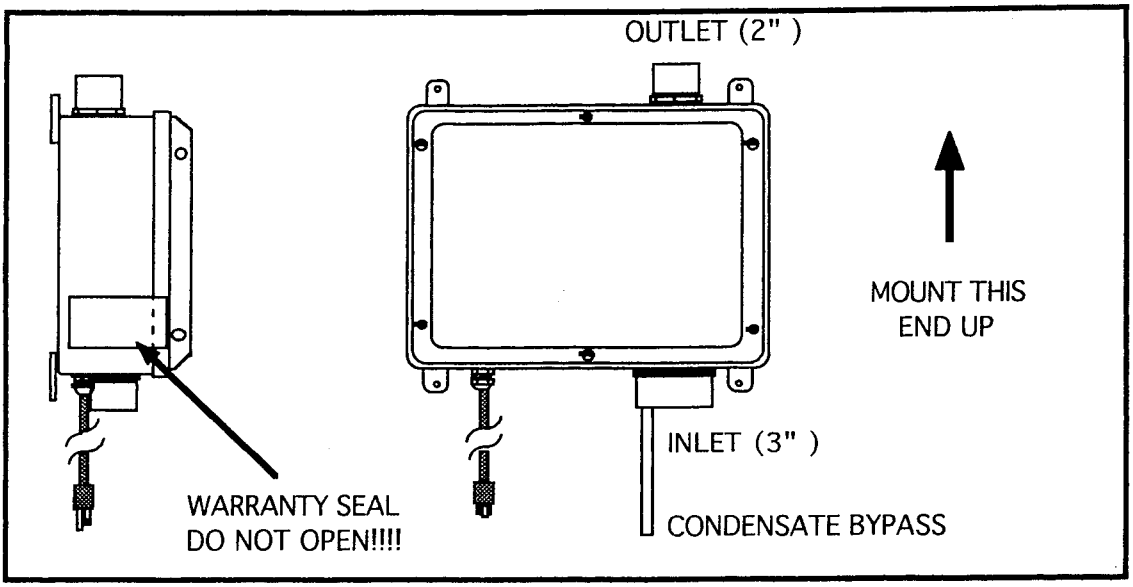
The DynaVac plugs into a standard 120V outlet. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

1.8a ELECTRICAL BOX (optional)

The optional Electrical Box (p/n 20003) provides a weathertight box with switch for outdoor hardwire connection. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit.

1.9 SPEED CONTROLS

Electronic speed controls can **NOT** be used on HS series units.



2.0 INSTALLATION

2.1 MOUNTING

Mount the DynaVac to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Insure the DynaVac is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to DynaVac with flexible couplings. Insure all connections are tight. Do not twist or torque inlet and outlet piping on DynaVac or leaks may result.

2.3 VENT MUFFLER INSTALLATION

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed above the roofline at the end of the vent pipe.

2.5 OPERATION CHECKS

____ Make final operation checks by verifying all connections are tight and leak-free.

____ Insure the DynaVac and all ducting is secure and vibration-free.

____ Verify system vacuum pressure with Magnehelic. Insure vacuum pressure is less than the maximum recommended as shown below:

DynaVac	HS2000	14" WC
DynaVac	HS3000	21" WC
DynaVac	HS5000	40" WC

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.)
If these are exceeded, increase number of suction points.

____ Verify Radon levels by testing to EPA protocol.

Addendum

PRODUCT SPECIFICATIONS

Model	Maximum Static Suction	Typical CFM vs Static Suction WC (Recommended Operating Range)						Power* Watts @ 115 VAC
		0"	10"	15"	20"	25"	35"	
HS2000	18"	110	72	40	-	-	-	150-270
HS3000	27"	40	33	30	23	18	-	105-195
HS5000	50"	53	47	42	38	34	24	180-320

*Power consumption varies with actual load conditions

Inlet: 3.0" PVC
Outlet: 2.0" PVC
Mounting: Brackets for vertical mount
Weight: Approximately 18 lbs.
Size: Approximately 15"W x 13"H x 8"D
Minimum recommended inlet ducting (greater diameter may always be used):
HS3000, HS5000 --- 2.0" PVC Pipe
HS2000 --- Main feeder line of 3.0" or greater PVC Pipe
Branch lines (if 3 or more) may be 2.0" PVC Pipe
Outlet ducting: 2.0" PVC
Storage temperature range: 32 - 100 degrees F.
Thermally protected
Locked rotor protection
Internal Condensate Bypass

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the HS Series Fan for shipping damage within 15 days of receipt. Notify **RadonAway of any damages immediately**. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.
There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the HS Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the HS Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of one (1) year from the date of manufacture (the "Warranty Term"). Outside the Continental United States and Canada the Warranty Term is one (1) year from the date of manufacture.

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at owner's cost) to the RadonAway factory. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not include damage in shipment unless the damage is due to the negligence of RadonAway.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE HS SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping cost to and from factory.

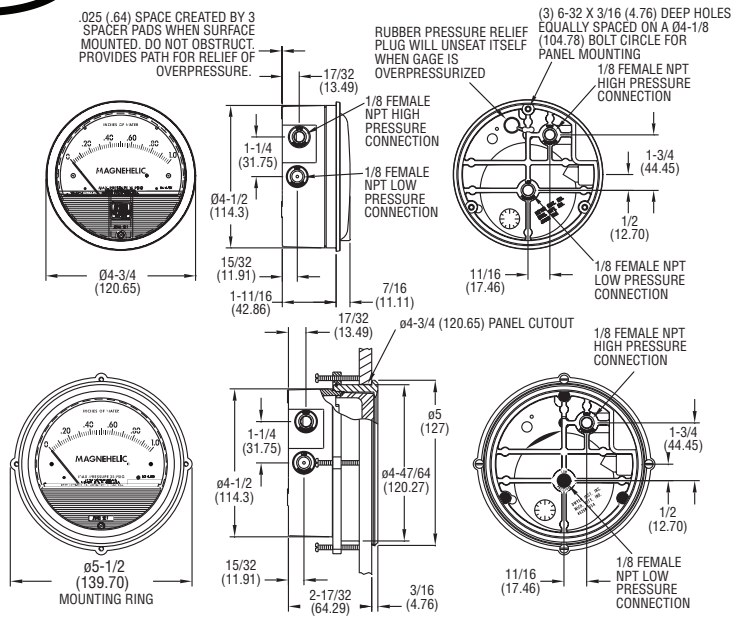
RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Bulletin A-27

Magnehelic® Differential Pressure Gage



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES: Two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023″ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20″ Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4″ (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8″ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Agency Approvals: RoHS.

