FINAL REPORT

Demonstration/Validation of More Cost-Effective Methods for Mitigating Radon and VOC Subsurface Vapor Intrusion to Indoor Air

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New lines of evidence and mathematical modeling are developed to aid in the design and performance monitoring of subslab venting systems for mitigation of radon and volatile organic compound vapor intrusion to protect the health of building occupants from inhalation exposures. The results indicate that the system performance depends strongly on the relative permeability of the floor slab and the material below the floor slab, and that both parameters can be determined with reasonable confidence using tests and analysis that are rapid and affordable. Where coarse granular fill is present below a high quality floor slab (typical in DoD building stock), the radius of influence may extend to considerable distances, which reduces the number of suction points required and the associated capital cost. Where a system already exists, mass emission monitoring may help reduce the operation, maintenance and monitoring costs.

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ACRONYMS AND ABBREVIATIONS

ΔP	differential pressure
ΔT	differential temperature
AF	Attenuation Factor (the ratio of indoor air VOC concentration/subsurface concentration)
AFB	Air Force Base
ASD	Active Soil Depressurization, also known as subslab depressurization (SSD).
ATD	Automatic Thermal Desorption
BPC	Building Pressure Cycling
Bq/m^3	Becquerels per cubic meter
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CH_4	methane
Cia or C_{IA}	Concentration in indoor air
cDCE	cis-1,2-dichloroethene
CO_2	carbon dioxide
COPCs	Compounds of Potential Concern
CSM	Conceptual Site Model
Cssv	Concentration in effluent of subslab venting system
11DCE	1,1-dichloroethene
DoD	Department of Defense
DQO	data quality objectives
ECD	Electron Capture Detector
EPA	Environmental Protection Agency
ER	Environmental Restoration

ESTCP	Environmental Security Technology Certification Program
FID	flame ionization detector
GC/MS	gas chromatography/mass spectroscopy
GIS	geographic information system
GWSL	Groundwater Screening Level
GWVC	Groundwater Vapor Concentration (groundwater concentration x Henry's Constant)
He	helium
HI	Hazard Index
HVAC	Heating, Ventilating and Air Conditioning
HVS	high volume sample
in-H_2O	inches of water column
IA	indoor air
IASL	Indoor Air Screening Level
IRP	Installation Restoration Program
J&E	Johnson and Ettinger
L	Liters
L/day	Liters per day
LTM	Long-Term Monitoring
ML	mass loading
MRL	Minimal Risk Level
MTBE	Methyl-tert-butyl ether
O_2	oxygen
OA	outdoor air
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration

OSWER	Office of Solid Waste and Emergency Response
OVM	Organic Vapor Monitor
Pa	pascals
PCE	Tetrachloroethene (a.k.a., Perchloroethene)
PEL	Permissible Exposure Level
PID	photoionization detector
QAPP	Quality Assurance Project Plan
Q_{BPC}	flow rate of air during building pressure cycling
Qssv	flow rate of subslab venting system
Q_{tracer}	Flow rate of tracer gas
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RAO	Response Action Outcome
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROI	Radius of Influence
RPM	Remedial Project Manager
RSL	Regional Screening Level
SC	Site Closure
SF_6	sulfur hexafluoride
SL	Screening Level
SSD	Subslab Depressurization, also known as active soil depressurization (ASD)
SSV	Subslab Ventilation
SSSL	Subslab Screening Level

SSSG	subslab soil gas
TCE	trichloroethene
TMB	trimethylbenzenes
μg/L	micrograms per liter
$\mu g/m^3$	microgram per cubic meter
VC	Vinyl chloride
VI	Vapor Intrusion
VOC	Volatile Organic Compound
VISL	Vapor Intrusion Screening Level
WMS	Waterloo Membrane Sampler

GLOSSARY OF TERMS

Advection – movement of a fluid and associated chemicals in response to a pressure gradient.

Aerated floors – a subslab design option which creates a very highly permeable space below the floor slab to facilitate mitigation with minimal long-term costs.

Air Exchange Rate – average rate at which the air inside a building is replaced with new air.

Attenuation Factor – the ratio of indoor air concentration to concentration at some depth below the building. Also known as alpha factor, AF or α.

Atypical Preferential Pathways – conduits that facilitate vapor transport (i.e., highly permeable to facilitate advection) much more than typical entry points for subsurface vapors into a building (e.g., sewer pipes with ineffective traps, large floor drains). The conduit must connect the building to a source of VOCs and there must also be a pressure gradient to drive advection before an atypical preferential pathway will contribute significantly to indoor air VOC concentrations.

Background – sources of volatile organic compounds that are not in the subsurface, such as consumer products and building materials inside a building and outdoor air.

Blower-Door – fan within a frame that fits snugly with a door frame and is used to either pressurize or depressurize a building (usually for energy audits, but easily re-purposed for building pressure cycling tests or mitigation system stress tests).

Building Pressure Cycling – sampling indoor air after manipulating the pressure of the building to be higher and then lower than atmospheric to turn vapor intrusion "off" and then "on". The product of the exhaust rate and VOC or radon concentrations under low pressure provides a measure of the emissions available to enter the building from the subsurface and the difference in concentrations between samples collected with positive and negative pressure assists in documenting background sources.

Diffusion – migration of molecules in response to a concentration gradient.

Henry's Law Constant – the ratio of the concentration of a vapor in air and the concentration of the same compound as a solute in water where the air and water are in contact in a closed system at equilibrium (temperature dependent).

High Volume Sampling – sampling where the volume of gas extracted from the subsurface is purposefully large to enable interpretation of vapor concentrations between and beyond suction points, provide data for understanding the permeability of materials below the floor slab to interpret the radius of extracted gas and the rate of leakage across the floor slab to interpret dilution in the extracted gas concentrations.

Mass Flux – mass per unit area per unit time across a surface

Mass Emission, Mass Loading, or Mass Discharge – mass per unit time across a surface with a specified area. Equal to the flux multiplied by the area of the surface being crossed.

Mitigation – protection of indoor air quality through engineering controls such as subslab venting, subslab depressurization, indoor air pressurization, increased building ventilation, indoor air purification with filters, etc. This is distinct from remediation, where the goal is to reduce subsurface concentrations below levels of potential concern for a permanent remedy.

Multiple Lines of Evidence (MLE) – Use of multiple distinctly different approaches to VI assessment to reduce uncertainty in the determination of potential human health risks. Sampling and analysis of multiple media (outdoor air, indoor air, soil gas and groundwater) are all subject to similar uncertainties (spatial and temporal variability, background sources). Building pressure and air exchange rates (physics), soil texture and layering (geology), soil moisture, water table depth and recharge rates (hydrology), microbially-mediated degradation (biology) and building ventilation (mechanical engineering) can all provide additional lines of evidence to help interpret the chemistry data.

Passive Sampling – sample collection by diffusion or permeation, rather than advection.

Radius of Influence – radial distance from the point of suction to a condition of minimal influence. This has traditionally been defined by an applied vacuum level of a few pascals or less for subslab depressurization systems but could also be defined by a gas velocity of a few feet per day or less in a subslab venting system, by a certain travel time, or by a certain proportion of flow from below the floor.

Reasonable Maximum Exposure – Concentrations that are unlikely to be exceeded during a period of human occupancy but are still within a range that is reasonably expected.

Screening level – concentration considered to pose no unacceptable risk.

Tracers – parameters that migrate in a manner analogous to parameters of interest but can be monitored with less uncertainty or a lower cost. For example, sulfur hexafluoride (SF_6) is often used as a tracer to measure building air exchange rates, proportion of flow across the floor slab during subslab venting operations, etc. In this study, helium (He) was used as a tracer to measure subsurface gas travel times.

Vadose zone – region between the ground surface and the zone of saturation at the top of the capillary fringe above the water table.

Vapor Intrusion – migration of volatile organic compounds from the subsurface to indoor air.

VI assessment – evaluation of whether VI poses unacceptable health risks to occupants of current or potential future buildings.

VI Guidance – Documents issued by regulatory agencies describing preferred methods of VI screening and assessment including sampling and analysis recommendations, conceptual site model considerations, frequency and timing considerations, generic screening levels

for indoor air, soil vapor and groundwater concentrations, mitigation considerations, and communication.

VI Screening – selection of buildings for which VI assessment is warranted.

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ABSTRACT

Introduction and Objectives

Human health risks from vapor intrusion related inhalation exposures to VOCs and radon are typically mitigated with subslab depressurization systems, the design and performance monitoring of which is typically based only on static vacuum measurements across the floor slab. The objective of this research was to develop a more comprehensive approach to provide protective systems at a lower overall cost.

Technology Description

The technology is parallel to the design and performance monitoring of a groundwater extraction system for containment of a contaminant plume. Components include monitoring ambient pressure gradients, pumping tests to measure vacuum vs time and vacuum vs distance, subslab tracer testing to measure gas travel rates, flow rate and concentration measurements in vent pipes, and mathematical modeling using a two-layer radial analytical solution developed by Hantush and Jacob (1955). This yields information on vacuum vs distance, velocity vs distance, travel time vs distance, proportion of flow originating below the slab vs distance and mass removal rates, all of which can be compared to performance targets to provide a basis for design and operation of an efficient and effective subslab depressurization or venting system. These data can also be used to calculate a building-specific attenuation factor for building-specific subslab screening levels.

Performance and Cost Assessment

The field methods are relatively fast and simple, using methods that are similar to pilot testing of soil vapor extraction and groundwater pumping test analysis. The mathematical models are either commercially available or easily programmed into a spreadsheet. As a result, the incremental cost to collect and analyze the data is easily offset by the benefits of avoiding overdesigned systems: reduced capital costs (smaller fans and/or fewer suction points) and operational costs (minimizing power consumption and the energy penalty associated with discharge of conditioned indoor air that leaks through the floor). Based on the buildings testing in this research, savings increase with the size of the building. DoD specifications require granular fill below the floor slab and reinforced concrete floor slabs, which generally results in a high contrast in the gas-permeability between the two layers, which is the ideal application for this technology.

Implementation Issues

Implementation issues will be minimal for most DoD buildings. For rare cases where the floor slab rests on very low permeability native soil, subslab venting systems may not achieve sufficient flow or mass removal to be protective of indoor air quality, in which case, other options such as aerated floors, building ventilation and/or barriers may be needed. For new construction, aerated floors may provide a less expensive mitigation option. Adoption of this technology into written standards may take some time.

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McAlary, T. Emerging Solutions for Vapor Intrusion, invited presentation at a half-day training session hosted by Maxxam Analytics, Mississauga, August 25, 2016.

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Mali, D., McAlary, T., Nicholson, P. and W. Wertz, 2016. New Methods for Design and Performance Monitoring of Subslab Depressurization Systems for VOCs and Radon, platform presentation at the Canadian Society for Civil Engineering (CSCE) Resilient Infrastructure Conference, London, ON, June 1-4, 2016.

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EXECUTIVE SUMMARY

Introduction

Subsurface vapor intrusion (VI) to indoor air of volatile organic compounds (VOCs) and radon pose potential health risks to building occupants through inhalation exposures. The most common method for mitigating risks is subslab depressurization (SSD), which is also known as active soil depressurization (ASD) or may be referred to as subslab ventilation (SSV) if the goal is to reduce concentrations below the floor slab instead of establishing a vacuum below the floor. SSD systems enhance subslab ventilation and SSV systems cause subslab depressurization, so the terms are interchangeable to some degree. Design and performance specifications were developed by radon researchers decades ago and were based mostly on achieving a measurable vacuum below the concrete floor slab. For example, EPA/625/5-88/024 (U.S. EPA 1988) recommended a minimum applied vacuum of 4 pascals and ASTM E2121 (ASTM 2013) recommended a minimum applied vacuum of 6 to 9 pascals. Revisions to guidance documents are in progress at the time of this report (ANSI/AARST RMS-LB, RMS-MF, RMS-SF for large buildings, multi-family residences and single-family residences, respectively). This poses an opportunity for advances to design and performance assessment, which was the motivation for this research.

Goal and Objectives

The goal of this research was to demonstrate and validate a more rigorous and cost-effective process for design and optimization of systems for mitigating vapor intrusion for VOCs and radon to reduce the capital and long-term operating costs. This research was predicated on the conceptualization that an SSD/SSV or ASD system is essentially a "capture system" that could be designed and monitored using methods analogous to those used to contain the migration of a plume of contaminated groundwater. This demonstration shows how a test procedure analogous to a groundwater pumping test can be performed very quickly and efficiently for subslab gas flow characterization and can be used with tracer testing, mass flux monitoring and mathematical modeling to create several lines of evidence for performance assessment and monitoring to improve mitigation system design and operations.

Specific objectives included:

1. **Reduce Lifecycle Costs** associated with system design and installation, electricity to run fans, and energy loss due to conditioned (heated, cooled, humidified or dehumidified) indoor air being drawn into the subsurface and vented to outdoor air and quantify these costs and recognized savings for comparison to the costs of performing the optimization,

2. **Maintain protection of indoor air quality** by maintaining indoor air concentrations below risk-based screening levels

3. **Maintain a protective mass removal rate**, similar to or higher than the emissions of VOCs and radon through the building during building depressurization testing and/or

comparable to the mass removal rate of an existing mitigation system where the optimization is performed after the initial system commissioning,

4. **Demonstrate and validate the technology** with sufficient data to allow a detailed review by third parties, include different buildings with a range of size and construction typical of DoD building stock, including residential buildings, engage a team of world-leading experts, and employ multiple lines of evidence, analytical modeling and long-term monitoring,

5. **Transfer the technology** to DoD consultants and contractors so that it can be easily adopted and implemented at as many buildings as needed, and

6. **Achieve regulatory approval**.

Technology Description

The scope included field testing at four buildings ranging from 1,200 to 64,000 ft^2 in footprint size. Testing methods included monitoring of:

- ambient cross-slab differential pressure (ΔP) to establish building-specific target subslab vacuum levels (Figure ES-1);
- subslab vacuum vs time in response to fan cycles (on/off) (Figure ES-2) and subslab vacuum vs radial distance (Figure ES-3) for matching to Equations 1 and 4 to characterize the transmissivity (T) and leakance (B);
- subslab tracer testing (Figure ES-4) to measure travel time from different radial distances to the point of suction to enable performance evaluation based on travel time and velocity;
- flow rate and VOC/radon concentrations in the vent-pipes under various operating conditions to assess the mass removal rate as a function of gas extraction rate for comparison to threshold values of mass loadings via building pressure cycling and the system performance during challenges imposed by a stress test (Table ES-1), and;
- mathematical modeling using the Hantush-Jacob (1955) Leaky Aquifer Model, after making adjustments to account for different density between gas and water.

Analysis of these data yields information regarding the temporal distribution of ambient cross-slab pressure differential, the transmissivity of the material below the floor, the leakage of the floor, the thickness and effective porosity of the dominant zone of air flow beneath the floor, the radial profiles of vacuum, travel time, gas velocity and proportion of flow originating below vs above the floor (Figure ES-5), which provide lines of evidence for system design and performance assessment. These data can also be used to calculate a building-specific attenuation factor (AF) to support customized subslab screening levels:

$$AF = \frac{T\,\Delta P}{B^2 h\,AER} \qquad \text{(EX-1)}$$

where T, ΔP and B are defined above, h is the building height and AER is the air exchange rate.

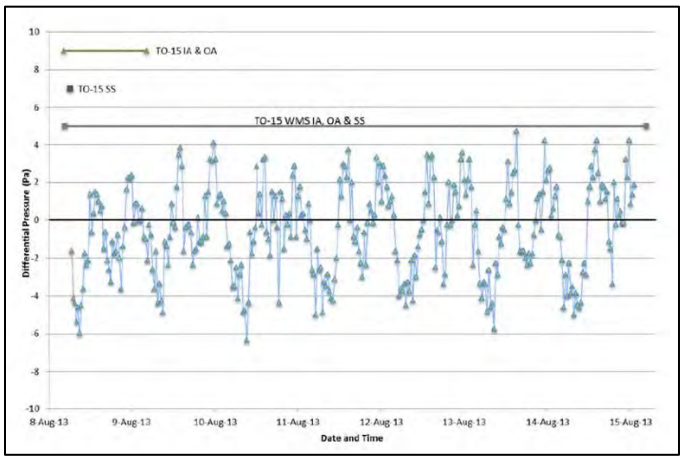


Figure ES- 1: Example of ambient cross-slab differential pressure monitoring

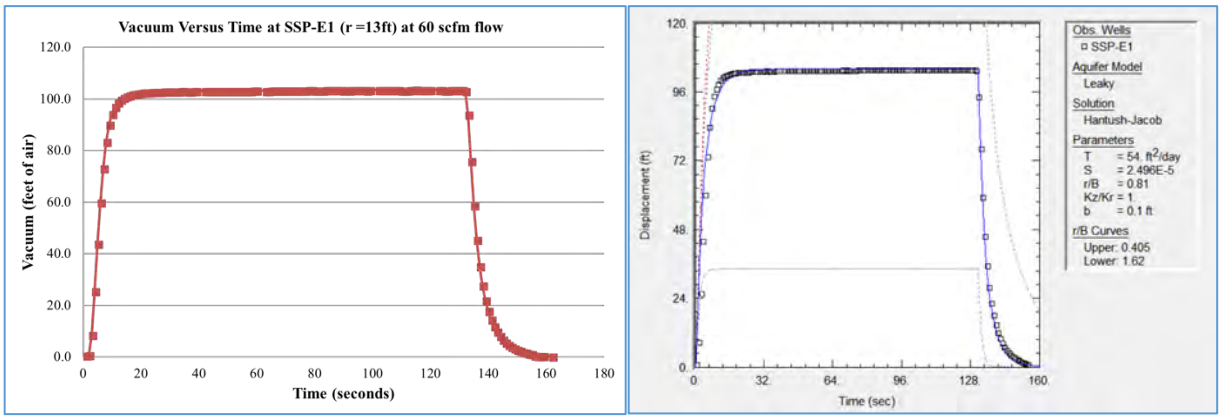


Figure ES- 2: Example of subslab vacuum vs time: raw data (left), and fit to the Hantush-Jacob Model (right)

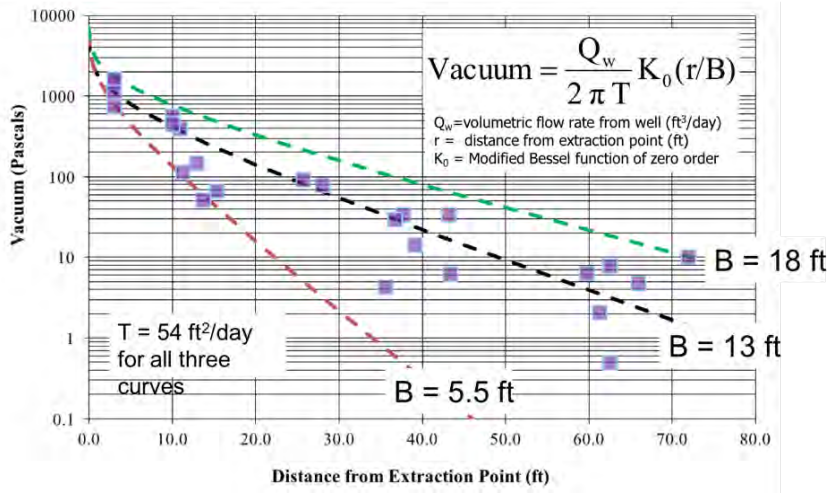


Figure ES- 3: Comparison of vacuum vs distance measurements to profiles calculated using the Hantush-Jacob Model

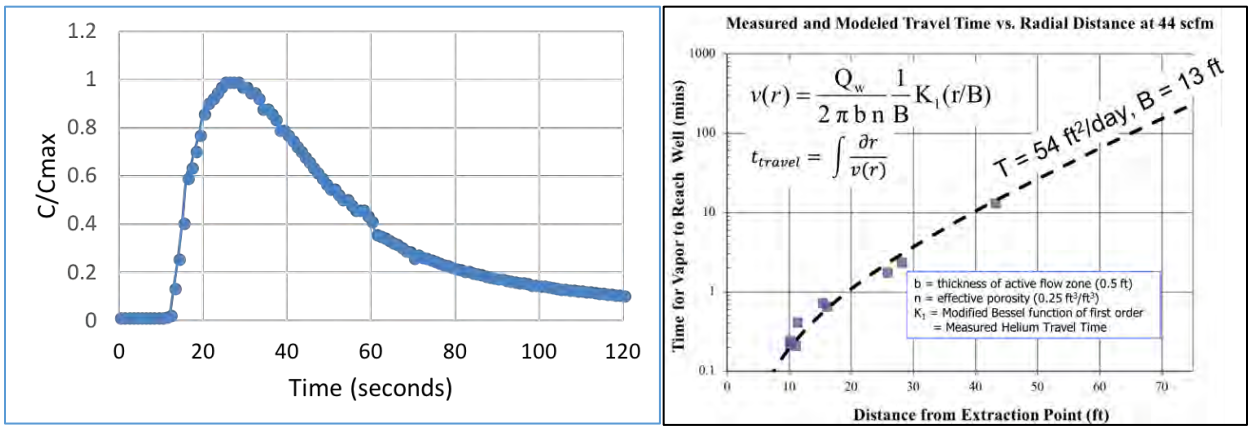


Figure ES- 4: Measured (left) and modelled (right) travel time vs distance from suction point

Table ES- 1: Mass Loadings for a range of operating conditions

			PCE		TCE	
SSV Flow Rate (CFM)	Blower Door Flow (CFM)	Duration (hr)	SSV Mass Loading (g/day)	Building Mass Loading (g/day)	SSV Mass Loading (g/day)	Building Mass Loading (g/day)
50		1	45		1.0	
		5	50		0.79	
25		1	24		0.38	
		16	22		0.30	
25	5100	1	27	2.0	0.30	0.15
60	5100	1	67	1.9	0.74	0.18
		17	50	1.3	0.52	0.10
65	5100	3	55	4.2	0.55	0.14
65	3800	1.5	52	5.7	0.55	0.13
60	3800	4.5	37	3.6	0.42	0.085
60		22 days	10		0.26	

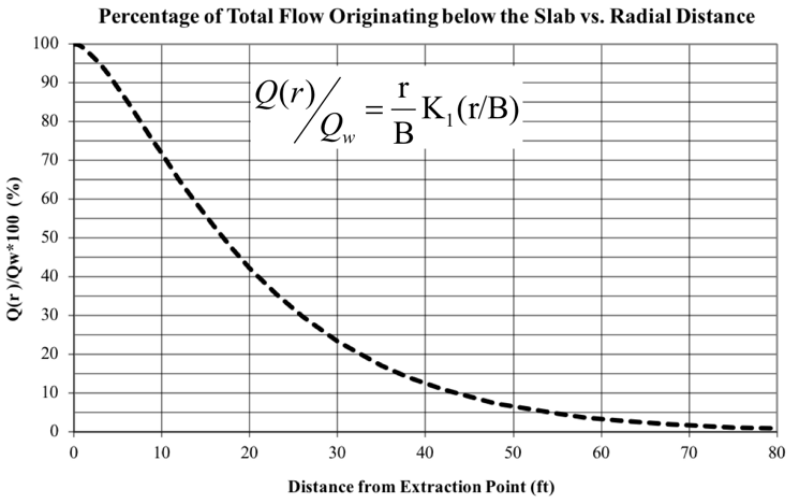


Figure ES- 5: Proportion of flow originating below the floor vs radial distance

Performance Assessment

Where the material below the floor is granular fill (which is usually specified in building codes) and the floor is relatively competent (e.g., few utility penetrations, epoxy sealants, sealed expansion joints), the optimal spacing between suction points can be very large, which reduces the capital cost of installation for a large building compared to designs with closer spacing between suction points. Appendix B of this report provides a worked example of this scenario and shows that conventional design methods tend to underestimate the radius of influence in this scenario. The U.S. DoD has a Unified Facilities Criteria Program (http://www.wbdg.org/ffc/dod) to assure good and consistent construction practice and specifies 4 to 6 inches of reinforced concrete and 6 to 8 inches of ¾-inch granular fill that is gap graded to increase drainage rates (https://www.wbdg.org/guides-specifications/building-envelope-design-guide/below-grade-systems/floor-slabs). As a result, most new DOD buildings will fall into this category.