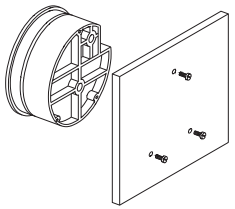
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

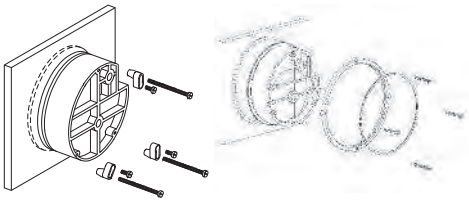
Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

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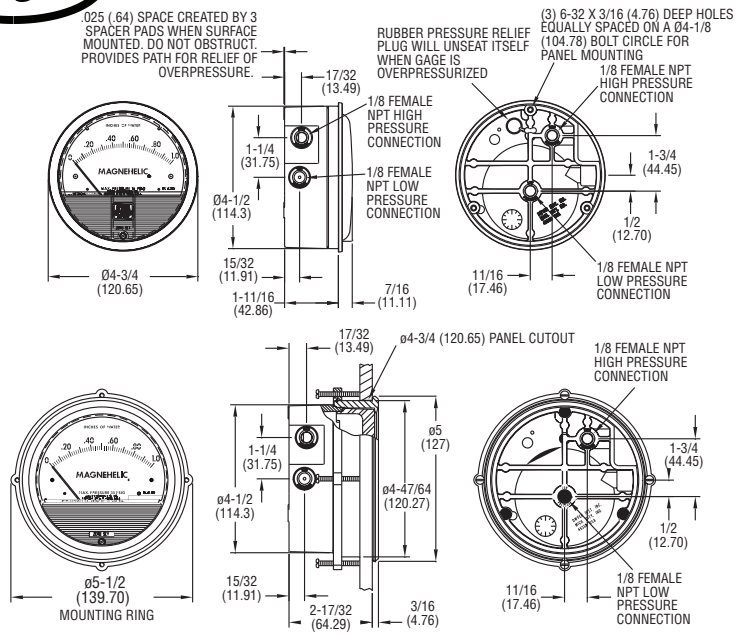
Magnehelic® Differential Pressure Gage
INSTRUCCIONES Y LISTA DE PARTES



(El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicona para el diafragma.)

Accesorios: Tapones 1/8" NPT para las conexiones duplicadas, dos adaptadores de rosca 1/8" NPT a tubo de goma; y tres adaptadores para montaje al ras y tornillos.

Accesorios para Los Modelos MP y HP: El anillo de montaje y el retensor del anillo de presión son substituidos por 3 adaptadores, accesorios de compresión de 1/4" remplazan a los adaptadores de rosca 1/8" a tubo de goma.

Protección Para Sobrepresión: Los Manómetros Diferenciales Magnehelic Estándar están clasificados para una presión máxima de 15 psi y no se deberían de usar donde el límite puede excederse. Los modelos emplean un tapón de goma en el trasero que funciona como una válvula de alivio desmontándose y ventilando el interior del instrumento cuando la sobrepresión alcanza aproximadamente 25 psig. (Los modelos MP y HP son excluidos) Para proveer un camino libre para el alivio de presión, el instrumento viene con rodilleras que mantienen un espacio de .023" cuando el instrumento es montado en superficie. No bloque el espacio creado por estas rodilleras.

† Para aplicaciones con alto ciclo de velocidad dentro de la clasificación de presión total del instrumento, la próxima clasificación mas alta es recomendada. Vea las opciones de media y alta presión.

El instrumento puede ser usado con hidrogeno cuando se ordena con diafragma de Buna-N. La presion tiene que ser menos de 35 psi.

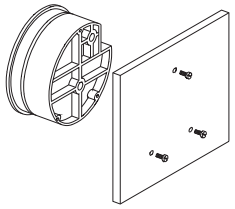
ESPECIFICACIONES

Servicio: aire y gases no combustibles, gases compatibles. (ópcion disponible para uso con gas natural).
Materiales Mojados: Consulte con la fábrica.
Carcasa: Caja y anillo de retención de aluminio fundido a presión con tapadera de acrílico. (El modelo MP tiene la tapadera de policarbonato.)
Exactitud: ±2% de fondo de escala a 21 °C
Mod. 2000-0 ±3%; Mod. 2000-00 ±4%
Límite de Presión: -20 Hg. a 15 psig. † (-0.677 bar a 1,034 bar); opción MP: 35 psig (2.41 bar), opción HP: 80 psig (5.52 bar).
Sobrepresión: El tapón de alivio se abre aproximadamente a los 25 psig, modelos estandard únicamente. El tapón de goma no es usado en los modelos sobre 180 pulgadas de presión de agua, modelos de presión media o alta, o en instrumentos que requieren un elastizado en cualquier otro material que no sea silicio para el diafragma.
Límite de Temperatura: -6.67 a 60ºC. * Modelos de baja temperatura disponibles como opción especial.
Dimensiones: diám. 120,65 mm x 55,6 prof.
Orientación de Montaje: El diafragma debe ser usado solo en posición vertical. Consulte con la fábrica para otras orientaciones de posición.
Conexiones: 1/8" NPT para alta y baja presión, duplicadas (atrás, a los lados).
Peso: 510 g, MP y HP 963 g.
Aprobación de la agencia: RoHS.

Instalacion

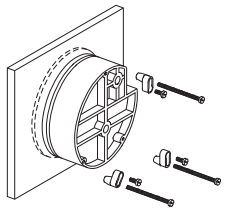
Seleccione un lugar libe de exceso de vibraciones, y donde la temperatura ambiente no supere los 60°C. Evite luz solar directa, para evitar decoloración de la cubierta plástica. Las conexiones de proceso pueden tener cualquier longitud sin afectar la exactitud, pero pueden extender el tiempo de respuesta del instrumento. Si hay pulsación de presión o vibración, consulte a fábrica sobre medios de amortiguación.
Los MAGNEHELIC han sido calibrados con el diafragma vertical, y deben ser usados en esas condiciones. Para otras posiciones, se debe especificar en la orden de provisión. Los de rango elevado pueden ser usados en diversas posiciones, pero se debe reajustar el cero. Los modelos de la serie 2000-00 y equivalentes métricos deben ser usados solo verticalmente.

Montaje en Superficie



Perfore tres orificios separados 120° sobre una circunferencia de 105 mm de diám. y sostenga el instrumento con tres tornillos 6-32 de long. apropiada.

Montaje alineado



Perfore un circulo de 115 mm de diám. en el panel, y sostenga el instrumento mediante los.

Montaje Sobre Pipa

Para montar el instrumento sobre pipas de 32 a 50 mm de diám., ordene el adaptador opcional A-610.

Puesta a Cero Después de Instalar

Deje las conexiones de presión abiertas a atmósfera y ajuste a cero desde tornillo del panel frontal.

Operacion

Presión Positiva: Conecte la tubería desde la fuente de presión a cualquiera de las dos conexiones de alta presión (HIGH), bloqueando la no usada; Las conexiones de baja (LOW) presión pueden dejarse uno o los dos abiertos a la atmósfera.
Presión Negativa: Repita el procedimiento anterior, conectado en este caso las conexiones de baja presión (LOW). Deje las otras conexiones abiertas.
Presión diferencial: Conecte el tubo correspondiente a la presión más positiva al cualquiera de los conectores de alta presión (HIGH) bloqueando el no usado, y la más baja presión o presión negativa (vacío) al conector de baja presión (LOW). Puede usarse cualquier conector de cada par, dejando siempre uno bloqueado. Si se deja una conexión abierta a la atmósfera, se recomienda el uso de un filtro tipo A-331 en el lugar correspondiente para mantener limpio el interior del instrumento. Para uso portable, o instalación temporaria, uso adapta dores para rosca de tubo de 1/89 a tubo flexible, y conecte a proceso mediante una tubería de goma, o equivalente. Para instalación permanente, se recomienda el uso de tubo de cobre o aluminio de por lo menos 1/4" de diám. exterior.

No se requiere mantenimiento específico alguno, ni lubricación. Periódicamente, desconecte el instrumento, ventee la presión acumulada, y reajuste el cero. Para instalaciones permanentes, se debe usar un juego de válvulas de montaje permanente para el venteo.
El instrumento de Serie 2000 no puede ser re parado en el campo y debería de ser regresado si reparos son necesarios (Reparos en el campo no deben de ser intentados y pueden cancelar la garantía.). Asegurarse de incluir una descripción breve del problema más cualquier notas pertinentes a la aplicación para devolución de productos antes de enviar el instrumento.

Cuidado! : La recalibración en campo puede invalidar la garantía. No se recomienda la recalibracion por parte del usuario. En caso necesario envie el instrumento con transporte pago a:

Localización De Fallas

• *El instrumento no indica, o es lento en reacción.*
1. Conexión duplicada abierta.
2. Diafragma roto por sobrepresión.
3. Tubería de conexión perforada, con pérdidas o pinchazos.
4. Anillo de retención flojo, u "O " ring dañado.
5. Conexión a proceso indebida o inadecuada.
6. Temperatura muy baja. Para este caso ordene tipos LT (baja temperatura).

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Cox-Colvin & Associates, Inc. Environmental Services

Standard Operating Procedure Installation and Extraction of the Vapor Pin™

May 20, 2011

Scope:

This standard operating procedure describes the installation and extraction of the Vapor Pin™[1] for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the Vapor Pin™ for the collection of sub-slab soil-gas samples.

Equipment Needed:

- Assembled Vapor Pin™ [Vapor Pin™ and silicone sleeve (Figure 1)];
- Hammer drill;
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00206514 or equivalent);
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch diameter bottle brush;
- Wet/dry vacuum with HEPA filter (optional);
- Vapor Pin™ installation/extraction tool;
- Dead blow hammer;
- Vapor Pin™ flush mount cover, as necessary;
- Vapor Pin™ protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel.

[1]Cox-Colvin & Associates, Inc., designed and developed the Vapor Pin™; a patent is pending.

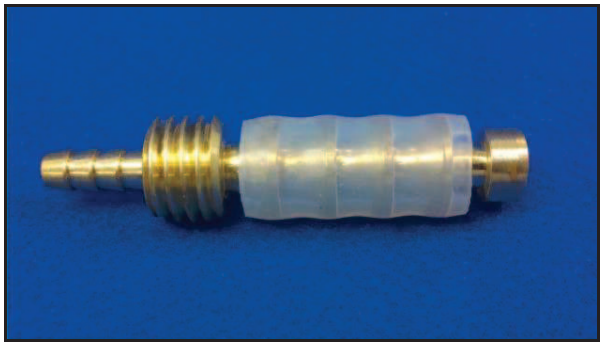


Figure 1. Assembled Vapor Pin™.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch diameter hole at least 1¾-inches into the slab.

4) Drill a 5/8-inch diameter hole through the slab and approximately 1-inch into the underlying soil to form a void.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of Vapor Pin™ assembly into the drilled hole. Place the small hole located in the handle of the extraction/installation tool over the Vapor Pin™ to protect the barb fitting and cap, and tap the Vapor Pin™ into place using a

dead blow hammer (Figure 2). Make sure the extraction/installation tool is aligned parallel to the Vapor Pin™ to avoid damaging the barb fitting.

Figure 2. Installing the Vapor Pin™.

For flush mount installations, unscrew the threaded coupling from the installation/extraction handle and use the hole in the end of the tool to assist with the installation (Figure 3).

Figure 3. Flush-mount installation.

During installation, the silicone sleeve will form a slight bulge between the slab and the Vapor Pin™ shoulder. Place the protective cap on Vapor Pin™ to prevent vapor loss prior to sampling (Figure 4).

Figure 4. Installed Vapor Pin™.

7) For flush mount installations, cover the Vapor Pin™ with a flush mount cover.