If the material below the floor is highly permeable, the flow velocity and induced ventilation below the slab can be sufficient to reduce subslab concentrations by subslab ventilation (SSV), even in areas where the induced vacuum is too small to reliably measure. If the ventilation rate below the slab is sufficient to reduce the VOC and radon concentrations to very low levels, then an occasional reversal of the cross-slab pressure gradient will not result in substantial VOC transport into the building, so the conventional minimum subslab vacuum design criteria of 6 to 9 Pa (ASTM E2121) may not be necessary to prevent unacceptable exposures due to vapor intrusion. In such cases, current standard practice generally results in unnecessary installation of larger fans and more suction points, which both increases capital and operation costs, but also results in wasted energy because conditioned indoor air is extracted and exhausted outdoors. The subslab tracer testing, mass flux monitoring and mathematical modeling developed during this research provide additional lines of evidence to support a protective design with smaller induced vacuums, a larger spacing between suction points and/or lower fan power which reduces capital and operating costs. The detailed example in Appendix B illustrates how conventional designs using a minimum specified static vacuum of 6-9 Pa result in a radius of influence estimate of 36 feet, whereas the methods developed in this research demonstrate the ROI is up to about 90 ft. For a building with these characteristics and a floor area of 100,000 ft^2, a conventionally designed system would require 25 suction points drawing 2500 standard cubic feet per minute (scfm) of soil gas whereas an optimized system would require only 4 suction points drawing 400 scfm. Use of the optimized system would be much less costly to install, operate and maintain yet still meet all of the performance objectives. The permeability of the material below the floor and the leakance of the floor vary from building-to-building, so results will vary, but the test procedure includes building-specific measurement of these critical parameters as part of the optimized system design.

The rate of mass removal by the system also provides a useful performance metric that can be compared to the mass loading through a building via building pressure cycling as a means of demonstrating the adequacy of the mitigation system design and performance. It can also be used to support an exit strategy if the system is clearly capturing all the available mass and the rate of mass removal of the mitigation system is insufficient to pose an indoor air quality concern considering the building size and air exchange rate.

Where the material below the floor has a low permeability and the subslab vapor concentrations are very high (i.e., >~1E6 $\mu g/m^3$), diffusive transport of VOCs through the floor slab can

potentially pose indoor air quality concerns even if there is an appreciable vacuum below the floor and supplemental measures such as increased building ventilation, floor coating or carbon filtration may be needed as interim measures until there is a reduction in subslab vapor concentrations.

For new construction, the use of "radon ready" construction with subslab collection pipes or aerated floors enables subslab ventilation with minimal effort and may be feasible with passive ventilation (driven by thermal gradients, wind-driven turbines or solar-powered fans). Vapor barriers alone may be adequate in some cases, but they may also allow vapor concentrations to gradually increase to levels similar to those of the underlying source, and lead to diffusive transport across the barrier that could pose a threat to indoor air quality. Barriers will also inhibit the downward flux of oxygen, which is beneficial for natural degradation of petroleum hydrocarbon vapors and methane.

Cost Assessment

The field methods developed to support mitigation optimization are relatively fast and simple with readily-available equipment and can be mastered by practitioners skilled in the art and sciences of hydrogeology, vapor sampling and soil vapor extraction. The mathematical models are commercially available or readily programmed into a spreadsheet. As a result, the costs associated with implementing the lines-of-evidence developed in this research is modest compared to the potential savings in capital and operations, maintenance and monitoring, so a net savings is to be expected, particularly for larger buildings. The testing program demonstrated that conventional methods for determining a radius of influence may result in a much greater number of suction points being installed than are really needed, which is costly and disruptive. The testing also shows that total system flow rates may commonly also be overdesigned, which wastes electricity to run the fans and also incurs excess energy costs when conditioned indoor air is drawn through the floor and wasted by discharge to outdoor air.

Implementation Issues

Implementation issues will be minimal for most DoD buildings. For rare cases where the floor slab rests on very low permeability native soil, subslab venting systems may not achieve sufficient flow or mass removal to be protective of indoor air and alternatives such as aerated floor, increased building ventilation and/or barriers may be needed. For new construction, it may be preferable to use aerated floors or other options, in which case the analysis developed here would not be needed. Adoption of this technology into written standards may take some time.

1.0 INTRODUCTION

This Final Report was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the U.S. Department of Defense (DoD) Environmental Security Technology Certification Program (ESTCP) as part of ESTCP project ER-201322. The objective of this project is to demonstrate and validate a more cost-effective process for design, optimization and monitoring to reduce the capital and long-term costs of engineered systems for mitigating vapor intrusion for volatile organic compounds (VOCs) and radon. This document was prepared following the ESTCP Final Report Guidance (ESTCP, 2018).

This study included field work at four buildings, selected to span a range of size and construction at locations shown in Figure 1.1:

1) Building 205, Former Raritan Arsenal, Edison, NJ (slab-on-grade commercial, 64,000 ft^2)

2) Building 200, Former Edison Arsenal, Edison, NJ (slab on grade commercial, 2,200 ft^2)

3) Sun Devil Manor, Layton, UT (2-story residence, 1,000 ft^2)

4) Building 11193, Vandenberg AFB, Lompoc, CA (slab-on-grade commercial, 11,000 ft^2)

Figure 1-1: Location of field test sites

1.1 BACKGROUND

Subsurface vapor intrusion into indoor air has been a widely-recognized public health concern for radon for several decades and VOCs for about 30 years. The U.S. DoD is responsible for the health of occupants of thousands of structures built over or near areas of naturally occurring radon gas or

anthropogenic VOCs. For structures where mitigation is needed to reduce indoor air concentrations or achieve regulatory approvals for site closure, active subslab venting (SSV) or subslab depressurization (SSD) systems are the most common mitigation technology.

Conventional SSV/SSD mitigation systems for radon and VOCs are typically based on a decades-old technology and policy (e.g., U.S. EPA, 1993 and ASTM E-2121-13), which specify a minimum target vacuum of 4 pascals or 6 to 9 pascals respectively everywhere below the building floor slab as a performance specification. The reason this level of vacuum is specified is to enable a typical radon contractor to quickly and easily verify an induced vacuum relative to the natural fluctuations in the pressure differential across the floor slab of a building from wind gusts, occupants' activities, exhaust appliance operation, thermal convection (e.g., the "stack effect"), and heating, ventilating and air conditioning (HVAC) operations. Figure 1-2 shows examples of the cross-slab differential pressures measured in three buildings, which have significantly different baseline conditions, including consistently positive, cyclic and neutral. It may be overly-simplistic to assume that one single value for the target imposed vacuum by a mitigation system would be appropriate for all buildings.

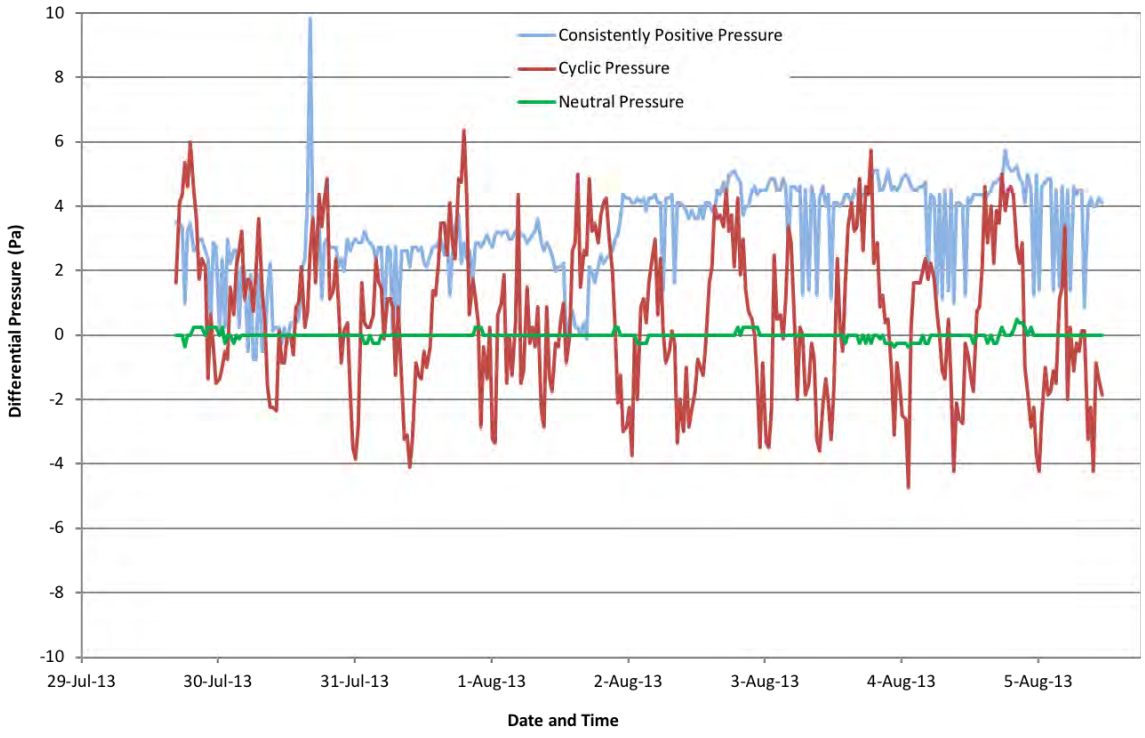


Figure 1-2: Cross-slab pressure differentials for three buildings with no SSV systems

Vacuum measurement is fast and simple, but it is not the ideal performance metric because of baseline fluctuations and instrument sensitivity limitations. Experience has shown that vacuum levels as low as 0.5 to 1 Pa can be protective (Lutes et al., 2011, Moorman, 2009), but the signal-to-noise ratio becomes problematic at low levels of vacuum because wind gusts alone can impart a few pascals of fluctuation in the cross-slab pressure differential. If the target subslab vacuum is set high enough to be easily resolved against baseline fluctuations and account for seasonal

variability, the result may be an over-designed system that is costly to install and operate and draws an excessive amount of conditioned indoor air across the floor slab for discharge above the roofline. Energy efficiency becomes increasingly important for large buildings.

The current practice for SSD design does not include design specifications related to the permeabilities of the floor or subfloor, the velocity distribution below the floor, or the distribution of mass below the slab. Current building codes generally call for granular fill to be placed below concrete floors as a capillary break for interior moisture control (e.g., California Building Code, Chapter 19 or California Residential Code, Chapter 5). In highly permeable subslab fill materials, a modest pressure gradient can cause a substantial velocity of gas flow (McAlary, et al., 2010), and as a result, subslab ventilation may be adequate to protect against vapor intrusion risks at vacuum levels lower than the level of noise in baseline pressure fluctuations.

In residential buildings, a vacuum of 6 to 9 Pa can often be achieved with a single fan drawing about $100/yr of electricity, so there is little cost incentive for SSD optimization. However, in larger buildings (typical of DoD facilities), the power draw for multiple fans or large blower operation alone can cost >$10,000/yr for a single building. Installation and balancing of a system designed to meet the current ASTM performance criteria also requires significant disruption to operations in an active building, and may not be feasible due to security concerns or the nature of the activities that take place in certain parts of a military building. Furthermore, operation of SSV/SSD systems typically draws large volumes of conditioned (heated or cooled, humidified or dehumidified, and filtered) building air through the floor slab, resulting in substantial additional energy losses (Moorman 2009, Turk and Hughes 2009). The ASTM vacuum criterion of 6 to 9 Pa is now recognized as excessive by many practitioners (see Moorman 2009 for example), but no alternative design process or performance specifications have been published to replace the current standards. Moorman (2009) showed that energy losses from extraction of heated or cooled indoor air (depending on the season) were the dominant cost factor for a typical radon mitigation system, yet these costs are not typically quantified or considered when designing a system. Mitigation system performance can alternatively be assessed using indoor air quality monitoring as a performance metric, but it is expensive (more so for VOCs than radon), and complicated by spatial and temporal variability in VOC concentrations and the presence of background sources.

Regulatory screening levels for subslab vapor concentrations are often very conservative, typically assuming 3% of indoor air originates from the subsurface, based on the 95th percentile of empirical data from mostly residential structures analyzed by U.S. EPA (U.S. EPA, 2012). Commercial/industrial buildings generally have different heating, ventilating and air conditioning (HVAC) systems and military buildings often have more substantial foundations and floor slabs than average buildings, so there may be no significant vapor intrusion risks even when subslab concentrations are 100 to 1000-times higher than screening levels. However, regulators are often uncomfortable with no further action decisions in these cases because of the risk of future building degradation or modification. In these circumstances, pre-emptive mitigation or long-term monitoring may be required, and at the present time, both options are very expensive. This research also resulted in a new method to characterize the building-specific attenuation factor, which can help support no further action decisions in cases where the building is more resistant to vapor entry than the generic default attenuation assumptions used for subslab screening levels.

For VOCs, there may be localized areas of high concentrations beneath large buildings (e.g., near former degreasers or storage tanks). The technology described in this report is easily adapted to include High Volume Sampling (McAlary et al., 2010 and AFCEC, 2018) which provides data for characterization of the distribution of vapors between and beyond the sampling locations and minimizes the disruption and cost of subslab vapor characterization for large buildings.

1.2 OBJECTIVE OF THE DEMONSTRATION

The general objective of this research is to demonstrate and validate a more technically advanced process for design, optimization and performance monitoring of subslab venting (SSV) systems to reduce the initial capital and long-term operating costs of mitigating vapor intrusion for VOCs and radon compared to the conventional process.

Army, Navy and Air Force personnel estimate that there are potentially hundreds of buildings that may need mitigation for VOC vapor intrusion with an average size of 10,000 m^2 (pers. comm. DoD, 2012). The capital cost of a conventional system is in the range of $10 to 50 per m^2 (ITRC, 2003), therefore, the capital cost for these hundreds of buildings may be $10 to $100M for VOC mitigation systems alone.

Additional savings are possible if the research is also applied to radon mitigation systems. The USEPA estimated that 7% of US single-family homes had annual radon concentrations above EPA's Reference Level of 4 pCi/L (U.S. EPA 2003). Based on statistics compiled by the General Accounting Office, the DoD owns or leases approximately 285,000 units of family housing (U.S. GAO, 2001). If 7% of that housing stock required mitigation to address unacceptable radon or VOC vapor-intrusion-related exposures, and if the total average lifecycle cost of energy saved/unit by improved mitigation techniques is about $2,500, the savings to the DoD could approach $50M (20,000 units x $2,500).

Operation, maintenance and monitoring (OM&M) costs are typically in the range of $3K/yr to $10K/yr per system for large buildings. In addition, most SSV system designs do not quantify or attempt to control energy losses from conditioned indoor air that is drawn into the SSV system through floor cracks, expansion joints, utility penetrations or other discontinuities. Heating and cooling the air inside occupied buildings is usually about 41% of the total energy cost of building operations (U.S. DOE, 2002), or approximately $30,000 per year for a 10,000 m^2 (100,000 ft^2) building. In a recent report to the USEPA (Turk and Hughes, 2009), a detailed characterization of the SSV at three mitigated homes demonstrated that basement air comprised from 46 to 72 % of the total air flowing out of the SSV exhaust. The total flow from an SSV system can be on the order of $1/10^{th}$ to $1/3^{rd}$ of the air exchange rate of the building, so the energy losses for all DoD buildings with existing or future SSV systems for VOC mitigation could add up to $5M to $10M per year. Over the lifecycle of operation (typically decades to indefinite), the OM&M and energy loss costs could add up to hundreds of millions of dollars. Collectively, this poses a substantial opportunity for savings via improved efficiency in system design and performance monitoring.

The specific objectives of this work are to:

1. Reduce the costs associated with system design and installation, electricity to run fans, and energy loss due to conditioned (heated, cooled, humidified or dehumidified) indoor air being drawn into the subsurface and vented to outdoor air,
2. Quantify these costs and recognized savings for comparison to the costs of performing the optimization,
3. Demonstrate the technology with sufficient data to allow a detailed review by third parties,
4. Include different buildings with a range of size and construction typical of DoD building stock, including residential buildings,
5. Validate the technology with a team of world-leading experts, multiple lines of evidence, analytical and numerical modeling and long-term modeling,
6. Transfer the technology to DoD consultants and contractors so that it can be easily adopted and implemented at as many buildings as needed, and
7. Achieve regulatory approval.

1.3 REGULATORY DRIVERS

Regulatory guidance for assessment and management of risks associated with vapor intrusion has been issued by over 25 States, the United States Environmental Protection Agency (U.S. EPA, 2015), and the Interstate Technology and Regulatory Consortium (ITRC, 2007). These documents are predominantly guidance, not statutory requirements; however, there are statutory requirements to protect human health (CERCLA), and regulatory programs have developed cleanup goals considered protective of human health at cancer risk levels ranging between 1E-06 and 1E-04 and hazard quotients ranging between 1.0 and 3.0. To account for temporal variability, mitigation systems may be selected as a pre-emptive risk management measure even in cases where available data show concentrations below actionable levels.

Radon mitigation is recommended when indoor air radon concentrations are above 4 picocuries per liter (pCi/L) (U.S. EPA, 2003). Regulatory drivers vary to some extent from State-to-State. There are ASTM Standards for radon mitigation (ASTM E-2121-13, ASTM E1465-08a) and U.S. EPA guidance (U.S. EPA, 1994), all of which have similar recommendations (implement subslab depressurization or a comparable remedy when indoor air radon concentrations exceed 4 pCi/L).

2.0 TECHNOLOGY

2.1 TECHNOLOGY DESCRIPTION

Active subslab venting (SSV) or subslab depressurization (SSD) are the most common alternatives for protecting against human health risks associated with vapor intrusion. The current standards of practice for design, installation, operation and maintenance are essentially the same for VOCs and radon (e.g., ASTM E2121-13). These practices are based on technology that is decades old and depend primarily on a single performance metric (subslab vacuum) that is not an ideal metric because of limitations imposed by measurement sensitivity and baseline fluctuations in the cross-slab pressure differential. This demonstration shows how a test procedure analogous to a groundwater pumping test can be performed very quickly and efficiently for subslab gas flow characterization and can be used with mathematical modeling and additional lines of evidence for performance monitoring to improve mitigation system design and operations.

Figure 2-1 provides a summary of the technology and how it can be integrated with conventional mitigation system design and performance monitoring practice. The left side of Figure 2-1 summarizes current standard practice. The additional lines of evidence developed in this research are outlined in the middle (recommended) and right (optional). For simple cases, the conventional approach may be sufficient. For example, in a single-family dwelling with a reasonably competent floor slab and moderate to highly permeable granular fill, the additional recommended and optional lines of evidence may not be needed to develop a cost-effective mitigation system. In fact, this is the case for Sun Devil Manor, the testing in this program simply provided additional lines of evidence to demonstrate the effectiveness. For cases where the conventional approach results in ambiguous results, additional lines of evidence are very helpful. For example, if the system has a high flow rate, but there is no measurable vacuum at the distal communication test points, subslab tracer testing can quickly demonstrate whether there is rapid flow (indicating that the absence of a measurable vacuum is simply attributable to a very high transmissivity) or not (indicating that the extracted gas may be short-circuiting through a preferential pathway).

The incremental costs of many of these lines of evidence are very low. For example, the inter-well tracer tests and transient vacuum monitoring typically takes only a few minutes with equipment that is commonly used by field technicians familiar with vapor intrusion assessment and mitigation. Additional assessment effort becomes increasingly cost effective as the total cost of the mitigation system increases, which is typically a function of the size of the building. So, in general, it will be appropriate to employ more of the recommended and optional activities in larger buildings, compared to single family residences.

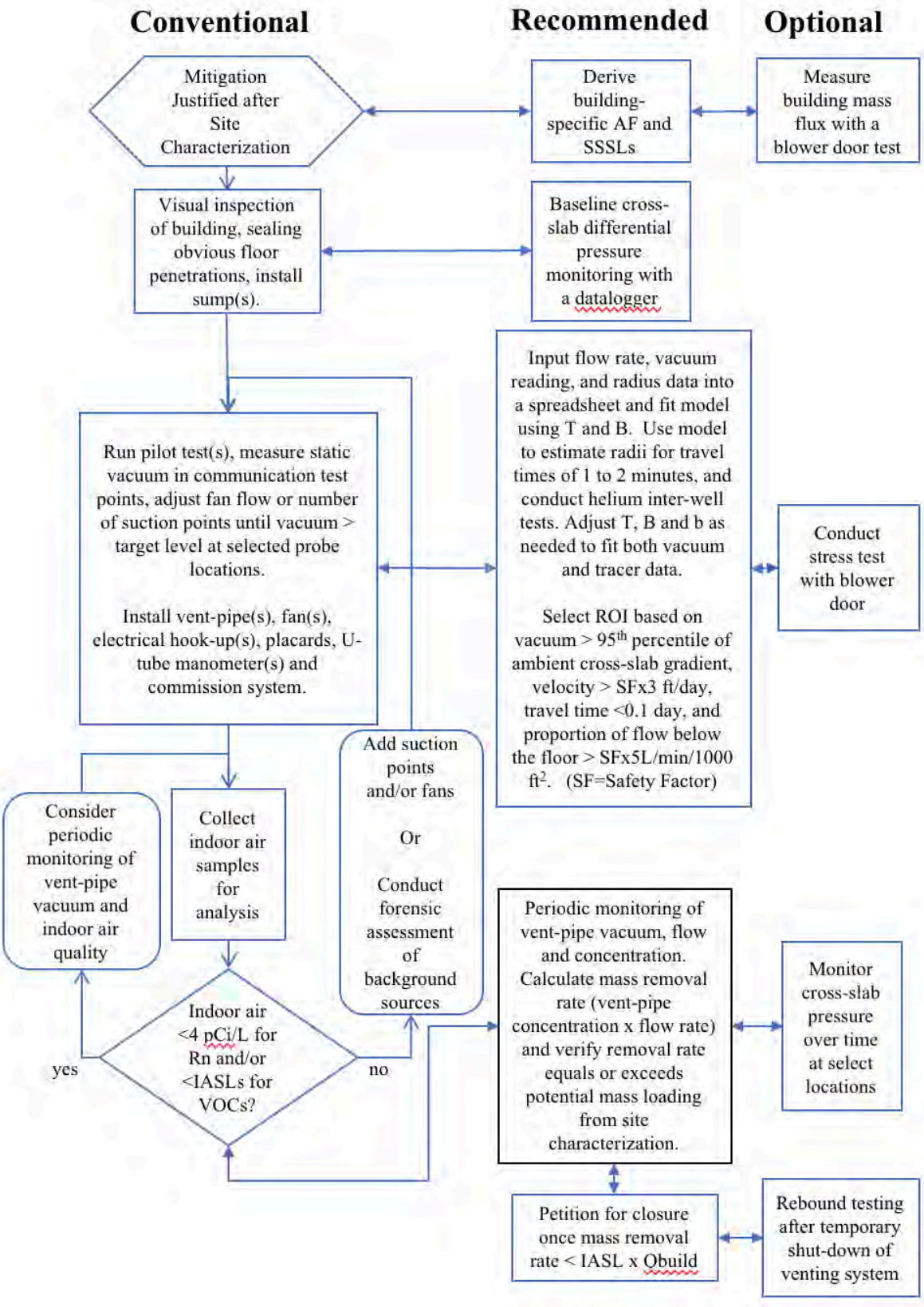


Figure 2-1: Logic flow diagram for mitigation system design and performance monitoring

2.2 SUBSLAB PNEUMATIC TESTING, TRACER TESTING AND MATHEMATICAL MODELING

Subslab pneumatic testing, tracer testing and mathematical analysis is used to calculate the transmissivity (T) of the materials below the floor, the leakance (B) across the floor slab, and the thickness of the zone through which flow predominantly occurs (b), which allows calculations of the radial profiles of vacuum, gas velocity, travel time, and relative proportions of flow from above and below the slab for a given extraction flow rate (Q_{SSV}). This information provides valuable insight for the selection of the number and spacing of suction points as well as the fan size needed to attain sufficient applied vacuum and associated flow. The leakance also provides information to assess the cost-benefit of floor sealing activities. The T and B values can also be used with cross-slab differential pressure, building height and air exchange rate information to calculate a building-specific attenuation factor, which can be used to help support no further action decisions at buildings with subslab vapor concentrations above conservative default screening levels where the building is less susceptible to vapor intrusion.

The mathematical framework for modeling the system is based on the "Leaky Aquifer Model" of Hantush and Jacob (1955), shown conceptually in Figure 2-2. The model was originally formulated for assessing groundwater flow in a two-layer system, with an aquifer (more permeable) overlain by an aquitard (less permeable). Water extracted from the aquifer creates a drawdown cone that reaches out to a certain radial distance, until the volume of water leaking down through the aquitard matches the volume of water extracted from the aquifer, at which time, the drawdown levels off.

The Hantush-Jacob Model is analogous to a system extracting gas from below a concrete floor slab if the material below the slab is more permeable than the concrete. The transient response of the vacuum in response to pumping follows a curve of the type shown in Figure 2-3, where the level of the head increases initially, and eventually stabilizes when the amount of soil gas leaking across the semi-confining layer equals the amount extracted. The drawdown versus time data is fit to the Hantush-Jacob (1955) Leaky Aquifer Model to calculate T and B (Massman, 1989).