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the Vapor Pin™ (Figure 5).

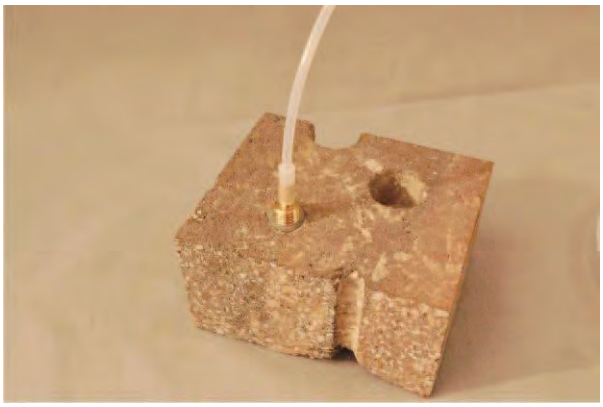


Figure 5. Vapor Pin™ sample connection.

10) Conduct leak tests [(e.g., real-time monitoring of oxygen levels on extracted sub-slab soil gas, or placement of a water

dam around the Vapor Pin™) Figure 6]. Consult your local guidance for possible tests.

Figure 6. Water dam used for leak detection.

11) Collect sub-slab soil gas sample. When finished sampling, replace the protective cap and flush mount cover until the next sampling event. If the sampling is complete, extract the Vapor Pin™.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the Vapor Pin™ (Figure 7). Continue turning the tool to assist in extraction, then pull the Vapor Pin™ from the hole (Figure 8).

Figure 7. Removing the Vapor Pin™.

Figure 8. Extracted Vapor Pin™.

2) Fill the void with hydraulic cement and smooth with the trowel or putty knife.

3) Prior to reuse, remove the silicone sleeve and discard. Decontaminate the Vapor Pin™ in a hot water and Alconox® wash, then heat in an oven to a temperature of 130° C.

The Vapor Pin™ to designed be used repeatedly; however, replacement parts and supplies will be required periodically. These parts are available on-line at www.CoxColvin.com.

Replacement Parts:

Vapor Pin™ Kit Case - VPC001
Vapor Pins™ - VPIN0522
Silicone Sleeves - VPTS077
Installation/Extraction Tool - VPIE023
Protective Caps - VPPC010
Flush Mount Covers - VPFM050
Water Dam - VPWD004
Brush - VPB026

Cox-Colvin & Associates, Inc. Environmental Services

Standard Operating Procedure Use of the Vapor Pin™ Drilling Guide and Secure Cover

July 16, 2012

Scope:

This standard operating procedure (SOP) describes the methodology to use the Vapor Pin™ Drilling Guide and Secure Cover to install and secure a Vapor Pin™ in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a Vapor Pin™ and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the Vapor Pin™ by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled "Installation and Extraction of the Vapor Pin™". However, portions of this SOP should be performed prior to installing the Vapor Pin™.

Equipment Needed:

- Vapor Pin™ Secure Cover (Figure 1);
- Vapor Pin™ Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00226514 or equivalent);
- assembled Vapor Pin™;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

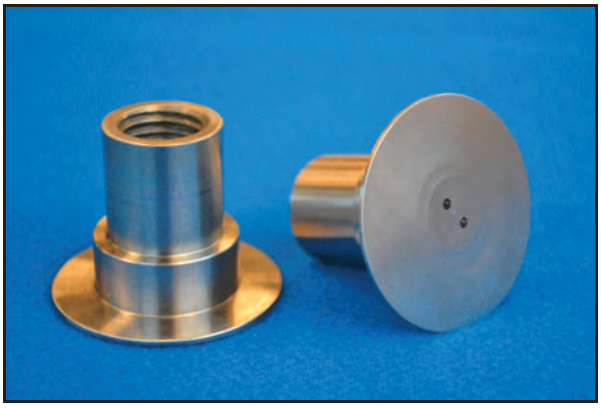


Figure 1. Vapor Pin™ Secure Cover.

Figure 2. Vapor Pin™ Drilling Guide.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a

depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the Vapor Pin™.

Figure 3. Installing the Drilling Guide.

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a $^{5}/_{8}$-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the Vapor Pin™, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the Vapor Pin™ in accordance with the SOP "Installation and Extraction of the Vapor Pin™.

Figure 4. Using the Drilling Guide.

7) Screw the Secure Cover onto the Vapor Pin™ and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

Figure 5. Tightening the Secured Cover.

Limitations:

On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the Vapor Pin™.

INSTALLATION & OPERATING INSTRUCTIONS
Instruction P/N IN015 Rev E
FOR *CHECKPOINT IIa*™ P/N 28001-2 & 28001-3
RADON SYSTEM ALARM

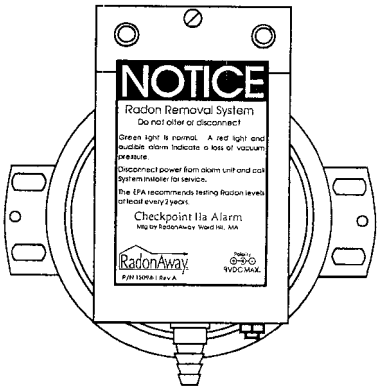
INSTALLATION INSTRUCTIONS
(WALL MOUNTING)

Select a suitable wall location near a vertical section of the suction pipe. The unit should be mounted about four or five feet above the floor and as close to the suction pipe as possible. Keep in mind that with the plug-in transformer provided, the unit must also be within six feet of a 120V receptacle. **NOTE: The Checkpoint IIa is calibrated for vertical mounting, horizontal mounting will affect switchpoint calibration.**

Drill two ¼" holes 4" apart horizontally where the unit is to be mounted.

Install the two ¼" wall anchors provided.

Hang the CHECKPOINT IIa from the two mouting holes located on the mounting bracket. Tighten the mounting screws so the unit fits snugly and securely against the wall.



Drill a 5/16" hole into the side of the vent pipe about 6" higher than the top of the unit.

Insert the vinyl tubing provided about 1" inside the suction pipe.

Cut a suitable length of vinyl tubing and attach it to the pressure switch connector on the CHECKPOINT IIa.