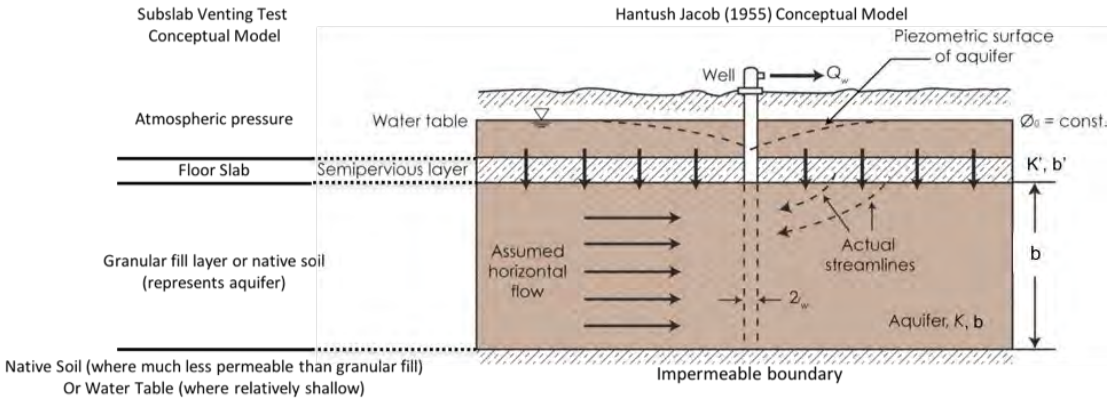


Figure 2-2: Conceptualization of Hantush-Jacob (1955) model and correlation to floor slab and subslab (modified after McAlary et al., 2010)

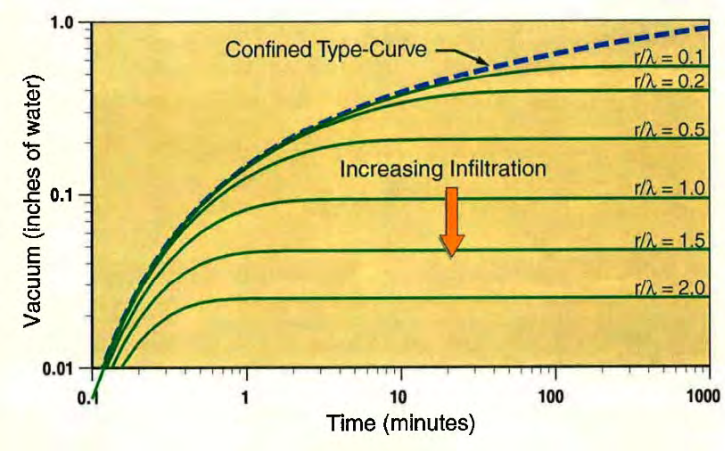


Figure 2-3: Type-curves showing the effect of leakage on the vacuum versus time data (after Bear, 1979)

The Hantush-Jacob Model assumes horizontal flow in a permeable layer with an impermeable layer below and vertical flow through an overlying "leaky" layer, with uniform, homogenous and isotropic properties for the permeable and leaky layers. Additional assumptions in the Hantush-Jacob Model and their application to subslab gas extraction are discussed in detail in the supporting information of McAlary et al., 2018. Good construction practice includes a layer of 10 to 15 cm of compacted granular fill below a concrete floor slab, which would be several orders of magnitude more permeable than the concrete slab and usually much more permeable than the native soil, so it can be the primary layer through which gas flows. Not all buildings have granular fill below the floor slab, but native soil is also likely to be more permeable than concrete. Granular fill is relatively uniform, homogenous and isotropic by design, which is consistent with the model assumptions. Concrete is permeable predominantly through discontinuities which are not uniform, homogenous or isotropic; however, like groundwater flow through fractured rock, the behavior approximates a porous medium if the region through which flow is occurring is large relative to the spacing between the discontinuities (Bear, 1979).

If granular fill is not present, or if the native soil is relatively permeable, the lower boundary to the permeable layer may be the water table or a low-permeability stratum at some depth in the vadose zone. Regardless of whether flow occurs primarily in the granular fill or native soil, the model yields the transmissivity, which is the product of the gas phase conductivity and the thickness of the active flow zone.

The pneumatic test procedure is analogous to a groundwater pumping test, although a soil gas pumping test can be performed in much less time (minutes instead of hours or days). The test procedure includes three types of measurements:

1) vacuum versus time using a pressure-transducer/data logger,
2) vacuum versus distance using a manometer or micromanometer,
3) travel time versus distance in the subslab region using a tracer such as helium

The vacuum versus time data are fit to the Hantush-Jacob (1955) Non-Steady Leaky Aquifer Model (Equation 1) to calculate T and B values. This can be performed using commercially

available modeling software (e.g., AQTESOLV, by HydroSOLVE, Inc. of Reston, VA). The AQTESOLV software requires the pressure data to be expressed in units of air head (one pascal is approximately 0.083 m (0.273 ft) of air head at 15 °C).

$$Vacuum\ (t) = \frac{Q_{SSV}}{4\pi T} \int_{y=U}^{\infty} exp\left(-y - \frac{r^2}{4B^2 y}\right) \frac{\partial y}{y} \quad (1)$$

Where y is a variable of integration and U and B are defined as:

$$U = \frac{r^2 S}{4Tt} \quad (2)$$

$$B = \sqrt{\frac{K\ b\ b'}{K'}} \quad (3)$$

and:

T = transmissivity of the region below the floor slab [L^2/T] (T=Kb)
U = well function [dimensionless]
B = leakance [L],
Q_{SSV} = discharge from the extraction well [L^3/T]
r = radial distance from extraction well (L),
π = 3.14159
t = time since the start of gas extraction [T]
S = storativity [dimensionless]
K = pneumatic conductivity of the zone of extraction [L/T] which is equal to the transmissivity divided by the thickness,
b = thickness of the zone of extraction [L],
b' = thickness of the floor slab [L],
K' = bulk average vertical pneumatic conductivity of the floor slab [L/T].

The vacuum versus distance data are then fit using Equation 4:

$$Vacuum\ (r) = \frac{Q_{SSV}}{2\pi T} K_0\left(\frac{r}{B}\right) \quad (4)$$

where:

K_o = Modified Bessel function of the second kind of order zero of (r/B) [unitless].

Some iteration may be required to obtain calibration of both Equation 1 to the vacuum versus time data and Equation 4 to the vacuum versus distance data using one unique pair of T and B values, however; there are two variables (T and B) and two lines of independent sets of data (vacuum versus time and vacuum versus distance), which is generally sufficient to yield a unique solution. The calibrated T and B values can then be used to calculate velocity versus radial distance using Equation 5:

$$Velocity\ (r) = \frac{Q_{SSV}}{2\pi bnB} K_1\left(\frac{r}{B}\right) \quad (5)$$

where:

n = air-filled porosity of the zone of extraction [volume of air/volume of soil]; and
K_1 = Modified Bessel Function of First Order of (r/B) [unitless]

Travel time from a given distance can be determined by integrating the velocities over discrete segments of the distance using:

$$t_{travel} = \int \frac{\partial r}{v(r)} \tag{6}$$

where:

v(r) = velocity at a given radial distance [L/T]
t_{travel} = travel time from a given radial distance (r) [T]

The calculated travel times can be compared to subslab tracer test data to provide another independent method of calibrating the model inputs and evaluating how well the system behavior matches the behavior predicted by the model. Two types of tracer tests were developed in this research: the inter-well tracer test (a small volume of helium is injected into a subslab probe and the arrival is monitored in the suction pipe), and the helium flood (the system flow is reversed, helium is added at about 1%v/v and the arrival of helium is monitored at subslab probes at various distances). A push-pull test was attempted, but the rate of helium diffusion was too fast compared to the gas velocity to provide a clear signal.

The air-filled porosity (n) can usually be estimated with reasonable accuracy, so this parameter is not particularly sensitive. Porosity of soils is generally in the range of 0.25 to 0.4 (Freeze and Cherry, 1979), which is a relatively narrow range. The air-filled porosity of the material at shallow depths below the floor is expected to be similar to the total porosity because the building prevents infiltration of precipitation, so the subsurface drains to field capacity and generally dries further if there is an active SSV system removing humid air. The thickness of the permeable layer (b) can often be assessed by visual inspection of soil core, but otherwise, the helium tracer tests provide an independent line of evidence for verification of the b value.

The calibrated model can also be used to calculate the relative proportion of the total gas flow extracted that originates below the slab (Q(r)) as a proportion of the total extracted gas flow (Qssv) using Equation 7:

$$Q(r)/_{Q_{SSV}} = \frac{r}{B} K_1(r/B) \tag{7}$$

where K_1 is the first order Bessel Function. Equation 7 can be used to calculate the level of dilution of the subslab vapor concentrations caused by indoor air leakage across the floor slab for various distance from the point of suction (r). Equations 2 through 7 are easily solved using a spreadsheet. For systems with multiple extraction points, the sub-floor vacuum can be estimated by superposition of the results from nearby suction points or a numerical flow model can be used if the building geometry is complex.

2.3 MASS FLUX / MASS LOADING

The mass flux of VOCs available for potential vapor intrusion is commonly conceptualized by the steady-state upward diffusive flux (Johnson and Ettinger, 1991) from a source located at some depth below the building (F_1 in Figure 2-4). Transient changes in concentration may also contribute to increases or decreases in the vapor intrusion potential in the short-term. Strictly speaking, flux is measured per unit area, and when integrated over the area of a building, is referred to as a mass discharge or loading or emission. The mass flux of radon available for potential intrusion to the building is controlled by the emission rate from the geologic materials below the building.

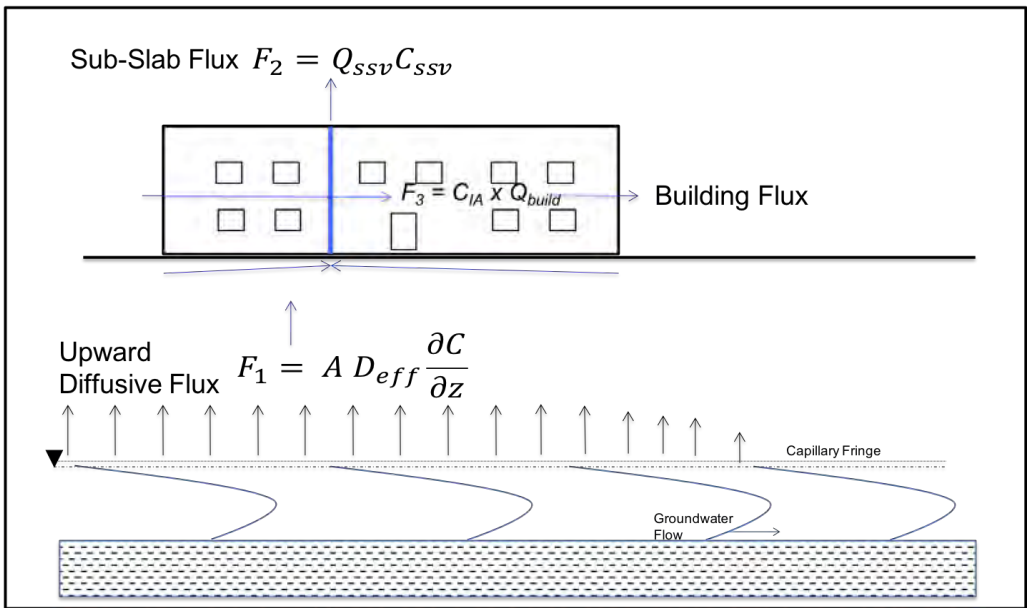


Figure 2-4: Conceptualization of Mass Flux

If the SSD system removes all or nearly all of the available mass flux into the building (F_2 in Figure 2-4), then the indoor air quality will be protected from vapor intrusion (this does not affect the presence of indoor air VOCs or radon from background sources inside the building or in outdoor air). Whatever fraction of the flux that is not captured may enter the building (F_3 in Figure 2-4 represents the mass flux through the building). In fact, one method to estimate F_1 is to depressurize the building in the absence of a mitigation system and measure F_3, which should be equal to or less than F_1, except for transient effects (see ESTCP ER201503). An overdesigned system can remove much larger volumes of gas, and as a result may capture some mass from beyond the footprint of the building, but if there is no increase in the VOC mass removal rate, the additional flow is not helpful, and is counter-productive because it contributes to energy losses (Figure 2-5).

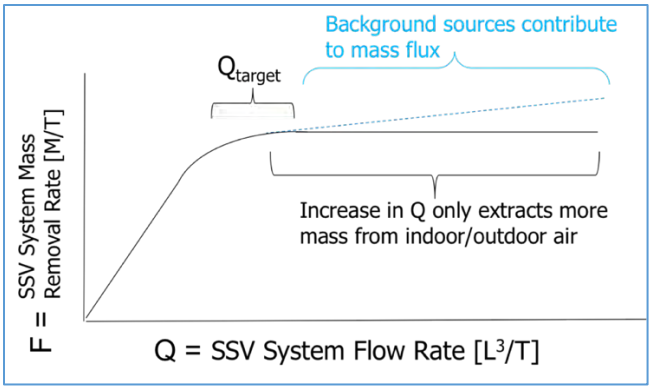


Figure 2-5: Mass removal rate as a function of subslab venting system flow rate

Mass flux monitoring can be useful for defining an exit strategy for a mitigation system, as shown in **Figure 2-6**. If the SSD/SSV system effectively contains all the available mass flux and the rate of mass removal is less than the minimum required to pose a potential risk (indoor air risk-based screening level multiplied by the building ventilation rate), these data support a no further action decision. To account for potential changes to mass in storage, this should be verified by means similar to cyclic operation of an SVE system prior to decommissioning.

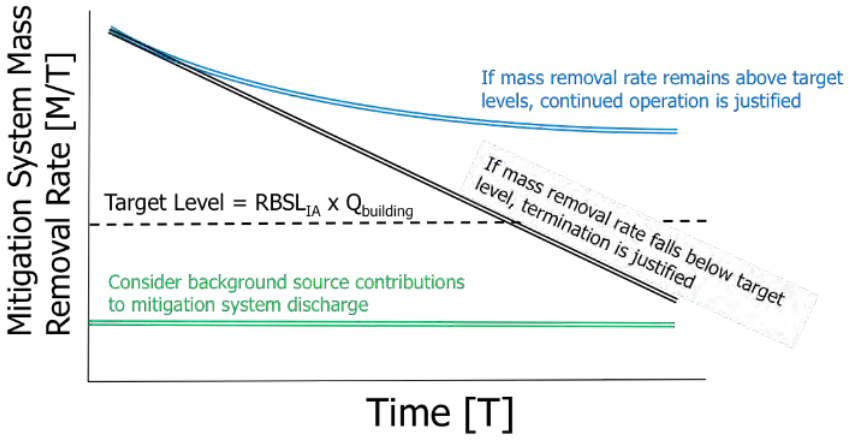


Figure 2-6: Possible trends in mitigation system mass removal rate over time

The mass flux can be conceptualized using a mass balance equation:

$$-D_{eff} (\delta C/\delta z) A = Q_{SSV} C_{SSV} + Q_{build} C_{IA} \quad (8)$$

where:

D_{eff}	effective diffusion coefficient for the compound of interest [L^2/t]
$\delta C/\delta z$	vertical concentration gradient [M/L^2]
A	building footprint area [L^2]
Q_{SSV}	subslab venting system flow rate [L^3/t]
C_{SSV}	subslab venting system concentration [M/L^3]
Q_{build}	building ventilation rate [L^3/t]

C_{IA} concentration in indoor air [M/L^3] from vapor intrusion (i.e. assumes no background indoor air contributions)

The goal of the SSV/SSD system is to keep C_{IA} below a threshold level. If the SSD system effectively captures all the available mass flux, then C_{IA} is reduced to zero and Equation 8 reduces to:

$$-D_{eff} (\delta C/\delta z) A = Q_{SSV} C_{SSV} \quad (9)$$

The upward diffusive flux of VOC vapors on the left side of Equation 9 is typically the rate-limiting step once mass in storage has been removed, so it can essentially be considered a threshold or target mass flux (MF) for the SSV system to contain, in which case Equation 9 reduces to:

$$MF = Q_{SSV} C_{SSV} \quad (10)$$

The goal of optimizing the SSV system is to select a Q_{SSV} that will maintain a mass removal rate (the product of Q_{SSV} x C_{SSV}) equal to MF as determined by: 1) $D_{eff} (\delta C/\delta z) A$, estimated from vertical profiles of sampling and analysis and soil property data, or; 2) $Q_{build} C_{IA}$, estimated from building pressure cycling. The mass removal rate from the system will initially include removal of mass from storage and subsequently stabilize at a level controlled by the upward diffusive flux. If the area of influence of the SSV system extends beyond the boundaries of the building, the mass removal rate may exceed the target mass flux by some margin. In the optimized system, the subslab vacuum may be lower than recommended by ASTM E2121, and occasional fluctuations in the building pressure could cause small amounts of soil vapor flow into the building. This is inconsequential if the upward flow is short-lived and the air entering the building was simply indoor air that moments earlier flowed in the opposite direction, or if the subslab ventilation rate is sufficient to reduce subslab concentrations to levels low enough to contribute negligible mass to the building over the duration of the pressure field reversal.

The mass flux also can be used to estimate a reasonable maximum indoor air exposure concentration ($C_{buildRME}$) that would be expected to be sustained if there was no operating SSV/SSD system:

$$C_{buildRME} = MF/Q_{build} \quad (11)$$

Q_{build} can be measured directly (ASTM E741-11 or ASTM D-6245) or estimated from the literature. The U.S. EPA's Exposure Factors Handbook (U.S. EPA 2011) lists the mean air exchange rates as 1.5 AE/hr for commercial buildings and 0.45 AE/hr for domestic residences, which can be multiplied by the length, width and height of the building to estimate Q_{build}.

By similar logic, a mass flux screening level (MFSL) can be calculated with Equation 12, which represents a threshold MF below which vapor intrusion is unlikely to pose an unacceptable health risk. This can be useful for defining an exit strategy if the available mass flux is or becomes insufficient to sustain indoor air concentrations above a threshold risk.

$$MFSL = IASL \times Q_{build} \quad (12)$$

where:

IASL = indoor air screening level [M/L^3]

2.3.1 Indoor to SSV Tracer Testing

Indoor to SSV tracer testing can provide a direct measure of the percentage of indoor air that is extracted by an SSV/SSD system. This provides an independent line of evidence to verify the floor slab leakance calculated using Equation 7. The test consists of distributing a tracer in indoor air and measuring the concentration in both indoor air and the exhaust of the SSV system. The fraction of indoor air in the exhaust streams, F, can be assessed with the following equation:

$$F = \frac{C_{SSV} - C_{out}}{C_{in} - C_{out}} \quad (13)$$

where:

C_{SSV} = the concentration of the tracer in the SSV exhaust stream,
C_{out} = the outdoor air concentration and
C_{in} = the indoor air concentration.

Sulfur hexafluoride (SF_6) was used as a tracer in this application at Building 200 and Sun Devil Manor because it can be detected at very low concentrations, it does not decay or sorb, and does not have significant background sources; however, SF_6 is a strong greenhouse gas, and is facing regulatory pressure to minimize its usage. Two other tracers were tested at Building 205, unfortunately, the carbon dioxide (CO_2) and formaldehyde (HCHO) data did not provide a clear signal, so tracer testing with those compounds was not pursued further.

2.3.2 Building-Specific Attenuation

The attenuation factor (AF), defined as the indoor air concentration (Cindoor) divided by the subsurface vapor concentration at a specified depth (Csource):

$$AF=(C_{indoor}/C_{source}) \quad (14)$$

For the special condition of a source directly beneath the foundation (i.e., the source-building separation distance $\rightarrow$ 0) and advection is the dominant mechanism of transport across the floor slab, AF$\rightarrow$Qsoil/Qbuilding, where Qsoil is the volumetric flow rate of soil gas into the building and Qbuilding is the total volumetric flow rate of air through the building or basement (i.e., the ventilation rate, which equals the interior volume multiplied by the air exchange rate). The building volume is easily measured or estimated. The air exchange rate can usually be estimated within a factor of about three for a typical residence: the mean air exchange rate for residences is 0.45 /hr and the 10^{th} percentile is 0.18 /hr, according to the U.S. EPA Exposure Factors Handbook (U.S.EPA, 2011). Chan et al., 2005 analyzed a database of 70,000 residential building leakage tests and showed comparable results. Qbuilding can be measured using blower door tests (ASTM E1821-11) and tracer tests ASTM E741-11, ASTM D6245-12). The air exchange rates for commercial buildings tend to be higher (mean = 1.5 /hr per EPA, 2011) and sometimes are

available from mechanical engineers responsible for the heating, ventilating and air conditioning (HVAC) systems.

In the field of hydrogeology, aquifer discharge (Qaq) is calculated using (Bear, 1979):

$$Qaq = K\ i\ A \tag{15}$$

where:

K = hydraulic conductivity [L/T]
i = hydraulic gradient [L/L], and
A = cross-sectional area perpendicular to flow [L^2]

Equation 15 can be applied to calculating Qsoil where A is the footprint of the building, i is the pressure gradient across the floor slab and K is the bulk average vertical gas conductivity of the floor slab.

Equation 3 can be re-arranged to solve for K':

$$K' = \frac{Kbb'}{B^2} \tag{16}$$

Combining Equations 1, 3 and 8 yields the following expression for the subslab-to-indoor air AF:

$$AF = \frac{Q_{soil}}{Q_{building}} = \frac{K' i\ A}{l\ w\ h\ AER} = \frac{\frac{Kbb'\Delta P}{B^2\ b'}A}{A\ h\ AER} = \frac{T\ \Delta P}{B^2\ h\ AER} \tag{17}$$

where Qsoil, Qbuilding, K', K, b', b, B, and T are defined above and:

A = area of the building (length (l) x width (w)) [L^2]
h = height of the interior space [L]
i = the pressure gradient across the floor slab (pressure difference (ΔP) in units of air head divided by the slab thickness (b')) [L/L]
AER = air exchange rate (number of building volumes exchanged per unit time) [T^{-1}]

In this formulation, the T and B values are derived from fitting vacuum vs distance data to Equation 4 and vacuum vs time data to Equation 1 (this typically requires some iteration to achieve the T and B values that match both most closely), the building height is either measured or reasonably estimated, the air exchange rate can be measured (ASTM E1827, E741 and D6245) or estimated from published data (U.S. EPA, 2011), and ΔP can be measured using a micromanometer with a datalogger.

2.4 TECHNOLOGY DEVELOPMENT

The mathematical approach employed in this research was developed by Geosyntec personnel for use in design of soil vapor extraction systems (Thrupp et al., 1996, 1998) and Geosyntec has been applying this for subslab venting system design since about 2008. A case study of the high-volume sampling (HVS) method and Hantush-Jacob analysis was published in a peer-reviewed journal

(McAlary et al., 2010) and additional mathematical modeling was presented in a platform presentation (McAlary et al, 2011). The HVS test has been performed at over 16 buildings with a total of 70 suction points and a total of 121 transient pneumatic response tests (McAlary et al., 2018). The vacuum versus time and vacuum versus distance profiles are consistent with the mathematical model in the majority of cases (exceptions include floors with complex pits, sumps, drains or bearing walls near the point of suction). AFCEE contracted Geosyntec for a Demonstration/Validation of High Volume Sampling versus Multi-Increment™ sampling (AFCEC, 2018), which included pneumatic testing and analysis at Vandenberg AFB Building 11193.

2.5 ADVANTAGES AND LIMITATIONS OF THE TECHNOLOGY

Advantages of the technology include:

1. Cost savings as a result of operating a reduced number of fans or fans of a smaller size using less electricity;
2. Cost savings as a result of reducing the loss of conditioned indoor air through leakage across the slab and discharge to the outdoor air via the SSV/SSD system;
3. Performance metrics based on measurements with a better signal/noise ratio compared to sub-floor vacuum and indoor air sampling; and
4. Development of a technical basis for an exit strategy for buildings when the mass flux of radon or VOC vapors is insufficient to pose a potential risk to building occupants.

Potential limitations of the technology include:

1. Site-specific conditions may pose currently unknown challenges (complex building foundations, interior footing for bearing walls, sub-floor utility conduits or other preferential pathways, floor slabs bearing on clay-rich soil, etc.);
2. Background sources of VOC vapors may complicate the interpretation of concentration data and calculations using the concentration data (forensic tools are available for analysis);
3. Temporal variability of subslab/stack and indoor air concentrations is to be expected, and is likely to require a margin of safety in the SSV/SSD system design.

3.0 PERFORMANCE OBJECTIVES

The performance objectives are provided in **Table 3.1**.