CALIBRATION AND OPERATION.

The CHECKPOINT IIa units are calibrated and sealed at the factory to alarm when the vacuum pressure falls below the factory setting and should not normally require field calibration. Factory Settings are:
28001-2 -.25" WC Vacuum
28001-3 -.10" WC Vacuum

To Verify Operation:

With the exhaust fan off or the pressure tubing disconnected and the CHECKPOINT IIa plugged in, both the red indicator light and the audible alarm should be on.

Turn the fan system on or connect the pressure tubing to the fan piping. The red light and the audible alarm should go off. The green light should come on.

Now turn the fan off. The red light and audible alarm should come on in about two or three seconds and the green light should go out.

WARRANTY INFORMATION

Subject to applicable consumer protection legislation, RadonAway warrants that the CHECKPOINT IIa will be free from defective material and workmanship for a period of (1) year from the date of purchase. Warranty is contingent on installation in accordance with the instructions provided. This warranty does not apply where repairs or alterations have been made or attempted by others; or the unit has been abused or misused. Warranty does not include damage in shipment unless the damage is due to the negligence of RadonAway. All other warranties, expressed or written, are not valid. To make a claim under these limited warranties, you must return the defective item to RadonAway with a copy of the purchase receipt. RadonAway is not responsible for installation or removal cost associated with this warranty. In no case is RadonAway liable beyond the repair or replacement of the defective product FOB RadonAway.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THERE IS NO WARRANTY OF MERCHANTIBILITY. ALL OTHER WARRANTIES, EXPRESSED OR WRITTEN, ARE NOT VALID.

For service under these warranties, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. **No returns can be accepted without an RMA.** If factory return is required, the customer assumes all shipping costs to and from factory.

Manufactured by:
RadonAway
Ward Hill, MA
(978)-521-3703

Appendix H:

CAMP Monitoring Plan

Community Air Monitoring Plan
Former Loudon & Kem Cleaners
Albany, New York
NYSDEC Site No. C401060

This Community Air Monitoring Plan (CAMP) has been prepared to be implemented during the remedial program, including Pre-Design Investigation and remediation construction, at the Former Loudon and Kem Cleaners Site, City of Albany, Albany County, New York (the "Site"). The site is being investigated in accordance with the Brownfield Cleanup Agreement (#C401060-08-16) between DF Acquisitions, LLC (Volunteer) and the New York State Department of Environmental Conservation (NYSDEC).

A CAMP requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities that may impact air quality are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air. Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Site Background

The Former Loudon and Kem Cleaners site is located in an urban area in the northern section of the City of Albany, NY. The site is northwest of Northern Boulevard, northeast of Albany-Shaker Road, east of Old Hickory Road, and southwest of Loudonville Road (Route 9). The site area is approximately 3.9 acres and is developed with an L-shaped retail building (strip mall). The building contains many separate businesses that operate in the single-story portion of the building and a three story office building located in the center of the building. The remainder of the site is parking for the businesses and office.

Two separate addresses/tenant spaces were occupied by dry cleaners (known as Loudon Dry Cleaners, Kem Cleaners and possibly other names) that used tetrachloroethene (Perc, PCE) from approximately 1954 to 1997. The the most recent dry cleaner business, Kem Cleaners, converted to 'drop-off service only' in 1997 and no longer used PCE on-site. There are currently no dry cleaning businesses on-site.

Based on investigations conducted to date, the primary contaminants of concern (COC) for the site include the following chlorinated solvents: tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene (cis-DCE), and vinyl chloride (VC). PCE and its breakdown products are found in on-site and/or off-site soil, ground water, and soil vapor that exceed standards, criteria, or guidance values (SCGs). The NYSDEC published a Record of Decision (ROD) in March 2015 that outlined a remedy for on-site and off-site impacts. DF Acquisitions, as a Volunteer in

the BCA, has committed to implementing the on-site portions of the remedy, which includes installing and operating a soil vapor extraction system (SVE), sub-slab depressurization systems (SSDS), and performing long-term monitoring.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area may be necessary.

The scope of work to be performed during the remedial program at the Former Loudon and Kem Cleaner Site includes installing a SVE, SSDS, and performing long-term monitoring. Ground intrusive tasks will include the installation trenches and piping for the SVE system.

Periodic monitoring for VOCs will be conducted consistent with the monitoring requirements specified in the Site Health and Safety Plan. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

Continuous monitoring consists of measuring air quality using a device capable of continuous measurement and data logging. The device can display instantaneous and time-averaged values. Continuous particulate monitoring will be performed if visible dust cannot be controlled in the work area as described below. Continuous VOC monitoring will be conducted if periodic photoionization detector (PID) measurements are greater than the action levels described below.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored in the work area on a periodic basis using a PID equipped with a 10.2 electron volt (eV) lamp. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The PID will be calibrated at least daily following the manufacturer's instructions.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for 15-minutes, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background based on a continuous 15-minute average.

- If the organic vapor level is above 25 ppm at the downwind perimeter of the work area, activities will be shutdown.

All readings will be recorded and documented in a log book, field notes, or appropriate field data form.

Particulate Monitoring, Response Levels, and Actions

The potential for generating excessive fugitive dust during drilling and well installation activities is very low because of the anticipated moisture content of the soil that will be encountered. Dust likely will be generated for short periods of time during the preparation of the slurry grout to backfill each borehole. Exposure can be mitigated by employing work practices that will minimize or eliminate dust and particulates in the work zone. Work practices include wetting dry or dusty materials as soon as practical. Airborne particulates will be monitored by visual observation and corrective measures will be implemented for control, as necessary.

Fugitive dust migration will be visually assessed during all work activities. If dust cannot be controlled in the work area, or persists for more than 15 minutes, then particulate concentrations will be monitored continuously at the downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed

- 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work will be stopped and re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and documented in a log book, field notes, or appropriate field data form.