Table 3-1: Performance Objectives, Data Requirements and Success Criteria

Performance Objective	Data Requirements	Success Criteria
Reduce Lifecycle Cost	Cost of baseline testing, analysis, optimization and verification. Savings via reduced energy costs.	Minimum 4X reduction in total Net Present Value/(Cost)
Maintain protectiveness of indoor air quality	Indoor air concentrations of VOCs and Radon	Rn<4pCi/L VOCs within acceptable risk range (Hazard Index<1.0, Lifetime Incremental Cancer Risk $<10^{-5}$) or background range
Maintain protective mass removal rate	Flow rates and concentrations in vent-pipes	Optimized system removes at least 95% of the mass removed by a conventionally designed system. Correction may need to be applied for chemicals known or suspected to have sources inside the building or in ambient outdoor air.
Validate the technology with sufficient technical detail for independent third-party review	Physical data (flow and both transient and steady-state vacuum), chemical data (concentration, mass flux), financial data (energy costs and savings), mathematical modeling (analytical and numerical), monitoring of spatial and temporal variability in the pneumatic parameters and VOC distributions.	Consensus among the diverse and knowledgeable study team, plus one or more peer-reviewed journal articles.
Transfer the technology to DoD consultants and contractors so that it can be easily adopted and implemented at as many buildings as needed	None other than those above	Detailed standard operating procedures, technical papers, training video, presentations and ESTCP reports
Achieve regulatory approval	Invitation to select members of the regulatory community to attend field activities.	Roll-out via CLU-IN of the final report, presentations at several conferences, and webinars.

3.1 DETAILED DESCRIPTIONS OF EACH PERFORMANCE OBJECTIVE

3.1.1 Reduce Lifecycle Costs

Lifecycle costs include capital costs of installation (typically driven by the number of suction points and number/power of fans), operation costs (electricity, fan replacement), monitoring costs (verifying continuous operation, sampling and analysis), regulatory reporting, the energy cost of conditioned indoor air extracted by the system, and administrative fees.

3.1.2 Maintain Protectiveness of Indoor Air Quality

Indoor air concentrations less than 4 pCi/L for radon and posing a hazard index less than 1 and a lifetime incremental cancer risk (LICR) less than 1E-5 for VOCs were considered protective. This was evaluated with indoor sampling and analysis and other lines of evidence.

3.1.3 Maintain Protective Mass Removal Rate

The mass removal rate was measured as the product of the SSV system flow rate and the concentrations in the extracted gas. Where available (Buildings 205 and 200), this was compared to the rate of mass removal from the system prior to optimization. For SDM and Building 11193, prior SSV system mass removal rates were not available, so the mass removal rate from the SSV system was compared to mass emission rates from the building during building depressurization testing.

3.1.4 Third Party Review

The contents of this report provide data and analysis/interpretation for four buildings, including one single-family dwelling (Sun Devil Manor), a small commercial building (Building 200), and two larger commercial buildings (11193 at 11,000 ft^2 and 205 at 64,000 ft^2). Data from these tests has been extensively shared with the technical community through the presentations listed in the Abstract of this report. A draft of this report was circulated for review to the members of the study team listed in Appendix A. A summary presentation was also made to the American Association of Radon Scientists and Technologists (AARST) Committee on Mitigation Standards, which includes over a dozen very experienced radon mitigation professionals (June 22, 2018).

3.1.5 Technology Transfer

The objective of technology transfer is intended to provide DOD personnel and their contractors with information they can use to understand the technology, its capabilities and limitations, benefits and costs to the degree needed to be able to employ the technology to the benefit of all.

3.1.6 Regulatory Approval

The objective of regulatory approval is intended to facilitate future applications of the technology by providing a clear basis that the approach is equally protective as the conventional approach and a track record of regulatory approval during the conduct of the research.

4.0 TEST DESIGN

This section describes the test design elements that were common to all four buildings. Elements that were unique to each building are described in Chapters 5 through 8, respectively.

4.1 CONCEPTUAL EXPERIMENTAL DESIGN

The basic concept for this research is that a subslab venting system for vapor intrusion mitigation can benefit from design principles commonly applied for groundwater extraction systems used to hydraulically contain plumes of contaminated groundwater. Water levels are not the sole design and performance monitoring parameter of groundwater mitigation systems, it is useful to characterize the aquifer permeability and use mathematical models to better understand the flow-field (ESTCP, 2003). The same logic can be applied to SSD/SSV systems.

Equations 4, 5, 6 and 7 provide a means to calculate radial profiles of vacuum, velocity, travel time and leakage across the floor slab. This raises the question of what values for each parameter would likely be protective. This is addressed in the following subsections. A worked example of how the mathematical modeling can be used to compare and contrast conditions with high and low transmissivity and leakance is provided in Appendix B.

4.1.1 Target Vacuum

Ambient cross slab differential pressure measurements provide valuable insight into the building-specific gradient, which is influenced by many factors, and therefore tends to be very different between buildings. When monitored over time, there are normally fluctuations, and commonly there are gradient reversals (from positive to negative building pressure). If readings are made every second, the magnitude of the fluctuations will be larger than if the differential pressure is averaged over time. The appropriate duration for averaging has yet to be studied in detail, but fluctuations of 1 second are unlikely to carry sufficient mass into a building to have a substantial effect on indoor air quality. An interval up to a minute is still very short relative to building air exchange rates.

If the compound of concern beneath a particular building has acute health effects, then it may be prudent to select an upper percentile value from the ambient differential pressure data for use as a target vacuum level. If chronic risks are the only concern, an average value may be more appropriate. In any event, it is prudent to err on the side of caution, so a margin of safety could be applied before selecting a building-specific target vacuum.

4.1.2 Target Velocity

There is currently no existing performance goal for the induced velocity below a floor slab, but as a frame of reference, one could calculate an upward velocity that corresponds with an upper-range estimate of the volumetric flow of soil gas into a building. EPA compiled data on subslab (Css) and indoor air (Cia) VOC concentrations (U.S. EPA, 2012) and the 95th percentile value of the empirical attenuation factor (AF=indoor air/subslab concentrations) was 0.03, which is considered protective. Using mass balance principles (Johnson, 2005) the AF is equivalent to the ratio of

Qsoil/Qbuild (volumetric flow of soil gas into building / volumetric flow of air through the building). Qsoil can be defined as:

$$Q_{soil} = V_{soil}\, An \tag{18}$$

where:

Vsoil = the net average upward velocity of soil gas [L/t]
A = building area [L^2], and
n = effective air-filled porosity [v/v]

Qbuild is defined as:

$$Q_{build} = A\, h\, AER \tag{19}$$

where:

h = building height [L]
AER = the air exchange rate [t^{-1}].

The Vsoil value corresponding to the upper 95th percentile attenuation factor (0.03) would be:

$$V_{soil} = (h\, AER\, AF_{95\%-ile})/n \tag{20}$$

A reasonable estimate of the air-filled porosity of soil beneath a building is about 30%. A typical building height for a residential building is 8 ft. The 95th percentile attenuation factor would likely correspond with a building having a relatively low air exchange rate, and the 10th percentile for residential air exchange rates is 0.18/hr (USEPA, 2011); therefore Vsoil is about 0.144 ft/hr (or about 3 ft/day). If the mitigation system induces a velocity toward the suction point that is greater than this value, subsurface vapors are likely to be captured or contained by the system. Coincidentally, 3 ft/day is the induced velocity considered to be sufficient for a soil vapor extraction system by AFCEE and U.S. ACoE (AFCEE, 2001 and USACoE, 2002). Note that this logic is based on a conservative (upper 95th percentile) default value for AF. A similar logic could be developed using a building-specific AF value, which can be calculated from the flow and vacuum testing (McAlary et al., 2018). For a median attenuation factor of 0.003 (USEPA 2012) and a median air exchange rate of 0.45/hr (USEPA, 2011), the Vsoil would be about 0.9 ft/day, which indicates Vsoil is likely to be considerably less than 3 ft/day in most cases.

4.1.3 Target Travel Time

If the upper-range subslab velocity into the building is 3 ft/day (as calculated above from the 95th percentile AF of 0.03) and the average thickness of the active flow zone beneath the building is 4 to 6 inches (commonly specified for granular fill in building codes), then the 95th percentile vertical travel time across the granular fill is about 3 to 4 hours. If the travel time from a particular radius to the suction point is less than this range, the vapors would likely be contained. Again, this is for a 95th percentile attenuation factor, and a building-specific attenuation factor could be used to calculate a building-specific target travel time. For a median attenuation factor (0.003), the target travel time across the granular fill would be approximately 9 to 13 hours (about half a day).

4.1.4 Target Vertical Flow Per Unit Area

Equation 7 can be differentiated to calculate the vertical component of flow across the floor per unit area at progressive distances from the point of suction, which can be compared to generic estimates of Qsoil. For example, the U.S. EPA recommended a default value of 5 L/min for Qsoil for their spreadsheet implementation of the Johnson and Ettinger (1991) model (EQM, 2004), which was for a default building area of 100 m^2, or roughly 1000 ft^2. Within a certain radius from the suction point, the vertical leakage of air down across the slab will equal or exceed this reference point of 5 L/min per 1000 ft^2.

4.2 DESIGN AND LAYOUT OF TECHNOLOGY COMPONENTS

For buildings with an existing SSV system (205, 200 and SDM), the components are described in Sections 5, 6 and 7. At Building 11193, a temporary SSV system was constructed, the components of which are described in Section 8. In future testing at buildings with no existing system, both transient and static vacuum response testing can be conducted using the apparatus shown in **Figure 4-1**. A suction point of at least 2-inch diameter is needed to minimize frictional losses. A concrete coring machine or a hammer drill can create a hole of 2 to 4 inches in diameter with minimal effort. It is advantageous to remove some granular fill from the region below the floor, typically 1 to 10 kg, depending on the diameter of the cored hole. A PVC pipe is then sealed to the floor using backer rod between the pipe and the concrete and fast-setting anchor cement in the annulus above the backer rod. A sample port and vacuum gauge are connected to the wellhead. A four (4) foot section of two (2) inch diameter PVC pipe extends from this connection to provide a near-linear flow regime for measurement of gas velocity with a thermal anemometer or similar quality flowmeter. A bleed valve is located ahead of the fan (a Shop-Vac® is equally useful as a fan) and can be opened if the flow rate is very low to reduce the risk that the fan will overheat. A lung-box (or vacuum chamber) is used to collect gas samples into a Tedlar bag for field screening via a photoionization meter (PID) and Landfill Gas Meter (LGM). Summa canister samples are collected by direct connection to a sample port in the PVC piping. The extracted soil gas can be treated with a portable carbon filtration unit comprised of one 55 gallon drum of activated carbon. A second 55 gallon drum of permanganate treated zeolites is recommended if vinyl chloride is present in soil vapor at elevated concentrations, because VC is not effectively retained by activated carbon filtration. The exhaust may also be discharged through layflat Mylar tubing through an exterior door or window to a location downwind of the building (polyethylene tubing is not recommended because VOC vapors diffuse through polyethylene at a rate that may result in indoor air concentrations of potential concern).

Figure 4-1: Apparatus for pneumatic testing showing Shop Vac, linear pipe segment for velocity measurement, sampling port with lung-box attached for Tedlar bag sample collection, Summa canister sample connected to sample port at wellhead

4.3 TESTING PROGRAM

4.3.1 Specific Capacity Testing

Specific capacity is the ratio of flow to applied vacuum, which is proportional to the permeability of the material below the floor slab. The flow velocity in a vent-pipe is easily measured using a Dwyer 471 thermal anemometer or similar, and the velocity is multiplied by the internal cross-sectional area of the pipe to determine the flow rate. The applied vacuum is easily measured using a U-tube manometer or Magnehelic vacuum gauge. The ratio of the flow divided by the applied vacuum is the specific capacity, expressed typically in units of scfm per in. H_2O.

4.3.2 Transient Vacuum Response Testing

Transient vacuum data can be collected by cycling a suction fan on and off while measuring applied vacuum at nearby subslab probes. Data logging micromanometers (e.g., DG-700 from The Energy Conservatory) can be used to record vacuum measurements at 1-second intervals. With the fan off, the meters are be zeroed prior to starting the test and the data logger started. Then the fan is turned on and time recorded. When vacuum measurements stabilize (usually within a minute or two, but sometimes as short as 10 seconds or as long as 30 minutes), the fan is turned off, and the

vacuum is recorded until it returns to baseline (usually a comparable amount of time as was required to reach a static vacuum). At least two on/off cycles are recommended where practical so the reproducibility of the data can be verified.

In cases where the transient pneumatic response is very rapid, the test data benefits from having a ball-valve between the fan and the suction point. It may take a few seconds for the fan to reach peak speed and a few seconds to stop after the power is cut, but the ball-valve can be opened or closed much more rapidly, which creates a more instantaneous change in the flow. The mathematical model for the analysis of the transient data assumed the pumping starts and stops instantaneously, so it is good to make best efforts to match this during the field data collection.

4.3.3 Static Vacuum Versus Distance Measurements

Static vacuum data should be recorded after the vacuum levels stabilize at all subslab probes in the proximity of the suction point being tested at any particular time. Static vacuum can be measured using the same micromanometer as the transient vacuum measurements.

There is a distinct advantage to having at least one monitoring point located at a small radial distance from the suction point because the vacuum at small distances from the suction point depends primarily on the T value. The rate at which the vacuum decreases with distance from the suction point depends largely on the B value. Therefore, the confidence in the T and B values improves if the subslab monitoring points include both short and large radial distances from the suction point. Note that the suction measured in the vent-pipe itself can be misleading because there is often turbulent flow in very close proximity to the suction point and inside the pipe, which would tend to cause a positive bias in the vacuum measured in the vent pipe.

If there is no measurable vacuum, it is instructive to use a smoke-pen or chemical smoke tubes to assess whether there is downward flow into the subslab probe (which can occur at very modest vacuum levels, too low to easily measure when the material below the floor is highly permable). Smoke tubes can also be used to inspect the flow of air from the building through obvious joints and cracks in the floor. If the vacuum is very small or if baseline fluctuations are relatively large, there is a benefit to logging the pressure over time and cycling the fan on and off several times. The magnitude of the change imposed by the fan will typically become apparent as a saw-toothed pattern of drawdown and recovery, which can be discerned even against baseline drift and fluctuation.

4.3.4 Helium Inter-Well Test

The inter-well tracer test consists of injecting a small slug (~10L over a few seconds) of 100% helium into a subslab probe near an operating suction point. Helium concentrations in the extracted gas are monitored by drawing gas from a small port in the vent pipe and monitoring continuously with a helium meter to determine the time lag between the midpoint of the helium injection and the moment of maximum helium concentration at the vent-pipe, which represents the average travel time, as shown in Figure 4-2.

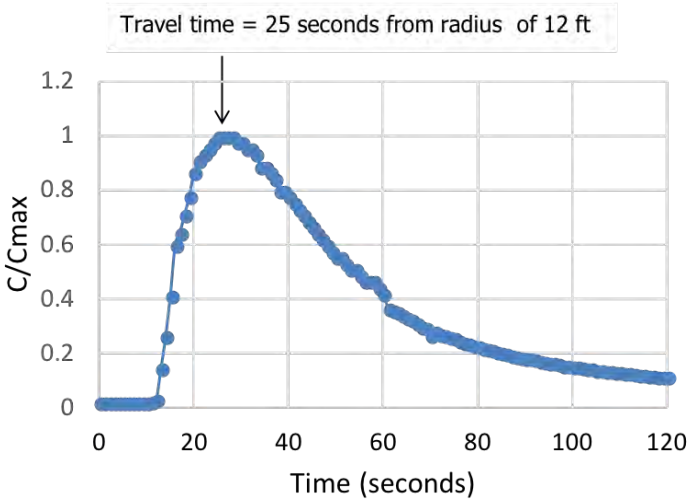


Figure 4-2: Example breakthrough curve for an inter-well subslab helium tracer test

The inter-well test provides the most useful results when the test is between about 30 seconds and 3 minutes in length. If the helium is injected so close to the suction point that it arrives in less than 30 seconds, then the time lag in the instrument reading can cause a positive bias that becomes significant. If the test is longer than a few minutes, the peak spreads by dispersion (helium has a very high diffusion coefficient), and the peak is very low and broad and the peak is harder to discern. The range of radial distances that would fall in the range of about 0.5 to 3 minutes travel time depend on the rate of gas extraction. A simple calculation can be used to approximate this, assuming that flow to the extraction point is dominated by a permeable granular fill layer of 0.1 m thickness (4 inches) and 25% air-filled porosity, with minimal leakage. The recommended minimum and maximum radial distance for the injection point(s) are provided in Table 4-1. If transient and steady-state pneumatic testing has already been conducted and the T and B values have been calculated, the radial distances corresponding to 0.5 to 3 minute travel times can be calculated using Equation 5 and 6 instead.

Table 4-1: Recommended minimum and maximum radial distances for the injection point of a helium inter-well tracer test as a function of the rate of gas extraction at the suction point

Q (scfm)	Minimum radius (m)	Maximum radius (m)
5	0.9	2.3
10	1.3	3.3
15	1.6	4.0
20	1.9	4.6
25	2.1	5.2
30	2.3	5.7
35	2.5	6.1
40	2.7	6.6
45	2.8	7.0
50	3.0	7.3
55	3.1	7.7
60	3.3	8.0
65	3.4	8.4
70	3.5	8.7
75	3.7	9.0
80	3.8	9.3
85	3.9	9.6
90	4.0	9.8
95	4.1	10.1
100	4.2	10.4

4.3.5 Helium Flood Test

The helium flood test is preferred for measuring travel time to larger radial distances than the inter-well test. If both inter-well and flood tests are planned, the inter-well tests should be performed first to avoid a background helium interference, and provide information for planning the frequency of monitoring and distances for the flood test. The flood test consists of injecting air into the subsurface through the vent pipe, either by reversing the fan or using a ShopVac® to blow approximately the same flow rate into the subsurface as is usually removed during extraction. A continuous stream of helium is added to the injected air at a flow rate sufficient to achieve about 1% v/v helium in the injected gas. The helium will migrate below the floor in all directions away from the vent-pipes. The He concentration is measured at regular intervals at subslab probes until the helium concentrations reach 50% of the injected helium concentration, which represent the average travel time to the given probe (see Figure 4-3). After the midpoint of the breakthrough curve has been reached, data collection can proceed to locations progressively farther from the

point of injection. Periodic measurements should be made after the midpoint has been recoded to verify that the final concentration at the probes matches the injected concentration.

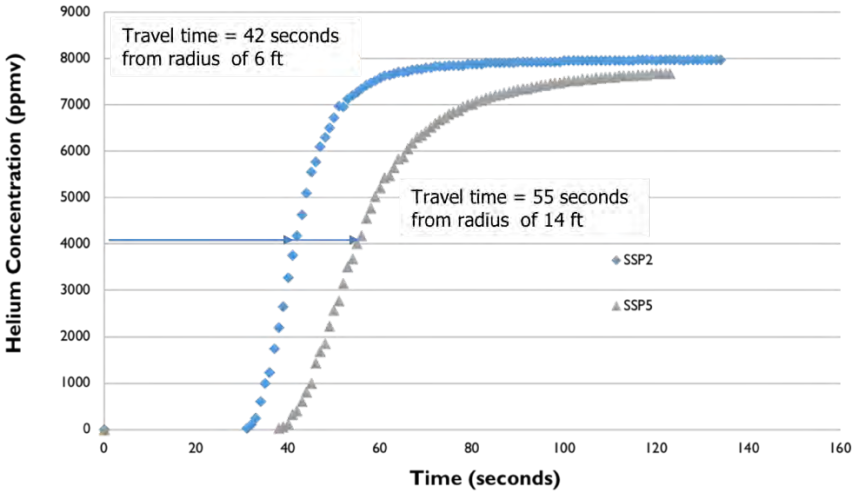


Figure 4-3: Example breakthrough curves for subslab helium flood tracer test

4.3.6 Cross-Slab Tracer Test

Equation 7 can be used to calculate the proportion of flow originating from below the floor slab, and the indoor air leakage test is designed to provide an independent line of evidence to test this calculation. The test consists of adding a tracer gas to indoor air and monitoring the concentration of the tracer in the emission from the vent pipe(s). If all of the gas extracted by the system is attributable to leakage across the floor slab, then the concentration of the tracer in the vent-pipe effluent will be equal to the concentration in the indoor air after at least a few pore volumes of gas have been swept through the active flow zone beneath the floor slab, or real-time monitoring has shown the tracer concentration in the effluent of the system has stabilized. If the steady concentration of tracer in the vent-pipe effluent is lower than the indoor air concentration, then the system is likely drawing gas from either outdoor air that enters the subsurface outside the building footprint, or from subsurface preferential pathways, or both.

4.3.7 Mass Flux Monitoring

Mass discharge from the venting systems was measured by calculating the product of the flow rate and concentrations of VOCs and radon from the vent pipes.

Mass discharge from the building was measured by depressurizing the building and measuring the air flow rate being extracted from the building and the average concentrations of VOCs and radon in the extracted air. For Building 205, this was accomplished by placing tarps partially over the air intakes without reducing the flow from the exhaust fans. For Buildings 200 and 11193, the building mass discharge was measured as part of ESTCP ER2015-03. For Sun Devil Manor, the building mass discharge was measured as part of SERDP ER1686.

4.3.8 Stress Test

A stress test was developed which consists of using a blower door to impose a vacuum on the building interior while the optimized mitigation system is operating. The imposed vacuum should be selected based on reasonable conditions for the building, and ambient cross-slab monitoring over time should be able to provide appropriate differential pressure data. The mass loading of target compounds to the building can be measured by collecting a sample at the face of the blower door after operating for long enough to reach a steady state condition, which can be verified by real-time monitoring or estimated by flushing a minimum of a few multiples of the building volume prior to sample collection (i.e., less than the mass flux screening level). The mass loading to the building under these conditions should ideally be too low to pose a potential health concern. If the stress test indicates an unacceptable loading to the building, additional forensic effort may be required to assess whether the root cause is an inadequate mitigation system design or background sources inside the building, or diffusive transport through the floor slab.

4.3.9 Building-Specific Attenuation Factor

For each building tested, the building-specific attenuation factor was calculated using Equation 17 and with available subslab and indoor air concentration data to compare and contrast the results.

4.4 SAMPLING METHODS

VOC vapor concentrations were primarily characterized by U.S. EPA Method TO-15 using passivated stainless steel canisters. Samples from vent-pipes were typically collected as "grab" samples (i.e., instantaneous, with no flow controller), indoor air samples were typically 24-hour samples in 6 L individually certified canisters and analyzed by the selected ion monitoring (SIM) method to achieve lower reporting limits. Some vent-pipe samples were collected using time-weighted average passive samplers (the Waterloo Membrane Sampler, Seethapathy and Gorecki, 2010, 2011). WMS samplers have been accepted by the State of New Jersey as a stand-alone technology for measurement of VOCs in discharge samples (NJDEP, 2009).

Radon concentrations were characterized either using a direct reading portable instrument (Duridge Rad7 or Accustar RadStar), by collection of whole gas samples in Tedlar bags, which were shipped to the University of Southern California for analysis by Professor Douglas Hammond using the Lucas cell method, or using E-Perm Electret samples over a period of typically 30 days.

Velocity measurements in vent-pipes were made using a Dwyer Model 471 thermal anemometer, which was inserted to the middle of the pipe and the average reading over about 10 seconds was recorded. Measurements were made in straight sections of pipe with a length at least 9 times the diameter to approximate laminar flow conditions.

Vacuum measurements were made using U-tube manometers, Dwyer Magnehelic gauges or one of a few digital micromanometer (Greywolf, Zephyr II, Dwyer or TEC DG700). Instruments were either auto-zeroing, or were zeroed before readings were made. Prior to analysis in AQTESOLV, the transient vacuum measurements were converted to units of feet of air head (1 Pa = 0.273 ft of air head at 15 ^{o}C).

Field screening for VOC vapor concentrations were made using a PID (preferably the Tiger by Ionscience, which manages interferences by water vapor better than other PIDs), or using a ppbRAE or miniRAE if the Ionscience instruments were unavailable.

Field screening for O_2, CO_2 and methane (CH_4) concentrations were made using a GEM 2000 or GEM 5000 LGMs.

Radial distances between suction points and subslab probes were measured in a direct line with a measuring tape where possible. If a wall was present between the suction point and the subslab probe, the distance was calculated using Pythagorean theorem from orthogonal distance measures on the other two sides of a right triangle.

4.4.1 Calibration of Field Equipment

All instruments and equipment used during field sampling and analysis were operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations. Operation, field calibration, and maintenance were performed by trained personnel on a daily basis. Field calibration was performed at the beginning of each day and checked at the end of each sampling day.

The PIDs were field-calibrated to zero gas and 100 ppm isopropylene span gas. The GEM 2000 or GEM 5000 LGMs were calibrated with a mixture of span gases and the Dielectric Helium Meters were calibrated by the rental agencies. The Duridge Rad-7 and Accustar RadStar meters were verified to have been calibrated within the past twelve months and that background measurements had been performed. Micromanometers were zeroed in the field prior to use or were auto-zeroing.

One calibration issue occurred during the study: Arizona State University provided a helium meter for use at Sun Devil Manor that provided readings lower than the other two instruments rented by Geosyntec. This is not problematic because both the helium flood and the inter-well tracer test depend on relative concentration (C/Cmax), not absolute values. The only consequence is that one of the flood tests was adjusted part-way through the test, so the breakthrough curve was non-ideal. This was manageable, because the test had already progressed to the stage where the initial (pre-adjustment) data was sufficient to extrapolate the remainder of the breakthrough curve.