Appendix I:

Soil Management Plan

ALPHA GEOSCIENCE
Geology
Hydrology
Remediation
Water Supply

September 7, 2018

Mr. Kyle Forster
NYS Dept. of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233-7016

Re: Excavation & Soil Management Work Plan
Former Loudon and Kem Cleaners Brownfield Cleanup Site
350 Northern Boulevard
Albany, New York
NYSDEC Site ID #C401060

Dear Mr. Forster:

The purpose if this Excavation & Soil Management Work Plan is to inform you of the planned excavation and to describe the procedures for screening, stockpiling, and disposing of soils generated during the installation of the soil vapor extraction (SVE) system at the Former Loudon and Kem Cleaners BCP Site (NYSDEC Site ID #C401060).

Site Background

The Former Loudon and Kem Cleaners site is located in an urban area in the northern section of the City of Albany, NY. The site is northwest of Northern Boulevard, northeast of Albany-Shaker Road, east of Old Hickory Drive, and southwest of Loudonville Road (Route 9). A site location map is attached as Figure 1. The former Kem and Loudon Cleaners were located on the southwest "L" of the plaza (Figure 2). The primary contaminants of concern (COC) for the site include the following dry-cleaning related chlorinated solvents: tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene (cis-DCE), and vinyl chloride (VC). The onsite contaminants are generally limited to the vapor phase.

Description of Current Activities

The current site owner (DF Acquisitions, LLC) has entered into a Brownfield Cleanup Agreement with the NYSDEC as a Volunteer to implement the on-site components of the remedy described in the 2015 Record of Decision (ROD). The on-site components of the remedy include the installation of an SVE system to remediate soil vapors beneath and around the southwestern wing of the on-site building.

Installation of the SVE system is anticipated to begin in September 2018. Installation includes excavation of a trench for the piping to connect the SVE wells to the treatment shed that will be located behind the building. Installation of a new portion of the sanitary sewer that will replace a

collapsed section will take place concurrently with installation of the SVE piping. The new six-inch diameter sanitary sewer will be placed at a depth of approximately four feet below grade. The sanitary sewer trench will be back-filled to a depth of approximately 1.5 to 2 feet. The SVE piping will be placed in the same trench as the new sewer and back filled with sand or crushed stone to grade. The location of the planned excavation is shown on Figure 3. The surface will be returned to its original condition (paved or concrete) at a later date as part of the ongoing renovations of the plaza.

Anticipated Environmental Conditions

Based on the soil analytical results contained in the Remedial Investigation Report (Shaw, 2014), on-site soil meets unrestricted use soil cleanup objectives. Soil samples collected by Alpha during the installation of the soil vapor extraction wells (Alpha, 2017) and during the installation of the sub-slab depressurization system (SSDS) also meet unrestricted use soil clean up objectives for VOCs. Headspace readings for soils collected from depths up to five feet during the remedial investigation (Shaw, 2014) and installation of SVE wells and SSDS system were generally non-detect (less than 0.1 parts per million [ppm]) to 0.7 ppm.

Soil Screening, Staging, and Characterization Methods

Soil screening will be performed by a geologist from Alpha during excavation using visual and instrument-based (photo-ionization detector [PID]) methods. While none is anticipated to be encountered, contaminated soils will be segregated based on field screening for staining, odors, or elevated PID readings (greater than 50 ppm above background). Soil with PID readings less than 10 ppm will be used to back fill the excavation to a depth of approximately two feet. Excavated soils that are not used for backfill will be placed in drums or a lined, sealed roll-off container. Any soil that require segregation based on the field screening observations of staining, odors, or elevated PID readings will be placed in a separate, labeled drum. All drums will be properly labeled and staged in a secure area, pending characterization and approval by the waste facility and the NYSDEC.

It is anticipated that approximately 110 cubic yards (cu. yd.) of soil will be excavated from the approximately 320 linear feet of trench. Approximately 60 cu. yd. of soil that meets the criteria will be reused as backfill in the trench. Approximately 30 to 60 cu. yd. of soil will be transported of-site for disposal.

The waste disposal company will identify the number of samples and analyses required. Representative samples of the excavated soil will be collected and submitted to a NYSDOH ELAP-certified laboratory for testing of VOCs by USEPA Method 8260. If soils were encountered that required segregation based on field screening, additional analyses may be required. The analytical results will be submitted to the NYSDEC Division of Solid and Hazardous Waste with a request for a “contained-in” determination.

Pending the “contained-in” determination, the soil will will be loaded into a NYSDEC Part 364 permitted truck or trailer and transported by MC Environmental Services (MCES) of South

Glens Falls, NY to the approved waste disposal facility. All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited.

Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Monthly Progress Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Compliance Statement

The work described in this plan will be performed in compliance with the approved Remedial Design Report for Soil Vapor Extraction and Vapor Mitigation prepared by Alpine, 29 CFR 1910.120, the Community Air Monitoring Plan (CAMP), the draft Excavation Work Plan (EWP), and site Health and Safety Plan (HASP). Site workers involved with the excavation will have, at a minimum, 24-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training. A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of excavated material. The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

Please do not hesitate to contact me if you have any questions. Thank you.

Sincerely,
Alpha Geoscience

Scott M. Hulseapple, PG, CPG
Hydrogeologist

Attachments
Cc: F. Lanni – DF Acquisitions, LLC
J. Privitera – MLTW, P.C.
M. Schnitzer, P.E. – Alpine