4.4.2 Quality Assurance Sampling

Quality assurance (QA) sampling was conducted to document the accuracy, precision, reliability and representativeness of the data. Field meters were calibrated and calibration checks were performed as documented in Field Calibration Forms which are included in Appendix C (which is subdivided for the four buildings tested).

Samples for laboratory analysis of VOCs were collected using Summa canisters or passive samplers. When Summa canisters were used, a duplicate frequency of one in ten (10%) was conducted, except when collecting small numbers of samples (1-3) during confirmation testing of optimized systems. When passive samplers were used, duplicate samples were also collected on a 10% basis and trip blanks samples were also analysed with a frequency of one per batch of samples.

Samples for laboratory analysis of Radon were collected using Tedlar bags or Electrets. When Electrets were used, duplicate samples were also collected at a 10% frequency. When Tedlar bag samples were used, the laboratory technician split each sample into two and analysis were performed twice on each sample.

4.4.3 Sample Documentation

Samples that were shipped to a contract laboratory for analysis were shipped by courier using chain of custody forms and custody seals. Samples were labelled with unique sample ID numbers, which generally included the location, media and samplers initials. Samples were labelled using indelible ink (not marker, which may emit VOCs). Daily field forms were used to document field activities and field measurements were recorded on forms specific for each monitoring method. Field forms are compiled and presented in Appendix C.

4.5 ACTIVITIES UNIQUE TO EACH TEST BUILDING

Activities unique to each of the four buildings tested are described in Chapter 5 (Raritan Arsenal Building 205), Chapter 6 (Raritan Arsenal Building 200), Chapter 7 (Sun Devil Manor) and Chapter 8 (Vandenberg Building 11193).

5.0 SITE 1: FORMER RARITAN ARSENAL BUILDING 205

Building 205 (Figure 5-1) is located at the former Raritan Arsenal in Edison New Jersey: a 3234-acre site that was used by the United States Army from 1917 to 1964 and is the subject of an ongoing Defense Environmental Restoration Program – Formerly Used Defense Sites (DERP-FUDS) remediation program being administered by the United States Army Corps of Engineers (U.S. ACoE). An existing mitigation system consisting of 27 suction points connected to 9 high suction fans was installed in October, 2005 (Alpha Concepts, 2006). This chapter describes the site conditions, site-specific testing, data analysis and interpretation. The data indicate that a system may not be needed, but in an abundance of caution, two fans remain operating, and are more than sufficient to be protective of VOC and radon vapor intrusion.

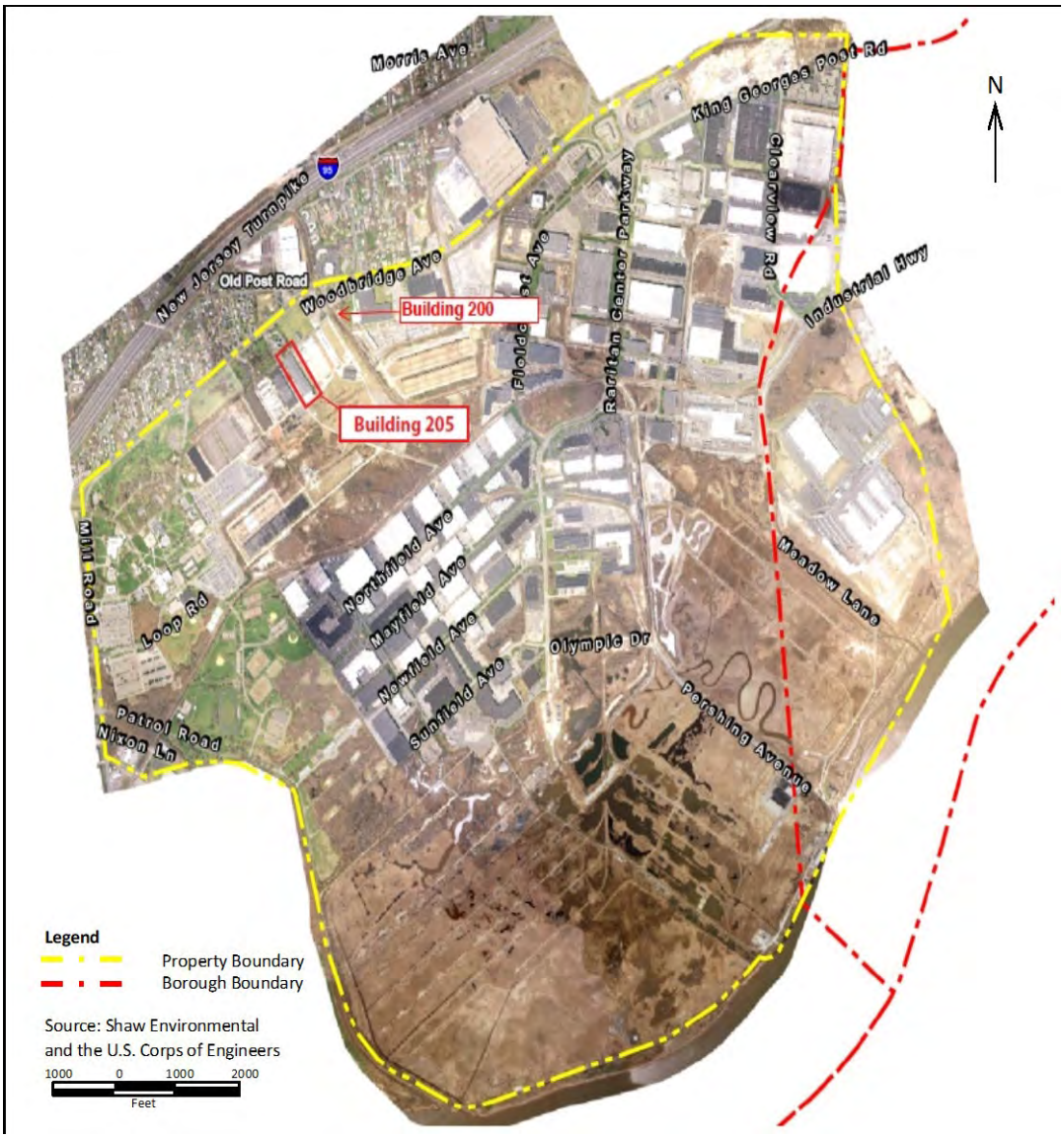


Figure 5-1: Location of Building 205 at the Raritan Arsenal

5.1 SITE DESCRIPTION AND HISTORY

Building 205 is a 64,000 ft^2, single-story brick building with a concrete slab floor on grade. The building is surrounded by a parking lot with a small landscaped lawn area. The building was constructed in 1918 and operations activities included pits, degreasers, stills, dip tanks and underground utility lines (U.S. ACoE, 2005). Currently, the building use is predominantly office space. Limited information is available on building footer construction, however the building appears to be constructed with a perimeter footing and interior columns supported on separate individual footers spaced at approximately 20 foot centers. A continuous footer may exist at the mid-point of the building running East-West across the building between extraction points HSF-05 and SSF-06 where the hallways are partitioned internally by doors that separate the different HVAC areas (indicated by shading in Figure 5-2). One HVAC unit serves the entire North-end of the building (about 29,000 square feet), a second HVAC unit serves the perimeter offices of the South-end of the building (about 24,000 square feet), and a third HVAC unit serves the internal offices in the South-end of the building (about 11,000 square feet).

Each of 9 Radonaway HS 2000 fans are mounted on the rooftop and discharge at a height about 4 ft above the roofline. Each fan is connected to three suction points through a 3-inch diameter PVC header than runs below the roof line (indicated by dashed lines in Figure 5-2). Photos of the exterior and interior are provided in Figure 5-3.

5.1.1 Site Geology/Hydrogeology

The Raritan Arsenal site is underlain by glacial lake sediments that have been described as inter-bedded sand and clay with some gravel. The data collected through historical site investigation activities indicates the shallow geology in the vicinity of Building 205 consists of generally homogenous unconsolidated sediments, primarily sand and silts with fill materials of variable thickness near the ground surface. The depth to the water table is approximately 30 ft bgs based on historical water level measurements.

5.1.2 Contaminant Distribution

Initial building-specific assessment activities were conducted by the U.S.EPA. In December 2004, they installed and sampled two temporary groundwater monitoring wells and 19 subslab points, shown in Figure 5-4. Sample results had a maximum TCE groundwater concentration of 7 μg/L and subslab concentration of 27,409 $\mu g/m^3$.

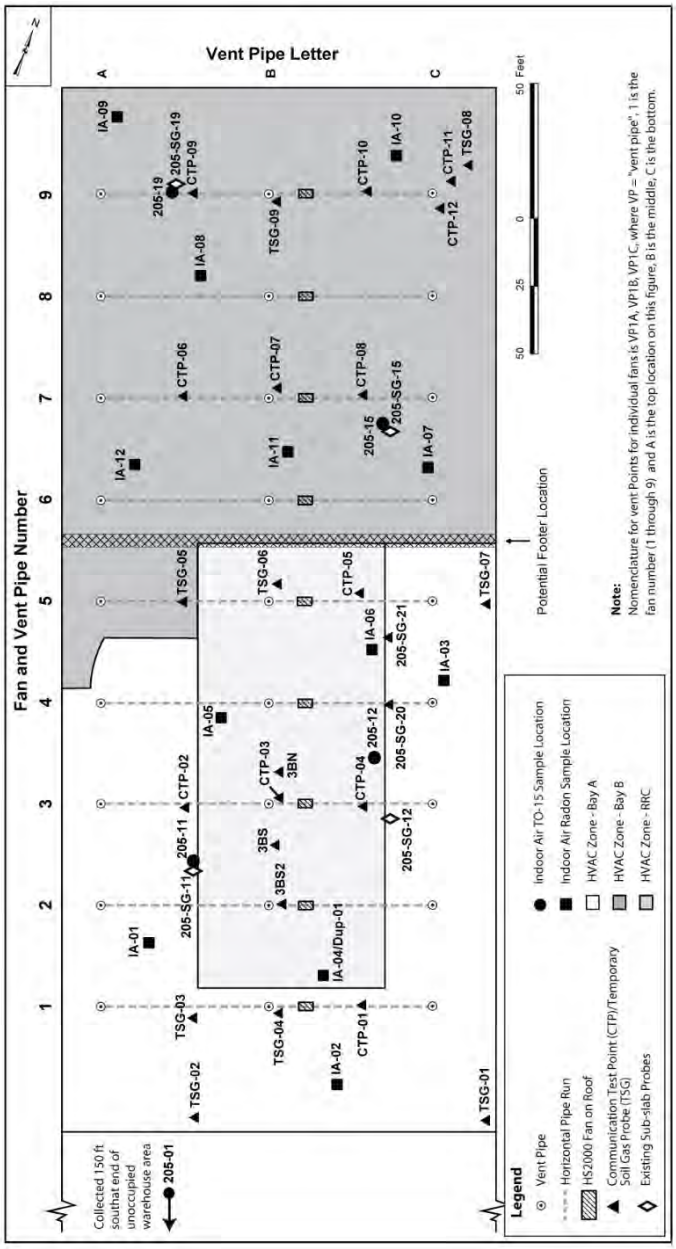


Figure 5-2: Building 205 air zones, locations of vent-pipes and sampling locations

Figure 5-3: Photos of exterior and interior of Building 205

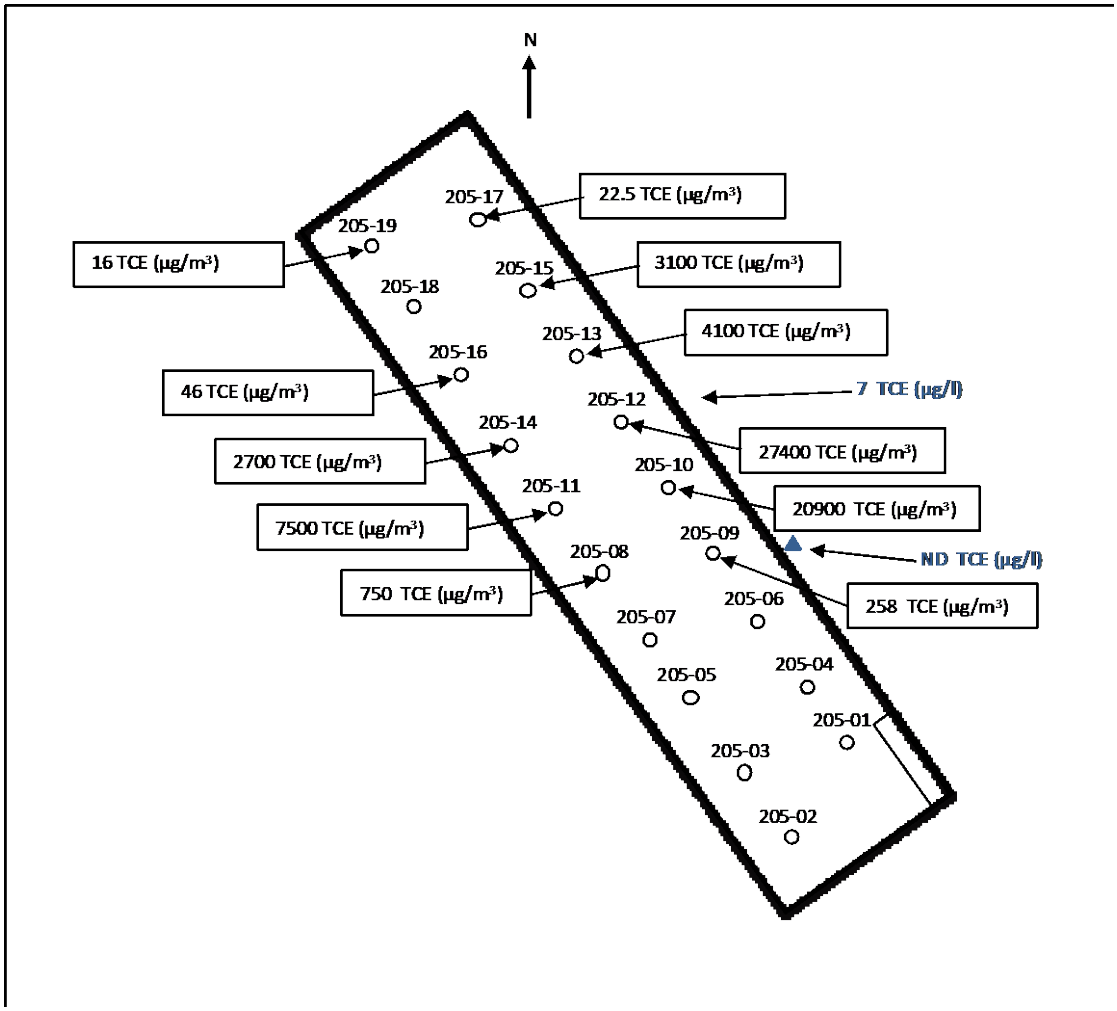


Figure 5-4: Measured concentrations of TCE in shallow groundwater and subslab samples collected from wells in the vicinity of Building 205

Based on those results, EPA sampled indoor air with a Trace Atmosphere Gas Analyzer (TAGA) unit in January 2005; measuring a maximum indoor air concentration of 57 ppb (310 µg/m^3), as shown in Figure 5-5 (note that the elevated concentrations of TCE in indoor air were very localized and did not correspond with the location of highest susbslab vapor concentrations, which raises the question of whether there may have been a background source inside the building). These concentrations exceeded their respective New Jersey Department of Environmental Protection subslab and indoor air screening levels by more than 10 times, so an SSD mitigation system was installed by the U.S.EPA.

Several rounds of indoor air and subslab soil gas sampling have been conducted by the U.S. ACoE since the SSD system was installed. Sample locations are shown on Figure 5-2. The indoor air concentrations (Table 4-1) are predominantly below reporting limits for TCE and PCE, with occasional detections and, rarely, with measured concentrations above 1 µg/m^3. The subslab data (Table 4-2) show that TCE concentrations are generally higher than PCE concentrations. Indoor air samples collected at five locations in the building on February 19, 2014 by Shaw Environmental

for the U.S. ACoE using Summa canisters and analyzed by USEPA Method TO-15 showed no detectable TCE at reporting levels that ranged from 0.07 to 0.107 μg/m^3 (Shaw, 2014). The measured subslab TCE concentrations in recent years are generally less than the NJDEP SSSL of 150 μg/m^3.

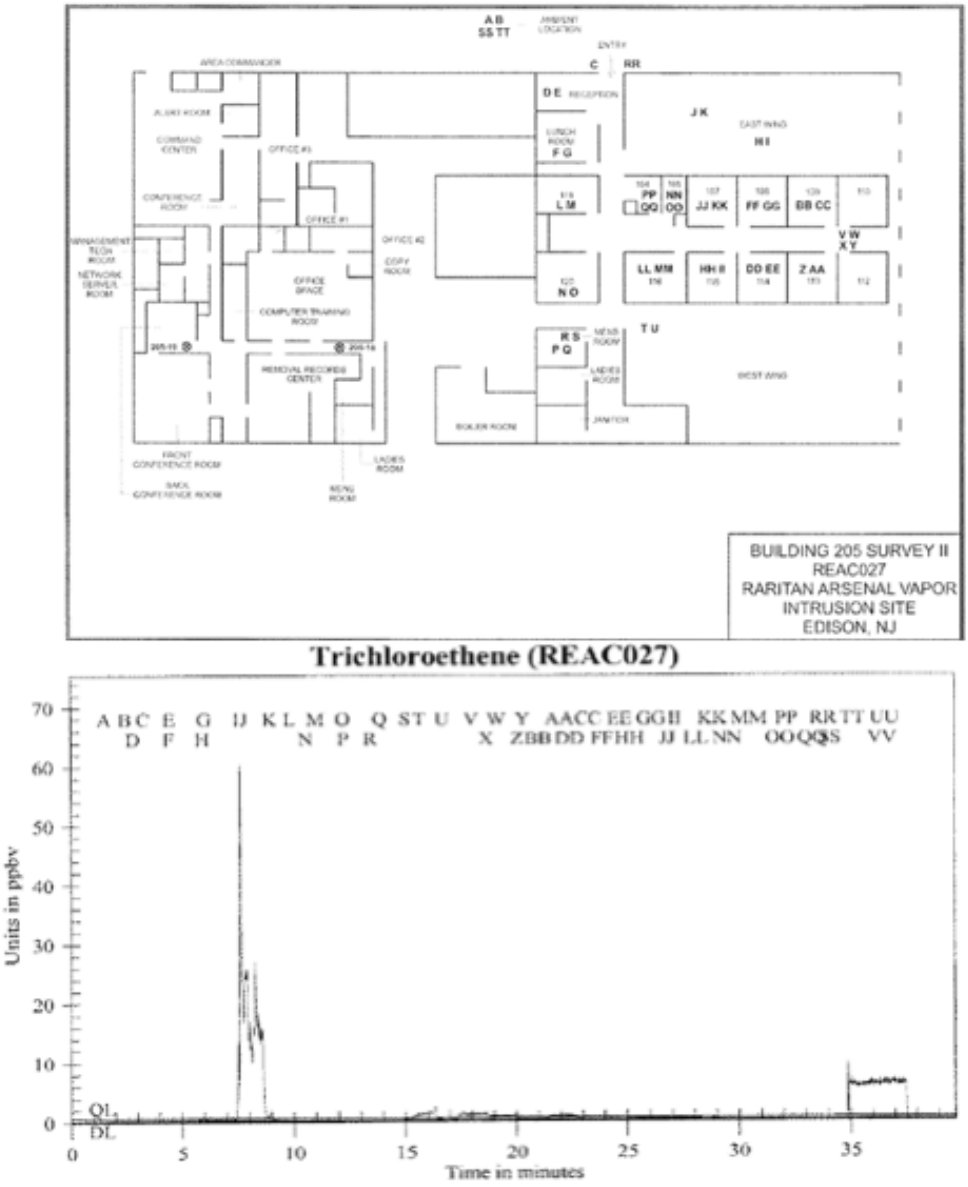


Figure 5-5: Building 205 indoor air TCE concentrations measured by the TAGA unit

Table 5-1: Historical Indoor Air Sampling and Analysis Data from Building 205

Indoor Air Samples

205-19 Small Conference room

Date	PCE	TCE
1/30/2006	1.4U	1.1U
6/13/2006	1.4U	1.1U
9/13/2006	1.4U	1.1U
1/11/2007	1.4U	1.1U
4/9/2007	1.4U	1.1U
8/27/2007	1.4U	1.1U
11/14/2007	1.4U	1.1U
6/3/2008	0.33	0.27
9/30/2008	0.34	1.02
3/12/2009	0.2J	0.21U
9/17/2009	0.2U	0.21U
3/3/2010	7.46	0.21U
9/24/2010	0.35	0.21U
9/20/2011	0.27U	0.21U
2/22/2012	0.27U	0.21U
10/23/2012	0.42	0.21U
2/26/2013	0.27U	0.21U
9/23/2013	1.36U	0.05J
2/19/2014	1.36U	0.04J

205-15 Bay A top of filling cabinet

Date	PCE	TCE
1/30/2006	1.5	1.1U
6/13/2006	1.4U	1.1U
9/13/2006	1.4U	1.1U
1/11/2007	1.4U	1.1U
4/9/2007	1.4U	1.1U
8/27/2007	2.7	1.1U
11/14/2007	1.4U	1.1U
6/3/2008	0.33	0.32
9/30/2008	0.47	0.22
3/12/2009	0.34	0.21U
9/17/2009	0.2U	0.21U
3/3/2010	0.2U	0.21U
9/20/2011	0.27U	0.21U
2/22/2012	0.37	0.21U
10/23/2012	0.24J	0.21U
2/26/2013	0.27U	0.21U
9/23/2013	1.36U	0.05J
2/19/2014	1.36U	0.04J

205-11 Bay B between 4th and 5th beam

Date	PCE	TCE
1/30/2006	1.4U	1.1U
6/13/2006	1.4U	1.1U
9/13/2006	1.4U	1.1U
1/11/2006	1.4U	1.1U
4/9/2007	1.4U	1.1U
8/27/2007	1.4U	1.1U
11/14/2007	1.4U	1.1U
6/3/2008	0.33U	0.22U
9/30/2008	1.08	3.87
3/12/2009	0.41	.21J
9/17/2009	0.2U	0.21U
3/3/2010	8.82	0.21U
9/24/2010	0.6	0.35
9/20/2011	0.24J	0.21U
2/22/2012	1.1	0.21U
10/23/2012	0.46	0.21U
2/26/2013	0.27U	0.21U
9/23/2013	1.36U	0.08J
2/19/2014	1.36U	0.07J

205-12 Bay B 3rd Beam

Date	PCE	TCE
1/30/2006	1.4U	1.1U
6/13/2006	1.4U	1.1U
9/13/2006	1.4U	1.1U
1/11/2006	1.4U	1.1U
4/9/2007	1.4U	1.1U
8/27/2007	1.4U	1.1U
11/14/2007	1.4U	1.1U
6/3/2008	0.33U	0.43
9/30/2008	0.41	1.18
3/11/2009	1.63	0.21U
9/17/2009	0.34J	0.21U
3/3/2010	18.99	0.21U
9/24/2010	0.55	0.26
9/20/2011	0.35	0.21U
2/22/2012	0.27U	0.21U
10/23/2012	0.43	0.21U
2/26/2013	0.27U	0.21U
9/23/2013	1.36U	0.12
2/19/2014	1.36U	0.10J

ALL UNITS ARE IN ug/m3

Table 5-2: Historic Soil gas sampling and analysis data from Building 205

Soil Gas Samples

205-SG-19

Date	PCE	TCE
1/31/2006	14U	510
6/13/2006	14U	26
9/13/2006	14U	34
1/12/2007	88	32
4/10/2007	14U	11U
8/29/2007	14U	11U
11/14/2007	14U	11U
6/3/2008	4.14	2.26
9/30/2008	0.33	0.38
3/12/2009	0.2J	0.21U
9/18/2009	0.41J	0.59J
3/16/2010	0.2U	0.21U
9/24/2010	1.1U	0.86U
9/20/2011	1J	2
2/22/2012	1.1U	1.2
10/23/2012	1.1U	0.86U
2/26/2013	1.1U	3.3
9/24/2013	1.36U	1.39
2/19/2014	1.36U	1.16

205-SG-15

Date	PCE	TCE
1/31/2006	14U	150
6/27/2006	14U	120
9/13/2006	14U	130
1/12/2007	88	120
4/12/2007	160	46
8/29/2007	14U	33
11/14/2007	14U	28
6/3/2008	24.82	20.42
9/30/2008	0.68	0.7
3/12/2009	0.34	0.38
9/18/2009	0.41J	11.82
3/16/2010	0.2U	12.36
9/24/2010	2	65.6
9/20/2011	0.95J	24
2/22/2012	1.4J	5.4
10/23/2012	2	32
2/26/2013	2.2	47
9/24/2013	1.76	31.16
2/19/2014	2.18	41.1

205-SG-11

Date	PCE	TCE
1/31/2005	1.8	86
1/31/2006	26	20
6/13/2006	14U	49
9/13/2006	14U	2000D
1/12/2007	52	41
4/10/2007	14U	75
8/29/2007	14U	11U
11/14/2007	14U	29
6/3/2008	0.75	1.4
9/30/2008	0.41	0.27
9/24/2010	4.8	213
9/20/2011	3	313
2/22/2012	1.6	152
10/23/2012	3.2	51
2/26/2013	11J	752
9/24/2013	7.66	902.4
2/19/2014	8.68	930

205-SG-12

Date	PCE	TCE
1/31/2005	1.4U	2800D
1/31/2006	14U	1500
6/13/2006	14U	330
9/13/2006	14U	340
1/12/2007	65	130
4/10/2007	14U	11
8/29/2007	14U	160
11/14/2007	14U	31
6/3/2008	32.89	3.44
9/30/2008	7.32	4.51
9/24/2010	1.1U	1.7
9/20/2011	1J	51
2/22/2012	1.1U	12
10/23/2012	1.2	7.5J
2/26/2013	1.1U	26
9/24/2013	0.91J	82.19
2/19/2014	1.36U	41.6

ALL UNITS ARE IN ug/m3

5.2 BUILDING-SPECIFIC TESTING

5.2.1 Site Reconnaissance

A site reconnaissance visit was conducted by Geosyntec on February 20, 2014, including:

- A walk-through tour inside the building to assess the uses of the building, interior layout and access to planned sample areas;
- Observations and photographs of the current SSD system configuration;
- Evaluation of fan power controls (locations of on/off switches) and whether each suction point can be controlled by a balancing valve;
- Evaluation of existing communication test point availability and condition;
- Measurement of the flow rate from each of the 9 vent fans; and
- Deployment of Waterloo Membrane Samplers (WMS), passive samplers in the exhaust of each fan for about one month followed by analysis by Eurofins/Air Toxics of Folsom, California.

Trichloroethene (TCE) was the dominant VOC detected in the WMS samples from the vent pipes (see Table 5-3). Samplers placed in vent-pipes at HSF-1 and HSF-6 were unfortunately dislodged from the vent pipe and were not analyzed (NA). The TCE concentrations in the effluent from fans HSF-2, HSF-3, and HSF-4 were all similar (49 to 66 $\mu g/m^3$) and concentrations for fans HSF-5 through HSF-9 were about an order of magnitude lower (average about 4 $\mu g/m^3$, which is only slightly above the IASL of 3 $\mu g/m^3$).

Table 5-3: Concentrations of TCE in vent pipe effluents

Fan	HSF-1	HSF-2	HSF-3	HSF-4	HSF-5	HSF-6	HSF-7	HSF-8	HSF-9
C_{SSV} TCE ($\mu g/m^3$)	***NA***	58	66	49	9.3	***NA***	2	3.4	1.4

5.2.2 Pneumatic Testing and Mathematical Modeling

Pneumatic testing was conducted to measure the transient (vacuum versus time) and steady-state (vacuum versus radial distance from the suction points) pneumatic response and the Hantush-Jacob model was fitted to both sets of data by adjusting the transmissivity (T) of the material below the floor slab and the leakance (B) of the floor slab (two variables and two independent data sets provides a unique solution for T and B values via iteration). Equations 1 through 7 were used to calculate the radial profiles of subslab vacuum, gas velocity, travel time, and relative proportions of flow from above and below the slab for a given flow rate.

Transient pneumatic test data were collected for 5 of the 9 fans (HS Fans 1, 3, 5, 7 and 9). There were no ball-valves on the 27 vent-pipes, so all three vent-pipes were active for each fan. The Hantush-Jacob leaky aquifer model was incorporated in the commercially-available software package AQTESOLV by HydroSOLVE, Inc. of Reston VA, and the software allows multiple extraction points at different radial distances to be included in the analysis, so all three individual

vent-pipes were incorporated in each transient test analysis. Communication test points (CTPs) were installed 3 ft from the center extraction point (denoted with the letter B) and at the midpoints between both the A and B and the B and C extraction points. Air velocity in each vent-pipe was measured using a handheld Series 471 digital thermal anemometer from Dwyer Instruments International of Michigan City, IN. The flow rate (Qssv) for each vent-pipe was calculated by multiplying the measured velocity by the cross sectional area of the inside diameter of the pipe. Vacuum in each vent-pipe was measured using U-tube manometers installed on each vent-pipe in 2005.

Steady-state vacuum versus distance was measured with only a single fan running (HS Fan 3) while all other fans were turned off and capped to minimize the influence of overlapping vacuum fields from multiple fans. The steady-state vacuum distribution was measured after allowing about 12 hours (overnight) for conditions from the single fan operation to stabilize.

5.2.3 Mass Flux of HS Fans

The mass flux removed from below the building by the HS Fans was measured as the product of the flow rate (Q_{SS}) and concentration (C_{SS}) of VOCs or radon in the fan discharge. The flux was measured four times: 1) in February 2014 during site reconnaissance, 2) in August 2014 with all 9 HS Fans running, 3) over a period from August to October 2015 with HS Fan 3 running alone, and 4) in December 2015 with HS Fans 3 & 8 operating. In February 2014, VOC concentrations in the fan discharge were measured using WMS, which were deployed in the discharge stream of each vent pipe for 30-days. WMS samplers were analysed by Eurofins Air Toxics of Folsom, California using solvent extraction followed by GC/MS. WMS samplers have been approved in New Jersey since 2009 for the collection of VOC samples from SSD systems (NJDEP 2009). WMS samplers were used in subsequent events for VOC data collection in August 2014, September 2014 and December 2015. Summa cannisters were also collected in December 2015 in conjunction with the deployment of the WMS samplers to provide inter-method duplicates as a QA/QC step. Summa cannisters were analysed by Alpha Analytical of Mansfield, Massachusetts using the EPA TO-15 method.

In August 2015, the mass removal rates were also documented for radon. Radon concentrations in the discharge of each HS Fan were measured over a 30-minute interval using a Durridge RAD7 from Durridge Radon Instrumentation of Billerica, MA. The SSD system was then reconfigured by turning off and capping all HS Fans except HS Fan 3. The mass flux of HS Fan 3 was measured as a function of time after the start of the system to characterize the rate of change (if any) in the rate of mass removal. Summa canister samples were collected from the discharge of HS Fan 3 after 10, 100, 1,000 and 20,000 minutes following the start of the optimized system. Radon samples were collected as a grab sample into Tedlar bags and analysed at the University of Southern California by scintillation cell counting.

5.2.4 Subslab Tracer Testing

Subslab tracer testing was conducted to measure the velocity of air flow below the floor as an independent verification of the velocity and travel time calculated with Equations 5 and 6. Inter-well tests were conducted at subslab probes CTP-12, 3BN and 3BS.

The helium flood consisted of turning off all 9 HS Fans, then blowing air into HS Fan 3 using a Model WD6425 Wet/Dry Vac from Rigid Tool Company of Elyria, Ohio. A bleed valve was used to control the applied pressure and adjusted until the pressure at each of the three vent-pipes was equal in magnitude to the vacuum under normal operating conditions, which caused flow rates into each vent-pipe within about 10% of the normal operating extraction rates, except with the opposite flow direction. Helium was then metered into the injected air to create an injection concentration of two percent by volume (2% v/v). The concentration of helium was monitored in two subslab probes (SG-20-205 and SG-21-205) shown on Figure 5-2, located distances of 43 and 67 ft, respectively, away from the nearest vent-pipes into which helium was injected. Samples were collected using a 1L Tedlar bag and vacuum chamber and screened with a MGD-2002 Helium meter.

5.2.5 Cross-Slab Tracer Testing

Both CO_2 and HCHO cross-slab tracer tests were attempted, unfortunately, neither provided data that could be analyzed to yield the proportion of indoor air in the vent-pipe exhaust because the ambient subsurface concentrations of CO_2 were too high and the ambient indoor air concentrations of HCHO were too low.

5.2.6 Building Depressurization Testing

Building depressurization testing was conducted to measure the indoor air concentrations of VOCs and radon under negative pressure and calculate the mass flux of TCE and radon through the building. All 9 SSD HS Fans were turned off and capped prior to conducting the building depressurization test. The building was depressurized overnight by running the HVAC exhaust fans at their maximum flow rate and covering about 90% of the openings of the supply air manifolds with fibreglass-reinforced plastic tarps to restrict inflows to the building. The HVAC exhaust flow rate from the building was about 1.2 Mm^3/day (30,000 standard cubic feet per minute [scfm]) and the building pressure was generally in the range of 10 to 30 Pa lower than the subslab pressure measured at four subslab probes (at least one was located in each of the three air-zones shown in Figure 5-2). After 16 hours, seven (7) indoor air grab samples were collected at locations shown on Figure 5-2 via Summa canister for VOC analysis by EPA Method TO-15 and radon was measured in three locations by Tedlar bag samples analyzed by Doug Hammond at the University of Southern California, Los Angeles.

5.2.7 Confirmatory Indoor Air Monitoring

Indoor air quality monitoring was conducted in October 2014, 59 days after the change to HS Fan 3 operating alone to validate the effectiveness of the optimized system. Five indoor air samples were collected over 24-hours with 6 L Summa canisters for analysis of VOCs by EPA Method TO-15 and nine EPERM Electrets from Rad Elec Inc. of Frederick Maryland were collected over a 30-day period at locations shown on Figure 5-2 for radon analysis.

5.3 RESULTS AND DISCUSSION

5.3.1 Specific Capacity

Table 5-4 provides the vacuum and flow rate data measured in each of the vent-pipes in August 2014. The flow rates from the 27 individual suction points ranged from 2 to 45 standard cubic feet per minute (scfm) and the applied vacuum ranged from 4.9 to 12.5 inches of water column (in. H_2O). The specific capacity (flow rate divided by applied vacuum) ranged from 0.35 to 9.15 scfm/in H_2O. Specific capacity is directly proportional to the permeability of the material providing flow to the well (Bear, 1979), so the material below the floor near HS Fans 1 through 4 has a lower permeability than areas near HS Fans 5 through 9. The specific capacity values were interpolated and contoured as shown in Figure 5-6.

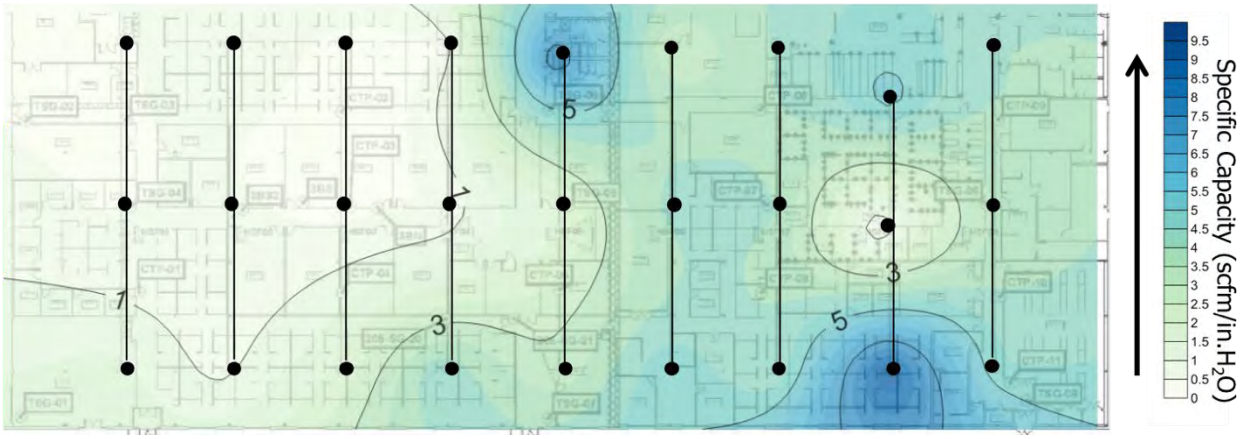


Figure 5-6: Contour plot of specific capacity for each of the 27 vent pipes

5.3.2 Mass Flux

Table 5-4 shows the total flow rates for each fan, TCE and radon concentrations measured in the fan discharge and mass flux in the discharge of each of the 9 HS Fans. The mass flux of TCE ranged from 0.004 to 0.12 grams per day (g/d), the total system TCE flux was 0.46 g/d and eighty-eight percent of the total system mass flux was measured in discharge of HS Fan 1 through Fan 4. This indicated that an optimized system may consist of fewer fans, and possibly Fan 3 alone could be sufficient, which was tested as described below.

The flux of radon was $2x10^9$ picocuries [pCi] per day and only 38% was from HS Fans 1 through 4. Therefore, a second scheme for optimization was tested using both Fan3 and Fan 8.

Table 5-4: Flow Rate, Vacuum, Specific Capacity, TCE and Radon Data from 9 HS Fans

HS Fan	Suction Point	Vacuum (in. H_2O)	Flow (scfm)	Specific Capacity (scfm/in. H_2O)	Fan Total Flow (scfm)	TCE Conc'n ($\mu g/m^3$)	TCE Flux (g/day)	Radon Conc'n (pCi/L)	Radon Flux (pCi/day x 10^6)
1	1-A	11.8	4.2	0.35	30	100	0.12	140	177
	1-B	11	5.2	0.47					
	1-C	12.5	21	1.69					
2	2-A	11	11	1.02	27	58	0.063	220	237
	2-B	10	6.2	0.62					
	2-C	10.8	9.2	0.85					
3	3-A	10.5	4.1	0.39	31	100	0.12	130	167
	3-B	10.5	4.0	0.38					
	3-C	10.8	23	2.09					
4	4-A	8.5	3.8	0.45	47	49	0.093	110	206
	4-B	8.5	4.8	0.56					
	4-C	8.5	38	4.45					
5	5-A	5	39	7.70	64	9.3	0.024	26	68
	5-B	5	8.7	1.74					
	5-C	5.3	16	3.10					
6	6-A	6	18	3.03	72	3.4	0.010	80	237
	6-B	6	25	4.10					
	6-C	6	30	4.94					
7	7-A	6	24	4.02	72	2	0.006	120	359
	7-B	6	25	4.10					
	7-C	6	24	3.94					
8	8-A	5	26	5.23	73	3.4	0.010	100	298
	8-B	5.3	2.0	0.39					
	8-C	4.9	45	9.15					
9	9-A	6	24	4.02	73	1.4	0.004	110	314
	9-B	6	22	3.61					
	9-C	6	28	4.60					
Total TCE flux							**0.46**	Radon	**2100**
TCE flux from HS Fan 3 alone after 10 minutes of operation							**0.47**		
TCE flux from HS Fan 3 alone after 100 minutes of operation							**0.46**		
TCE flux from HS Fan 3 alone after 1,000 minutes of operation							**0.45**		
TCE flux from HS Fan 3 alone after 20,000 min. of operation							**0.43**		
TCE flux from HS Fan 3 after 119 day plus Fan 8 after 10 min.							**0.56**		

The threshold mass flux from the sub-surface that would be needed to pose a concern to indoor air quality was calculated using Equation 12 as the product of a health-protective indoor air target concentration (C_{IA}) and the building ventilation rate (Q_{bldg}). Q_{bldg} is about 30,000 scfm, measured as the sum of the exhaust flows for all the exhaust fans during the building depressurization test. This equates to about 1.9 air changes per hour, for an area of 64,000 ft^2 and a height of 15 feet. The TCE screening level of 3 $\mu g/m^3$ could be sustained by a TCE mass flux of 2.7 g/d. The radon

mitigation level of 4 pCi/L could be sustained by a Radon mass flux of $6x10^9$ pCi/day. The mass flux measurements were lower than the thresholds of concern for both TCE and radon, however, a modest mitigation effort may still be appropriate in the abundance of caution to account for spatial and temporal variability and other sources of uncertainty.

5.3.3 Steady Vacuum Distribution with HS Fan 3 Operating Alone

Figure 5-7 shows a contour plot of the steady-state distribution of vacuum below the floor slab after about 12 hours with HS Fan 3 as the only operating fan. This data indicates that HS Fan 3 exerts a significant vacuum throughout the region of potential TCE vapor intrusion into Building 205, although possibly not so for radon, which was more uniformly distributed across the building.

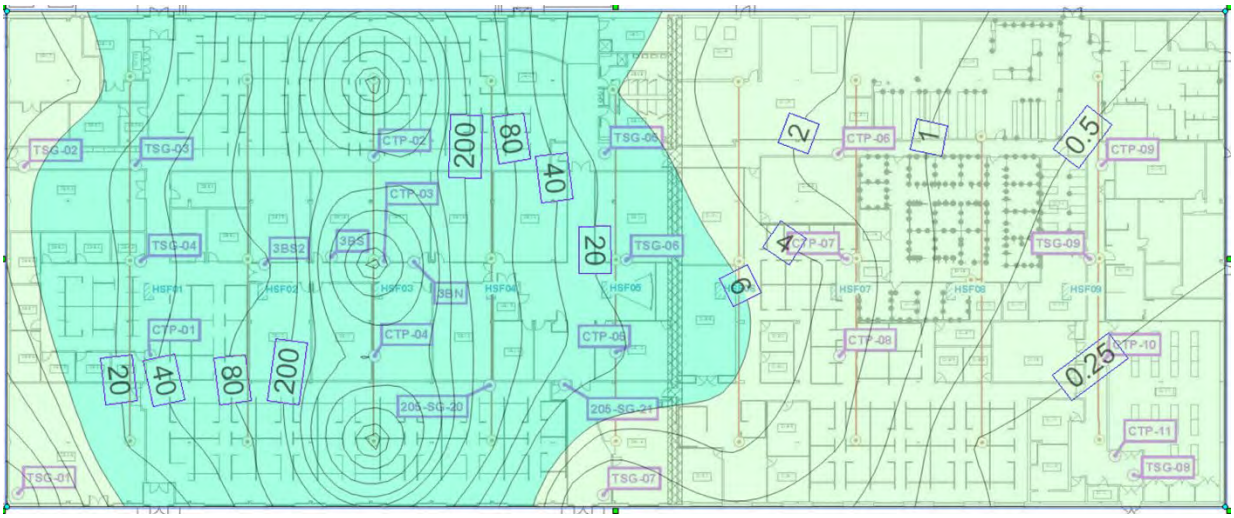


Figure 5-7: Static vacuum with only HS Fan 3 operating (darker green shading >6 pascals)

5.3.4 Transient Pneumatic Testing and Analysis

Table 5-5 summarizes the transmissivity and leakance values derived from analysis of the transient vacuum response (drawdown and recovery) data collected from subslab probes near HS Fans 1, 3, 5, 7 and 9 using the Hantush-Jacob Leaky Aquifer Model. An example set of transient response data is shown in Figure 5-8 (linear-linear scales) and the corresponding AQTESOLV output (log-log scales) is shown in Figure 5-9. The transmissivities for locations near HS Fans 1 and 3 are generally approximately an order of magnitude lower than the values measured for HS Fans 5, 7, and 9.

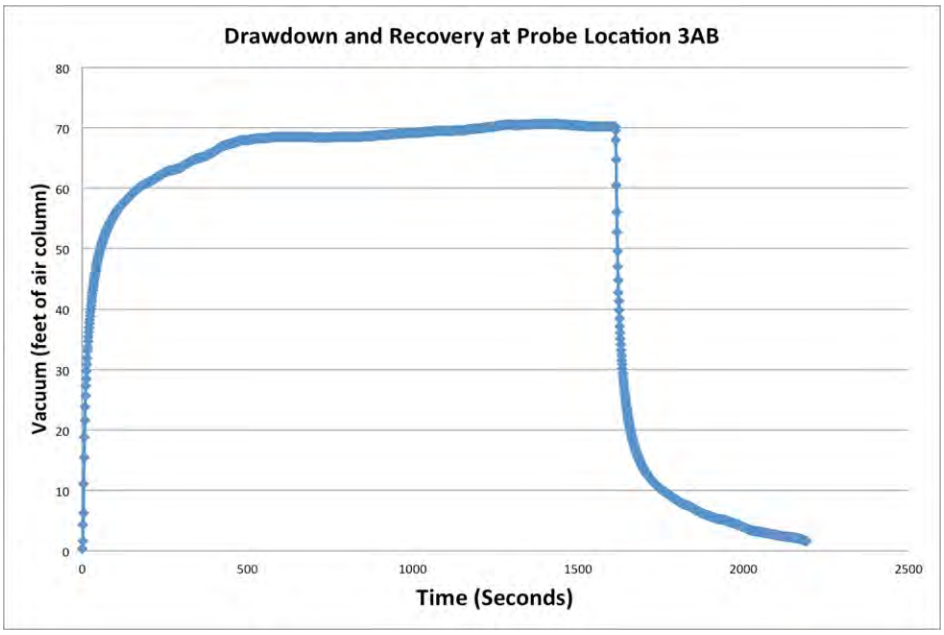


Figure 5-8: Transient pneumatic response recorded at observation point 3AB (located midway between suction points 3A and 3B) in response to cycling HS Fan 3

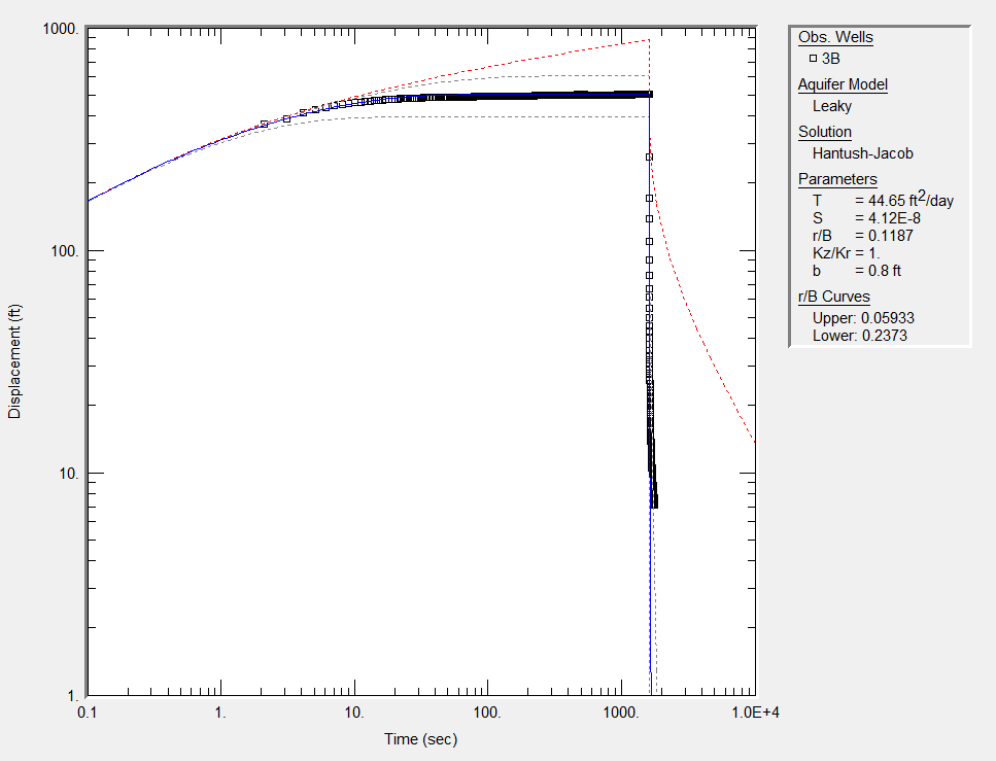


Figure 5-9: Hantush-Jacob Model curve fitting to transient data from observation CTP-03 (located 3 feet from suction point 3B) in response to cyclic operation of Fan 3 (from AQTESOLV software)

Table 5-5: Results of Hantush-Jacob Model Analysis of Transient Vacuum Response Data

Fan	Subslab Probe	Transmissivity (T)	r/B	Radius (r)	Leakance (B)	K´
		(ft^2/day)	(dim)	(ft)	(ft)	(ft/day)
1	3 ft from 1B	14	0.21	3	15	0.031
1	Between 1A & 1B	130	0.41	30	73	0.012
3	3 ft from 3B	45	0.12	3	25	0.036
3	Between 3A & 3B	22	1.0	30	30	0.012
3	Between 3B & 3C	22	1.0	30	30	0.012
5	Between 5A & 5B	700	0.78	30	38	0.24
5	Between 5B & 5C	710	1.2	30	25	0.57
7	Between 7A & 7B	440	0.73	30	41	0.13
7	Between 7B & 7C	660	1.5	30	20	0.83
9	Between 9A & 9B	860	2.2	30	14	2.2
9	Between 9B & 9C	1000	4.3	30	6.5	12

5.3.5 Model Calibration to Vacuum versus Distance

Figure 5-10 shows steady state vacuum versus distance measurements recorded with only HS Fan 3 running. Figure 5-10 also shows the calculated vacuum profiles from Equation 4 using the T and B values calculated from transient vacuum data recorded at communication test points near Fan 3 (Table 5-5). There is a good match between the measured and calculated profiles of vacuum versus distance and a very large radius of influence (150-200 feet) is indicated. This is sufficient to provide depressurization within the area of elevated TCE flux (Table 5-3) with Fan 3 operating alone, but this may not be adequate to not cover all areas of potential radon entry.