SMH/bms
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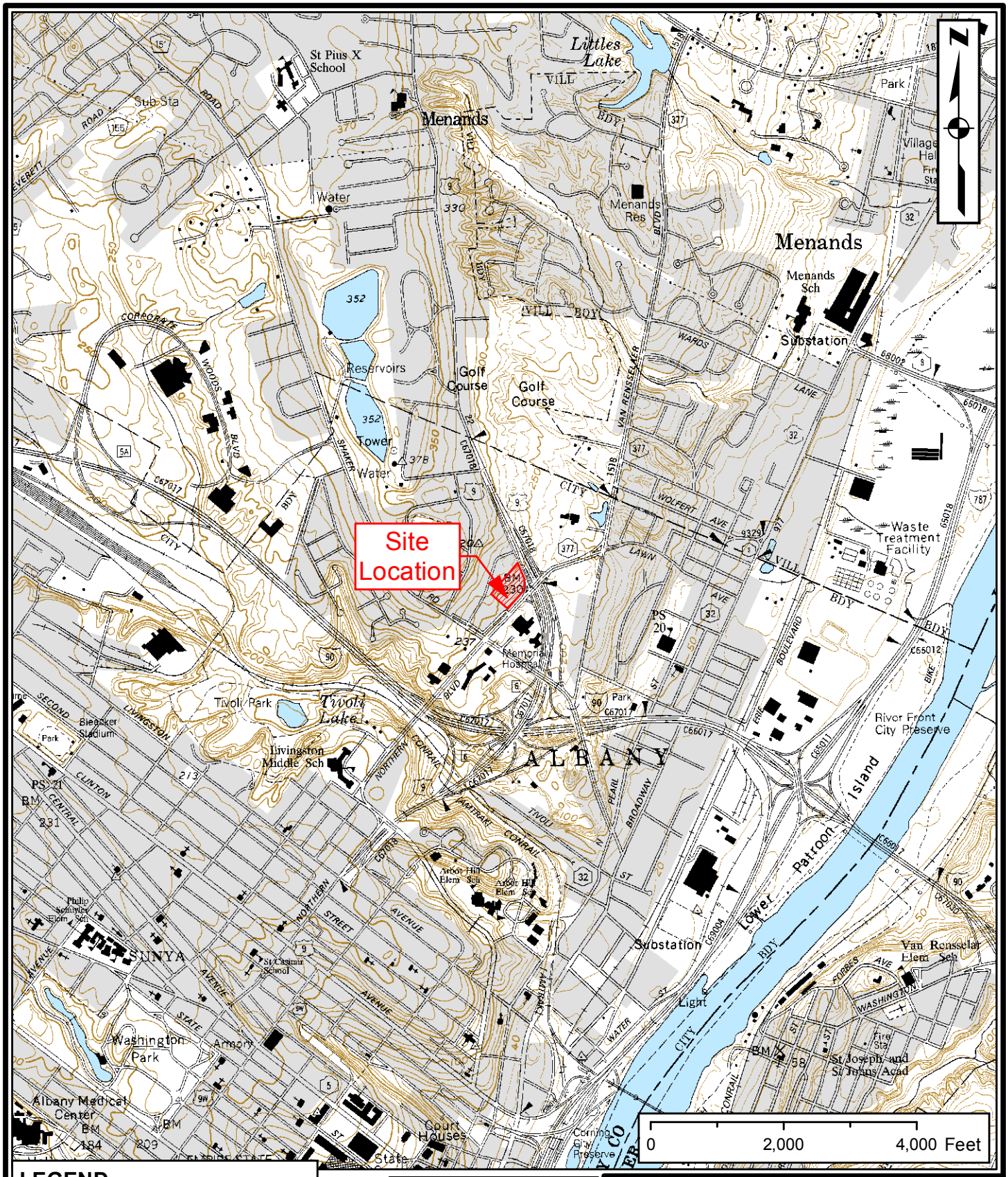
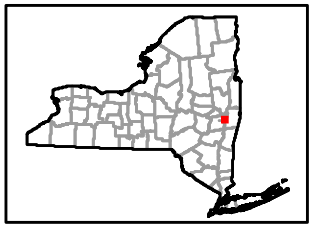


LEGEND

Site Boundary (approx.)

Source:
-NYSDOT 7.5-minute topographic map (Albany and Troy South quadrangles).
-Elevations are shown in feet above mean sea level.
-Contour interval is 10 feet.



ALPHA GEOSCIENCE

Proj. No. 16117

FIGURE 1
Site Location Map
Former Loudon and Kem Cleaner BCP Site
250 Northern Boulevard
City of Albany
Albany County, New York

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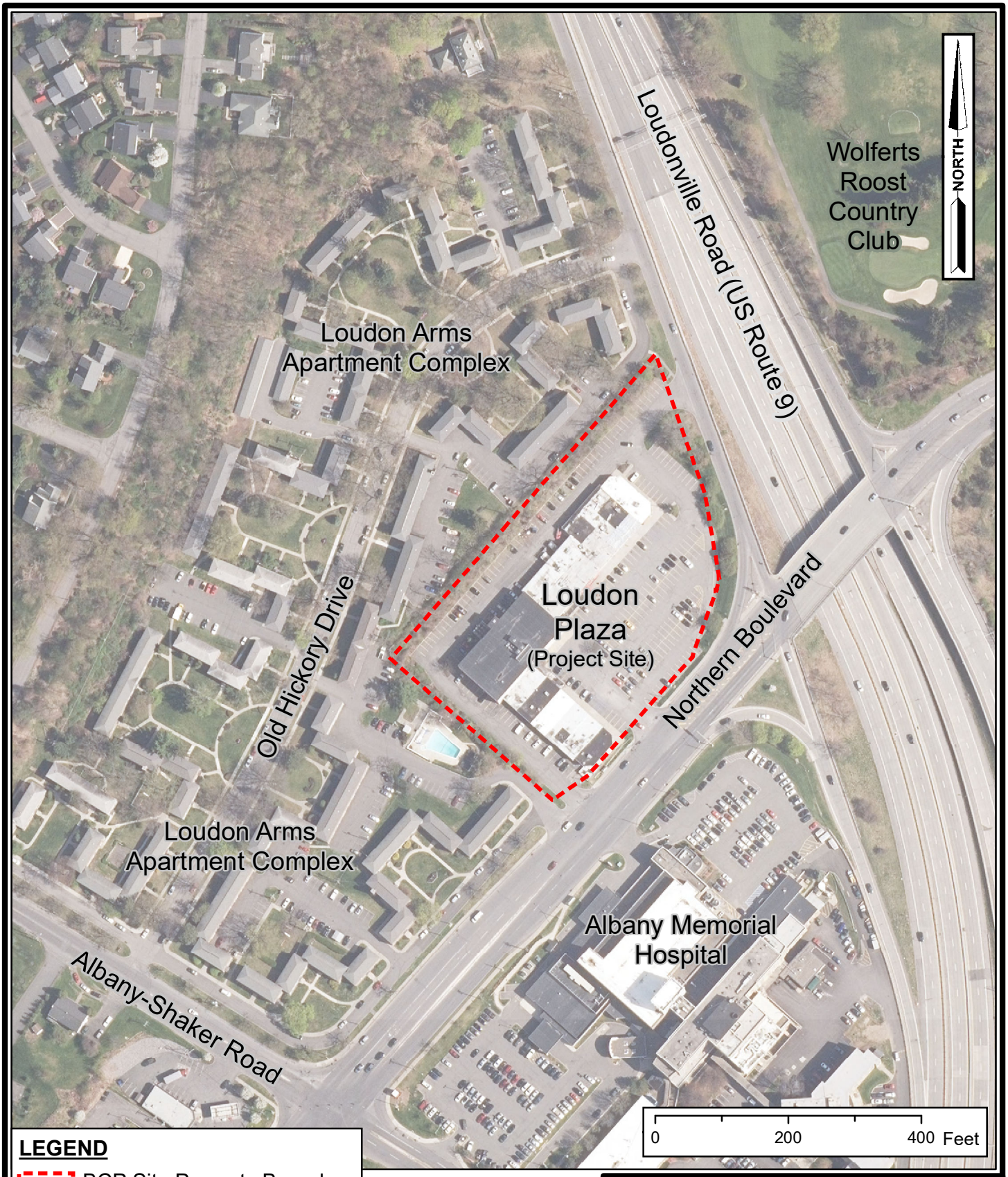