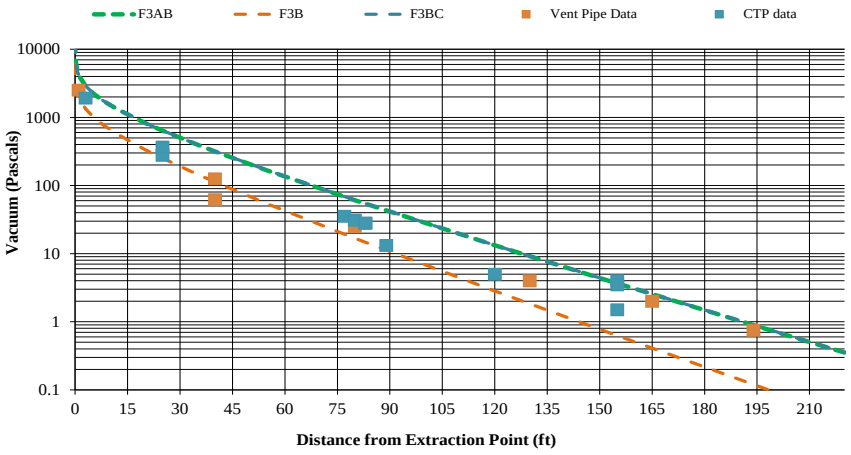


Figure 5-10: Vacuum versus distance from HS Fan 3 suction points (measured and modeled using T and B values for probes near HS Fan 3)

5.3.6 Subslab Helium Tracer Testing

Figure 5-11 shows the results of two of the inter-well helium tracer tests at probes located 14 feet on opposite sides of vent-pipe 3B. The two tests showed arrival times of 44 and 50 seconds, which are very similar. A third inter-well tracer test was conducted at a probe installed 6 feet from vent-pipe 9C (CTP-12) and had a time for the peak helium concentration of 130 seconds, indicating a much slower velocity (Figure 5-12). Vent-pipe 9C had a flow rate of 28 scfm, compared to 4 scfm at vent-pipe 3B, so the velocity near vent-pipe 9C should have been much faster than the velocity near vent-pipe 3B. Specifically, the travel time from a distance of 14 feet at an extraction flow rate of 4 scfm was about 3 times faster than the travel time from a distance of 6 feet at a flow rate of 28 scfm. This clearly indicates a much more rapid flow in one area compared to the other, and that demonstrates the potential utility of subslab tracer testing for assessing preferential flow pathways below the floor slab, which may be helpful for mitigation system design.

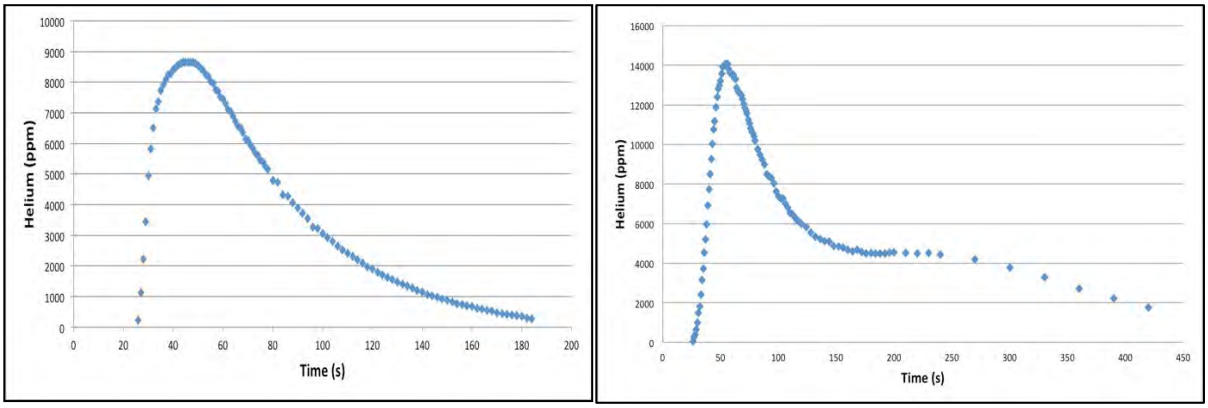


Figure 5-11: Helium inter-well tracer test data for two probes 14 feet from suction point 3B in the north (left) and south (right) directions with travel times of 44s and 50 s, respectively

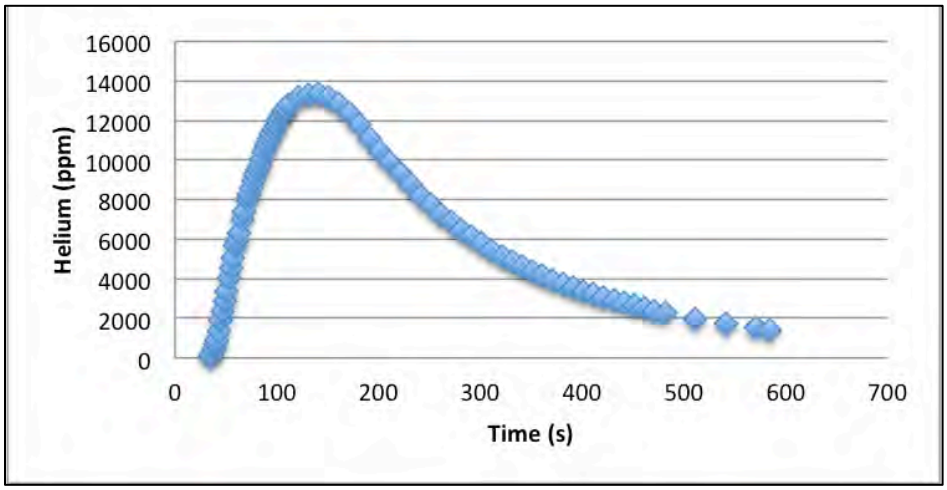


Figure 5-12: Helium inter-well tracer test from a probe at a radius of 6 feet from suction point 9C, with travel time of 130 s

Figure 5-13 shows data from the helium flood test. The average travel time from the injection points to the monitoring points is the time required for the subslab concentration to reach 50% of the injected concentration (50% of 2%, or 1% v/v, which is 10,000 parts per million). The average travel time to probe 205-SG-20 from Vent-Pipes 3A and 3B (located about 43 feet away) was approximately 100 minutes. Time restrictions forced an end to the test before the helium concentration at location 205-SG-21 reached 10,000 ppm, so the average travel time was extrapolated to follow a similar profile as 205-SG-20, resulting in an estimated time of 340 minutes to reach 10,000 ppm. These points are both plotted on Figure 5-13, which also shows the travel time profile calculated using Equation 6 and the travel times measured using the inter-well helium tracer tests. The travel times from the two inter-well tests 14 feet on either side of vent-pipe 3B (3BS and 3BN) are notably faster than the calculated He flood travel times, but the other tracer test data on Figure 5-13 all line up well with the profiles calculated with Equations 5 and 6. This indicates a preferential pathway in the vicinity of suction point 3B, where the two fast inter-well tests were located, which may be an underground utility, or more permeable fill along a footing (these probes are adjacent to an interior wall). The helium subslab inter-well and flood tests provide independent lines of evidence to validate the velocities calculated from the Hantush-Jacob model analysis.

The calibrated model provides information previously unavailable for mitigation system performance assessment. For example, Figure 5-14 shows that the travel time from radial distances ranging between 150 and 175 feet (i.e., the region of induced vacuum for HS Fan 3 shown on Figure 5-9), the travel time would be about 20,000 minutes (approximately 14 days). If the radius of influence was based on a travel time of 3 to 4 hours, the ROI would be about 60 ft. In other words, the area of influence (π ROI^2) would be 11,000 ft^2, so the 64,000 ft^2 building footprint could be covered with 6 suction points.

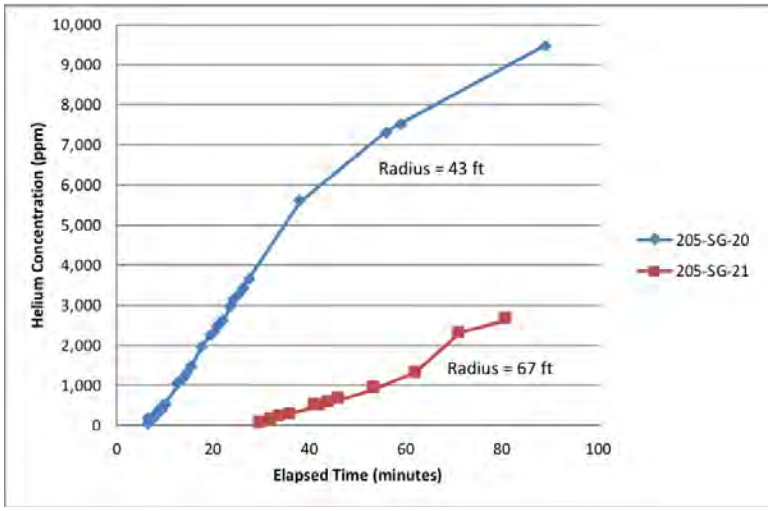


Figure 5-13: Helium Flood test data for probes 43 and 67 ft from the nearest injection point (3A, 3B or 3C)

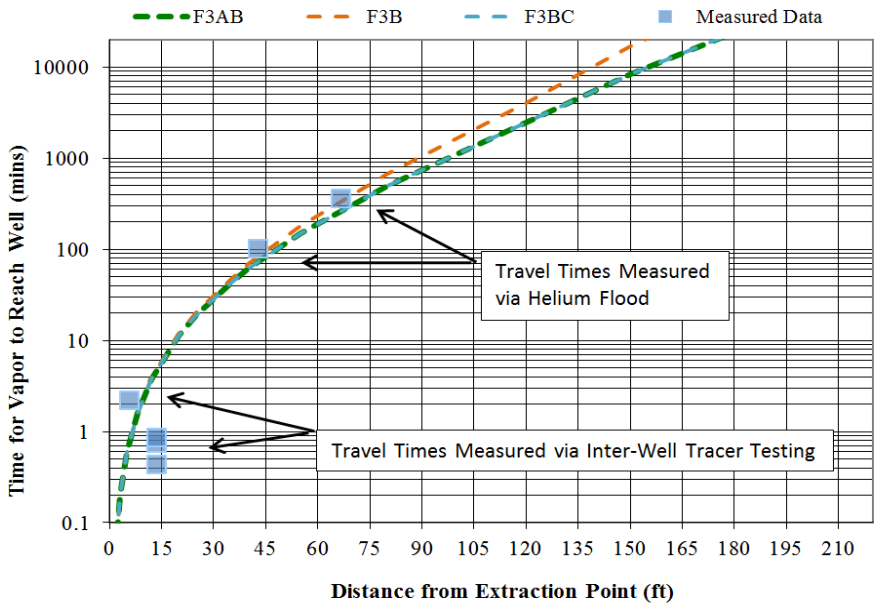


Figure 5-14: Subslab travel time versus radial distance using T and B values for probes near HS Fan 3, showing inter-well tracer test and helium flood results for comparison

Figure 5-15 shows the profiles of velocity calculated using Equation 5. If the ROI was defined by a velocity of 3 ft/day, it would be in the range of 145 to 165 ft, corresponding to areas of influence larger than the building.

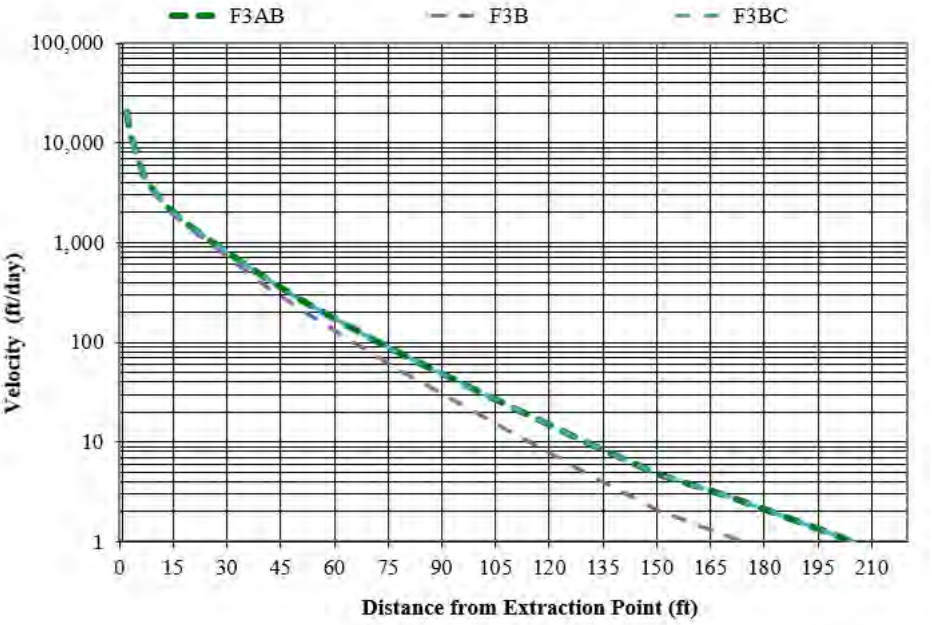


Figure 5-15: Calculated profiles of velocity vs distance from Fan 3 suction points

Figure 5-16 shows the proportion of flow originating below the floor calculated using Equation 7. At a radius of 90 ft, the proportion of flow originating from below the floor is about 10% of the

total flow (10% of 31 scfm = 3.1 scfm). The corresponding area (πr^2) would be 25,000 ft^2. So within this region, the flow per unit area would be greater than 3.5 L/min/1000ft^2, which is comparable to the U.S. EPA default of 5L/min for Qsoil in a 1,000 ft^2 residence (U.S. EPA, 2017).

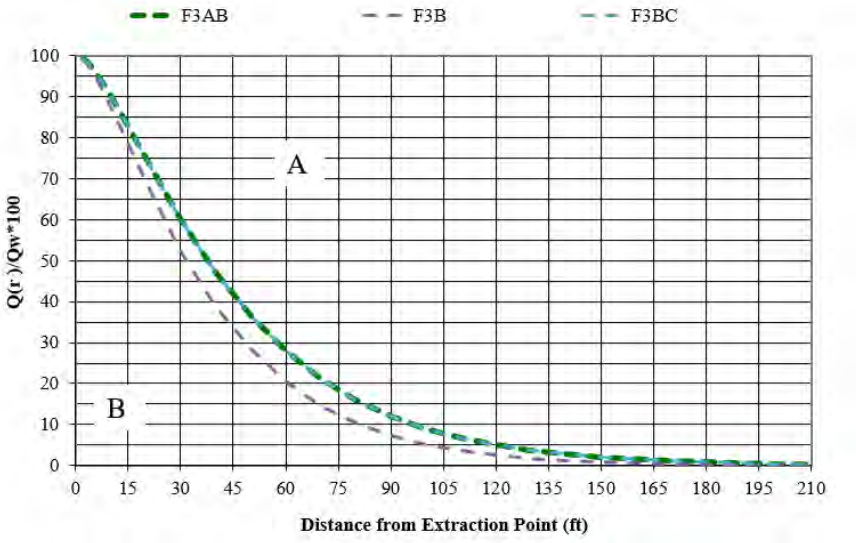


Figure 5-16: Proportion of flow originating below the floor slab as a function of radial distance from HS Fan 3 suction points

5.3.7 Building Depressurization Test

The differential pressure across the floor slab in the four locations monitored during building depressurization (with the SSDS off and capped) is shown in Figure 5-17. The air supply and exhaust flow rates measured during the test are listed in Table 5-6. Indoor air Summa canister samples collected after 16 hours of building depressurization showed no detectable TCE (<0.107 $\mu g/m^3$) in 6 of the 7 samples and one sample with a trace detection of 0.14 $\mu g/m^3$ (Location 205-15, see Figure 5-2), all of which were >20 times lower than the commercial indoor air screening level (3 $\mu g/m^3$). Three indoor air radon grab samples had concentrations in the range of 0.87 to 2.3 pCi/L, all of which are below the radon mitigation level of 4 pCi/L. The TCE mass flux through the building cannot be quantified exactly because TCE was not detected in most of the indoor air samples, but the mass flux through the building was less than 0.098 g/day (TCE concentration of 0.14 $\mu g/m^3$ multiplied by Q_{build} of 1.2Mm^3/day). The radon mass flux through the building assuming an average indoor air concentration of 1.5 pCi/L multiplied by Q_{build} of 1.2Mm^3/day is $1.8x10^9$ pCi/day, which matches the total extracted from the 9 fans on Table 5-4 almost exactly. The building depressurization test demonstrated that TCE and radon concentrations in indoor air do not exceed target levels even without the SSD operating and with the building depressurized to a level that would represent a reasonable maximum exposure for potential vapor intrusion. The TCE mass flux through the building is 27x less than the flux required to pose a potential health risk and the radon flux is at least 2x less than the flux required to cause indoor air concentrations above 4 pCi/L.

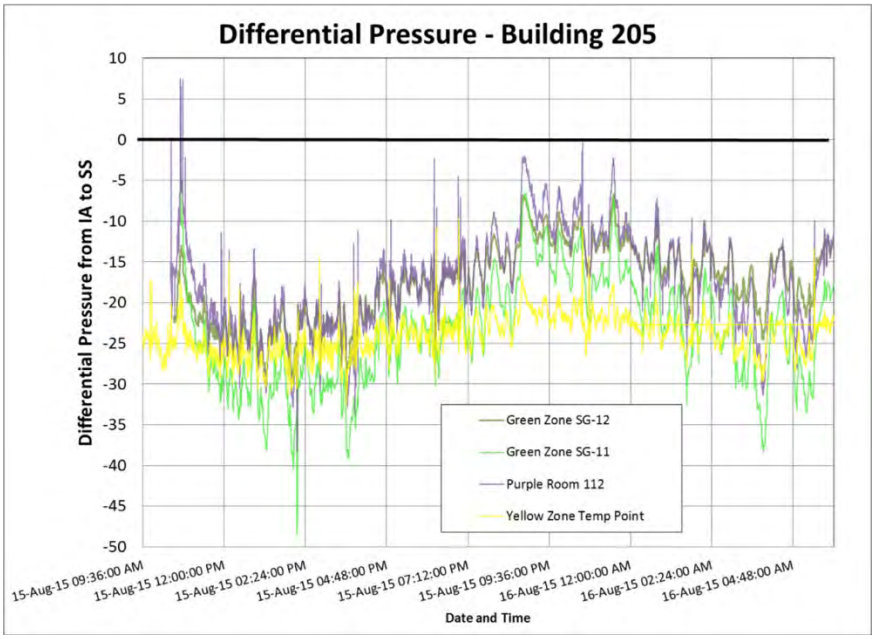


Figure 5-17: Cross slab differential pressure induced by building depressurization

Table 5-6: Air supply and exhaust measured during build depressurization test

	South		Middle		North	
	Supply	**Exhaust**	**Supply**	**Exhaust**	**Supply**	**Exhaust**
Facing	West	East	West	East	East	West
Velocity (ft/min)	85	430	52	75	45	450
Length (in)	116	116	36	72	116	116
Width (in)	38	38	36	24	45	45
Area (ft^2)	31	31	9.0	12	36	36
Flow (scfm)	2602	13162	468	900	1631	16311
Sum supply (scfm)	4701					
Sum exhaust (scfm)	30373					

5.3.8 Indoor air Concentrations Before and After Optimization

Table 5-7 summarizes TCE and Radon concentrations measured in indoor air before and after optimization of the mitigation system. TCE concentrations were <0.21 µg/m³ in both optimized scenarios. With only Fan 3 running, radon concentrations approached 4 pCi/L in Air Zone B, but were notably lower when Fan 8 was also running.

Table 5-7: Results of Indoor Air Sampling Before and After Optimization

Mitigation System		Baseline (All 9 HS Fans)	HS Fan 3 Only	HS Fans 3 & 8
Sampling Date		Aug-14	Aug-15	Dec-15
Location	Air Zone[1]	Radon Concentration from 30-day EPERM Electrets (pCi/L)		
IA-205-01	A	1.7	0.9	1.9
IA-205-02	A	1.9	1.6	2.2
IA-205-03	A	2.0	2.4	2.2
IA-205-04	RRC	1.2	1.5	1.1
IA-205-01	A	1.7	0.9	1.9
Dup-01	RRC	1.2	1.4	1.5
IA-205-05	RRC	1.1	1.4	1.4
IA-205-06	RRC	1.2	1.3	1.4
IA-205-07	B	2.0	3	2.2
IA-205-08	B	2.2	3.4	2.6
IA-205-09	B	1.8	3.3	1.4
IA-205-10	B	NA	NA	2.2
IA-205-11	B	NA	NA	2.1
IA-205-12	B	NA	NA	1.5
	Average	**1.6**	**2.0**	**1.8**
		TCE Concentration from Summa Canister TO-15 SIM (µg/m³)		
Location	Air Zone[1]	Sep-14	Oct-15	Mar-16
205-01	warehouse	0.21 U	0.21 U	0.21 U
205-11	A	0.21 U	0.21 U	0.21 U
205-12	RRC	0.21 U	0.21 U	0.21 U
205-15	B	0.21 U	0.21 U	0.21 U
205-19	B	0.21 U	0.21 U	0.21 U
Duplicate	B	0.21 U	0.21 U	0.21 U
Duplicate	B	0.21 U	0.21 U	0.21 U

[1] - air zone refers to the three areas identified in the Figure 5-2 for each location
U - non-detect, value is the reporting limit
NA – not available (locations were sampled only in the last event for supplemental data)

5.3.9 Mass Flux from HS Fan 3 Alone

The mass flux of TCE removed from HS Fan 3 operating alone after the building depressurization test was 0.47, 0.46, 0.45 and 0.43 g/day for samples collected 10, 100, 1,000 and 20,000 minutes after start-up (Figure 5-18), indicating minimal change over time and a mass removal rate similar

to the total system mass removal rate when all 9 HS Fans were operating (Table 5-4). From inspection of Figure 5-14, the sample collected after 20,000 minutes would be an integration of gas drawn from below the floor to a distance of about 150-175 ft from the suction points, which includes all the areas of elevated TCE mass flux. The WMS samples collected 40 to 70 days later showed a slightly lower mass flux (as low as 0.25 g/day), which is within a factor of 2 and may be partially attributable to temporal variability from August to October or inter-method variations in sampling and analysis (30-day WMS sample versus grab Summa sample).

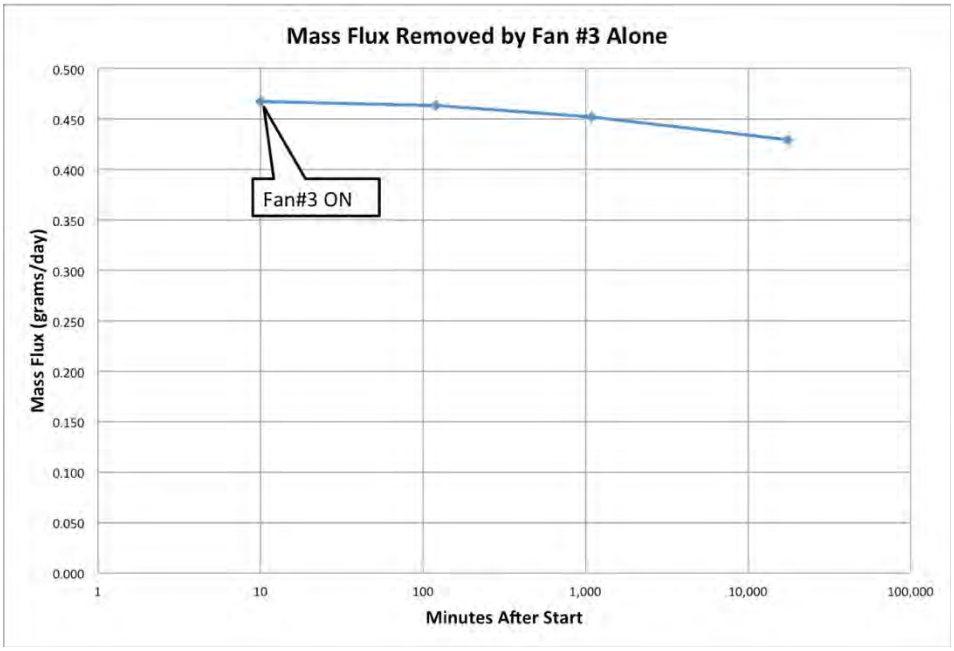


Figure 5-18: Mass removal rate from Fan 3 operating alone

5.3.10 TCE Mass Flux from HS Fans 3 & 8

Summa canister samples of the discharge were collected after 10 minutes of operation of HS Fan 8 and 119 days of operation of HS Fan 3. The HS Fan 3 TCE mass flux was 0.452 g/day and HS Fan 8 was 0.107 g/day for system combined TCE mass flux of 0.559 g/day, which is comparable to the performance of all 9 fans together as shown on Tables 5-3 and 5-4. The TCE mass flux from HS Fan 8 was about three times higher than the baseline mass flux from HS Fans 6 to 9, which likely indicates there was a rebound in subsurface vapor concentrations in the vicinity of HS Fan 8 over the few months that only HS Fan 3 was operating. Nevertheless, the TCE mass flux from HS Fans 3 and 8 combined was a factor of 5 times lower than the threshold flux of 2.7 g/day required to sustain indoor air concentrations of 3 $\mu g/m^3$.