LEGEND

BCP Site Property Boundary

Notes:
-Parcel boundaries: Albany County Tax Map (2015), Sheet 65-07.
-Basemap: Albany County 12-inch resolution natural color orthoimagery (2014), NYS Office of Information Technology Services (ITS) (http://www.nysgis.state.ny.us).
-Locations and boundaries are approximate.

ALPHA GEOSCIENCE

Proj. No. 16117

FIGURE 2
Site Map

Former Loudon & Kem Cleaners BCP Site
NYSDEC ID #C401060
350 Northern Boulevard
City of Albany
Albany County, New York

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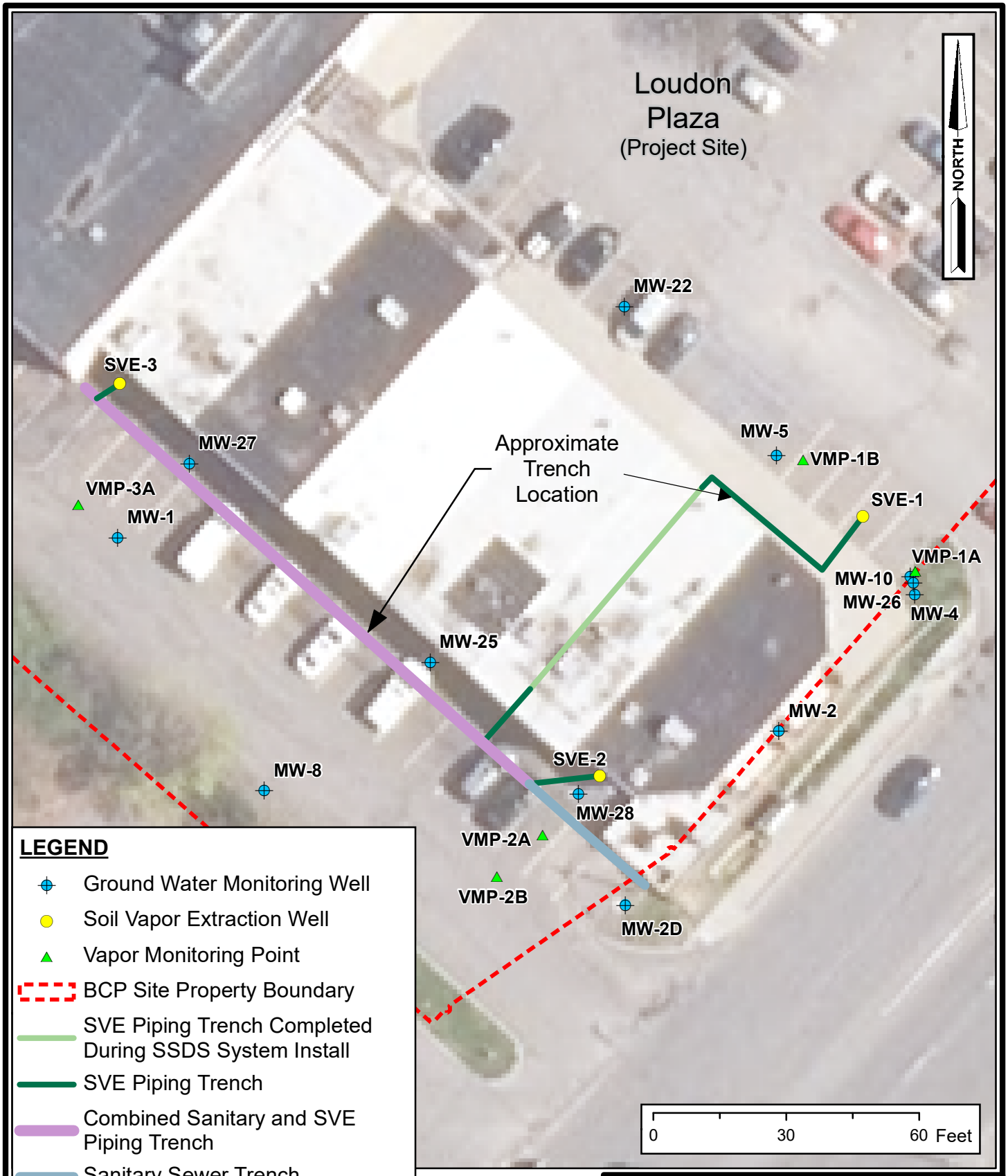

Notes:
-Parcel boundaries: Albany County Tax Map (2015), Sheet 65-07.
-Basemap: Albany County 12-inch resolution natural color orthoimagery (2014), NYS Office of Information Technology Services (ITS) (http://www.nysgis.state.ny.us).
-Locations and boundaries are approximate.

ALPHA GEOSCIENCE

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FIGURE 3
Proposed Combined Sanitary Sewer and SVE Piping Trench
Former Loudon & Kem Cleaners BCP Site
NYSDEC ID #C401060
350 Northern Boulevard
City of Albany
Albany County, New York

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