5.3.11 Long-Term Monitoring

Routine periodic indoor air quality monitoring at Building 205 performed by Avatar Environmental, LLC as part of a site-wide monitoring program was conducted at 5 locations on March 23, 2016 and Feb 22, 2017. The results for all of these samples were <0.21 $\mu g/m^3$ for TCE. Radon monitoring is not included in the indoor air quality monitoring program by Avatar, but is documented in Section 5.3.12, below.

5.3.12 Radon Measurements

Figure 5-19 shows the radon distribution in the vent-pipes with all 9 fans running in August 2014. Each location was monitored for 30 minutes, which allows multiple measurements, so the data are shown as box and whisker charts, where the whiskers represent the 5th and 95th percentiles, the box represents the 25 to 75th percentiles, the horizontal line within the box is the median and the dot within the box is the mean. The overall mean for all measurements combined was about 4200 becquerels per cubic meter (Bq/m^3), which equates to 114 pCi/L. The highest reading was almost 9000 Bq/m^3 (240 pCi/L) and the lowest reading was 425 BQ/m^3 (12 pCi/L). The exhausted gas includes indoor air that leaks across the floor slab, so this data may provide an indication of less leakage where the effluent radon concentrations are high and vice versa. With the exception of Fans 2 and 5, the radon readings were within a relatively narrow range (3,000 to 6,000 Bq/m^3 or 80 to 16 pCi/L).

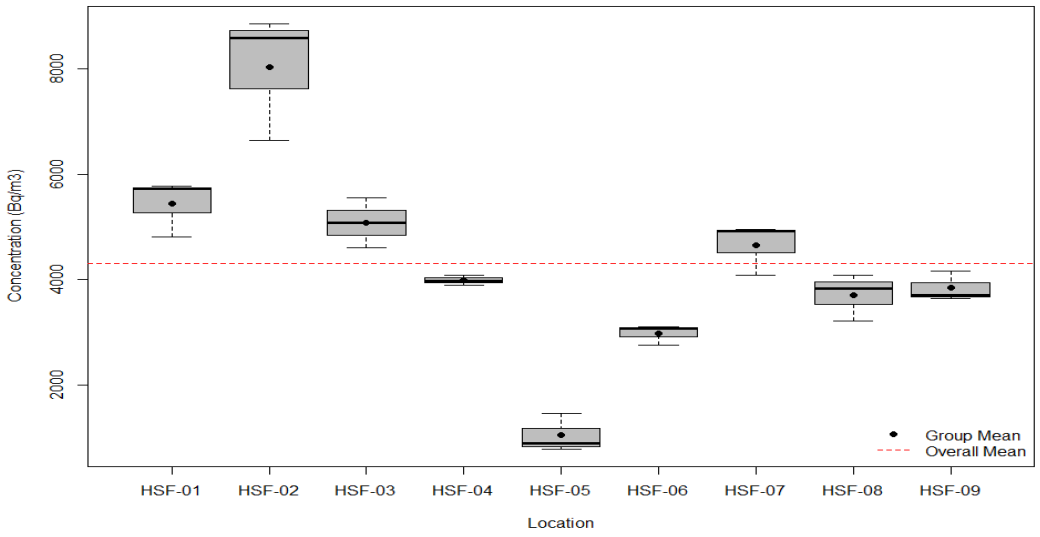


Figure 5-19: Radon concentration in the exhaust of vent pipes pre-optimization

Indoor air concentrations measured over a 24-hour period with only Fan 3 running are shown on Figure 5-20. These data are from a single location in the "Green" HVAC capture zone near suction point HSF-02A and are broken up into 6-hour increments to help visualize temporal trends within the 24 hour period. The mean values ranged from 37 to 55 Bq/m^3 (1 to 1.5 pCi/L). 30-day verification samples with EPERM Electrets showed indoor air Rn in the range of 41 to 81 Bq/m^3 (1.1 to 2.2 pCi/L) and outdoor air in the range of 11.1 to 14.8 Bq/m^3 (0.3 to 0.4 pCi/L). Samples collected over 30 days with both fans 3 and 8 running are shown on Table 5-7.

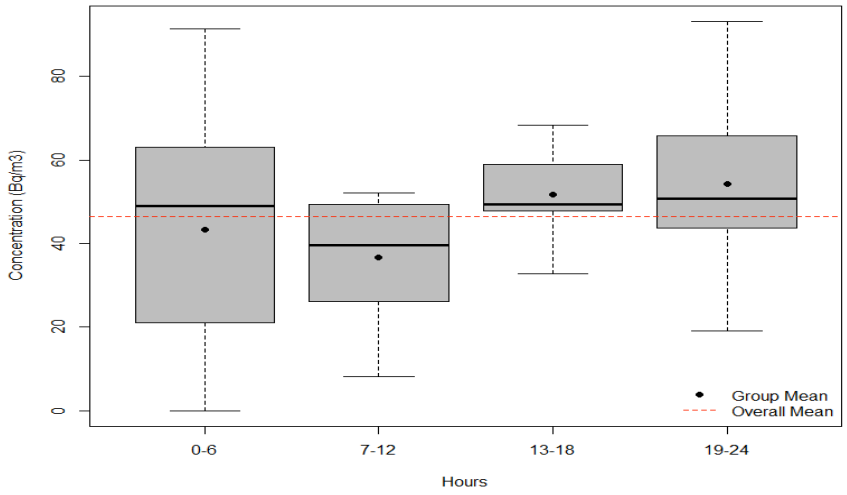


Figure 5-20: Rad7 measurements of radon in indoor air over 24 hours with Fan 3 alone

5.3.13 Building-Specific Attenuation Factor

Building-specific attenuation factors were calculated using Equation 17 and are provided in Table 5-8. The mean AF was 0.0008, which is 38 times lower than the generic subslab attenuation factor of 0.03 recommended in U.S. EPA guidance (U.S. EPA, 2012).

Table 5-8: Building-Specific Attenuation Factors for Building 205

Fan	Subslab Probe	T (ft^2/day)	B (ft)	h (ft)	deltaP (ft)	AER (/day)	AF (-)
1	3 ft from 1B	14	15	15	0.18	44	2E-05
1	Between 1A & 1B	130	73	15	0.18	44	7E-06
3	3 ft from 3B	45	25	15	0.18	44	2E-05
3	Between 3A & 3B	22	30	15	0.18	44	7E-06
3	Between 3B & 3C	22	30	15	0.18	44	7E-06
5	Between 5A & 5B	700	38	15	0.18	44	1E-04
5	Between 5B & 5C	710	25	15	0.18	44	3E-04
7	Between 7A & 7B	440	41	15	0.18	44	7E-05
7	Between 7B & 7C	660	20	15	0.18	44	5E-04
9	Between 9A & 9B	860	14	15	0.18	44	1E-03
9	Between 9B & 9C	1000	6.5	15	0.18	44	6E-03
						min	7E-06
						max	6E-03
						mean	8E-04

Empirical attenuation factors could not be reliably calculated for Building 205 because the only place TCE was detected in indoor air at any level of significance (Figure 5-5) was in an area where no subslab sample was analyzed (Figure 5-4) and the surrounding subslab samples had lower TCE concentrations than the indoor air peak.

5.4 COST CONSIDERATIONS

This section discusses the costs of the conventional system, the optimized system and the costs of optimization testing and analysis to demonstrate the potential net savings. Similar sections are presented at the end of Sections 6, 7 and 8 for the other three buildings tests. Detailed cost tables are provided in Appendix E.

Table 5-9 provides a summary of the cost comparison for the conventional vs optimized mitigation system for Building 205. The incremental cost of the optimization testing and analysis service (assuming a production level of detail and not a research level of detail) would be about $21,000, but would result in a net savings of $250,000 over a 30 year lifecycle, which is a return on investment of 11.6 times. The cost differential between the conventional and optimized system is shown as a factor of 2.5, but the second fan was included in the optimized system even though the indoor air radon concentrations were not above the 4 pCi/L target level, so this is still arguably overdesigned.

Table 5-9: Building 205 Cost Consideration Summary

Cost Components	Conventional	Optimized
Initiation	$ 14,125	$ 14,125
Reconnaissance	$ 16,200	$ 16,900
Pilot Test	$ 14,150	$ 27,160
Installation	$ 186,975	$ 17,150
Operation	$ 130,457	$ 69,356
Maintenance	$ 2,700	$ 600
Fan Replacement	$ 36,000	$ 8,000
Training	$ 5,000	$ 6,000
TOTALS	$ 405,607	$ 159,291
Total incremental cost of optimization activities		$ 21,210
Net Savings		$ 246,316
Return on Investment		11.6
Ratio of Conventional Costs vs Optimized Costs		2.5

6.0 SITE 2: FORMER RARITAN ARSENAL BUILDING 200

6.1 SITE LOCATION AND HISTORY

Building 200 is, like Building 205, located at the former Raritan Arsenal in Edison New Jersey (see Figure 5-1). Building 200 is a single-story building with vinyl siding and a concrete slab on grade floor. The current usage consists of office space and a nurse's station. The locations of the existing subslab vapor extraction points, subslab vapor monitoring points and nearby groundwater monitoring wells are depicted in plan view on Figure 6-1. Photos of the exterior and interior of the building are provided in Figure 6-2. Building 200 was also studied as part of another ESTCP Project (ER-201503 – Mass Flux Characterization for Vapor Intrusion Assessment).

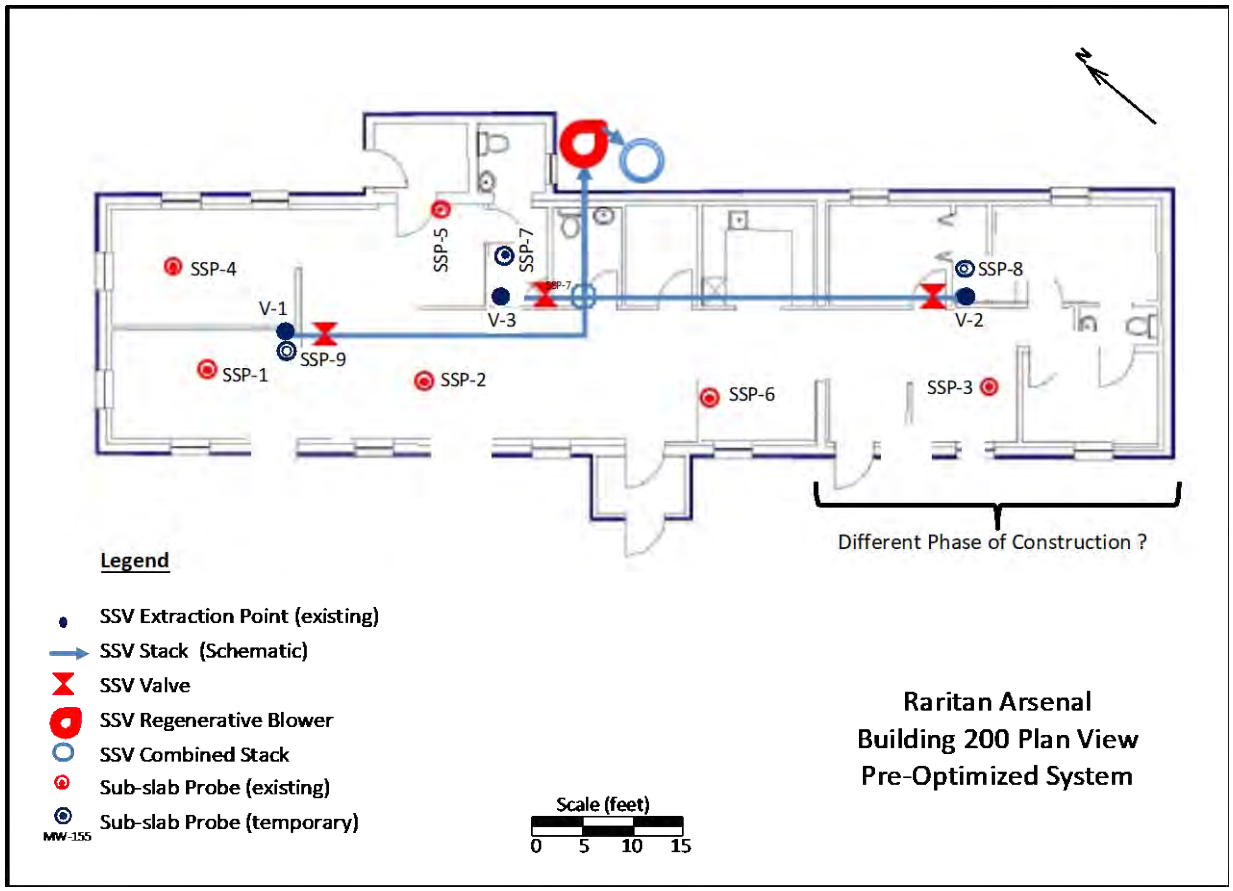


Figure 6-1: Building 200 photo and floorplan with instrumentation

Figure 6-2: Photos of exterior and interior of Building 200

6.1.1 Site Geology/Hydrogeology

The data collected through historical site investigation activities indicates the shallow geology in the vicinity of Building 200 consists of generally homogenous unconsolidated sediments, primarily sand and silts with fill materials of variable thickness near the ground surface. A detailed assessment of the geology is included in ESTCP Project ER-201503.

6.1.2 Contaminant Distribution

TCE is the primary constituent of concern in the groundwater at Building 200. Three groundwater monitoring wells (Figure 6-3) in the vicinity of Building 200 have been sampled as part of the DERP-FUDS remediation program (U.S. ACoE, 2014). The depth to the water table is approximately 20 feet below the top of the building slab. The measured concentrations of TCE in monitoring wells near the building ranged from less than the reporting limit up to 120 µg/L, which could yield equilibrium soil vapor concentrations as high as about 30,000 micrograms per cubic meter (µg/m^3) based on Henry's Law partitioning. The U.S. EPA installed three subslab soil vapor monitoring points (SSP-1, 2 and 3 on Figure 6-1) in Building 200 during December 2004 (Shaw, 2012) and reported subslab TCE vapor concentrations ranging from 86 to 29,019 µg/m^3, which was consistent with expectations. In February 2005, Westin Inc., on behalf of the U.S. ACoE,

installed and sampled four soil borings (Figure 6-3) to depths of 8 ft BGS at locations inside the building (Westin 2005) and TCE was detected at concentrations up to 9,500 micrograms per kilogram on a dry weight basis (µg/kg). Based on those results, EPA sampled indoor air with a TAGA unit in January 2005; measuring a maximum indoor air concentration of 13 ppb (70 $\mu g/m^3$) (Figure 6-4). These concentrations exceeded their respective New Jersey Department of Environmental Protection screening levels by more than 10 times, so a SSD mitigation system was installed by the U.S.EPA (shown on Figure 6-1).

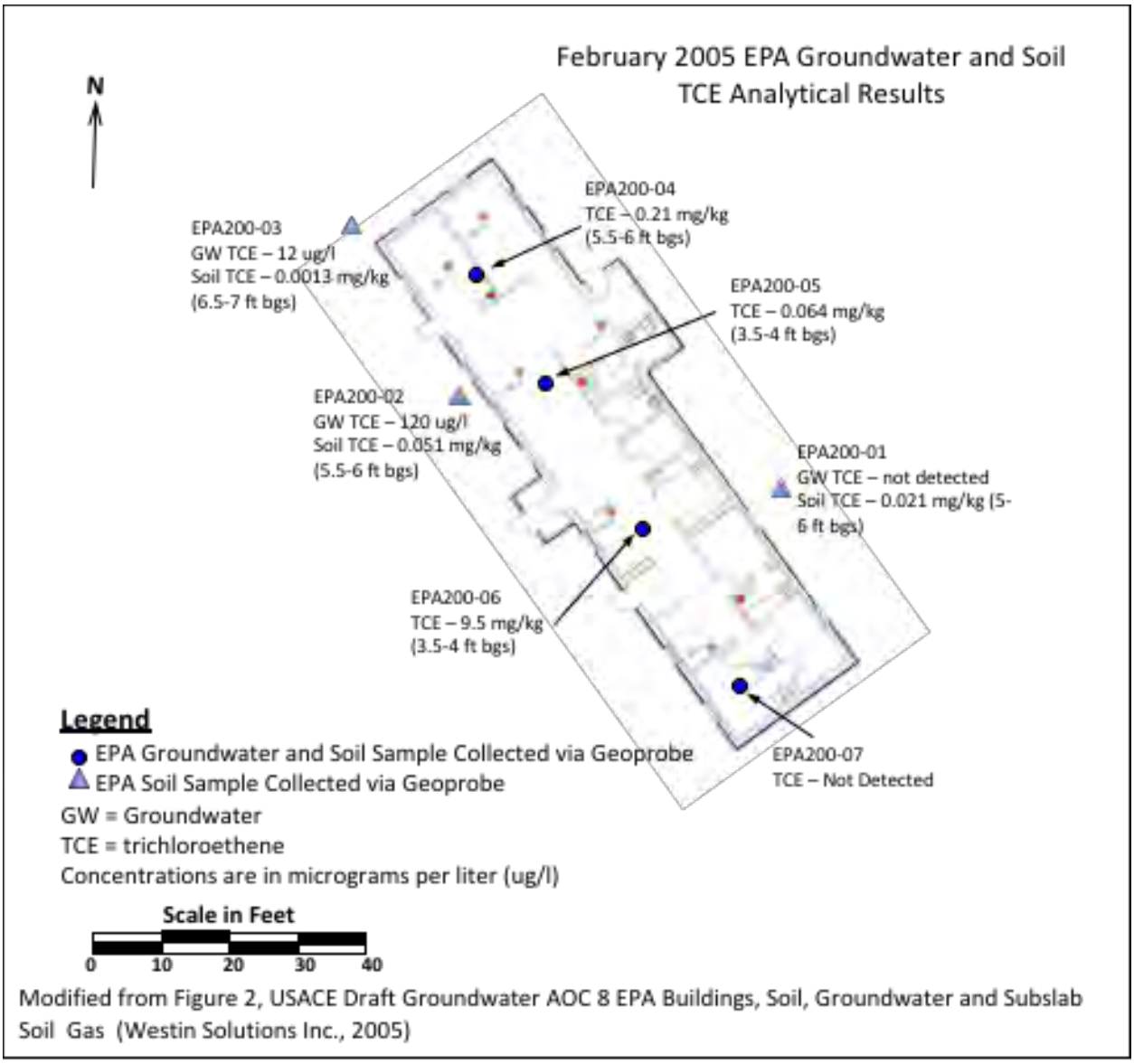
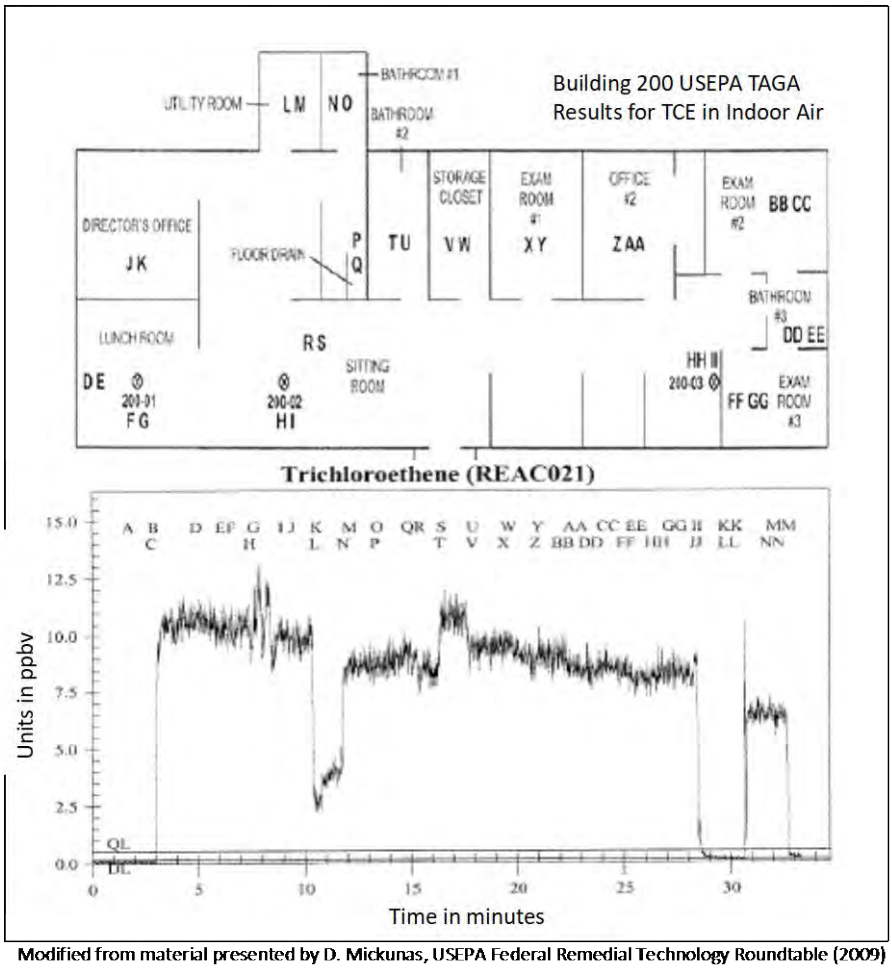


Figure 6-3: TCE concentrations in soil, groundwater and soil gas samples from Building 200



Modified from material presented by D. Mickunas, USEPA Federal Remedial Technology Roundtable (2009)

Figure 6-4: Building 200 indoor air TCE concentrations measured by the TAGA unit

The SSD system was designed using Conventional methods and installed in January 2005. The system was initially installed with two suction points (V-1 and V-2, Figure 6-1). VOC concentrations were monitored at two indoor air locations at the north and south ends of the building after the system began operating (Table 6-1) and there were consistent detections of TCE in indoor air. The system was upgraded in early 2008 with a third suction point (V-3) and a Rotron blower, which applied a vacuum as high as 47 in-H_2O. This resulted in acceptable indoor air concentrations (Table 6-2), but excessive noise and power draw. The system was retrofitted with a box to contain the blower as a noise barrier and a variable frequency drive to reduce the applied power, and eventually a recirculation loop to reduce the applied vacuum without overheating the blower and by 2014, the applied vacuum had been reduced to ~3 to 5 in-H_2O. Photos of the SSD system are provided in Figure 6-5. The total cost of operation and maintenance of the modified system was approximately $15,000 per year with an electricity cost of about $6,600 per year, which is high relative to the size of the building (~2,200 ft^2).

Table 6-1: Indoor air monitoring data collected after the initial SSD system installation

Date	200-02 North end of building	200-03 South end of building

	PCE	TCE	PCE	TCE
1/30/2006	1.4U	4.60	1.4	3.9
3/9/2006	1.4U	2.60	1.4U	2.6
6/13/2006	1.4U	3.00	1.4U	2.10
9/13/2006	1.4U	3.50	1.4U	3.10
10/24/2006	1.4U	3.50	1.4U	4.40
1/11/2007	1.4U	2.90	1.4U	3.80
3/29/2007	1.4U	2.30	1.4U	2.40
8/23/2007	1.4U	1.10	1.4U	1.1
11/15/2007	1.4U	2.70	1.4U	3.1

Figure 6-5: Photos of the existing SSD System, including (top, l to r) Rotron Blower, variable frequency drive, recirculation loop and entire assembly and vent pipes (bottom l to r) V-1, V-2, and V-3.

Table 6-2: Monitoring data collected after addition of V-3 and Rotron Blower

Date	SSV Vacuum (in H_2O)	SSV Flow (ft^3/min)	Subslab TCE at SSP-02 ($\mu g/m^3$)	Indoor Air TCE at North End ($\mu g/m^3$)

6/11/2008	47.3	13*	1.83	0.22U
10/3/2008	41.3	29.8	1.4	0.59
12/12/2008	22.7	6.7	0.81	0.7
3/13/2009	8*	7*	0.43	0.21J
5/29/2009	12*	12*	0.54J	0.32J
9/18/2009	20.4	6.0	0.32J	0.21U
12/18/2009	9.4*	12*	0.21J	0.21J
3/5/2010	7.8	6.0	0.21U	0.21U
9/24/2010	14.3*	7*	199	0.43
2/23/2011	4.9*	12*	0.86U	0.21U
9/20/2011	12.4*	0*	221	0.21U
2/22/2012	--	--	104	0.21U
10/23/2012	--	--	275	0.2J
2/26/2013	--	--	170	0.38
9/24/2013	--	--	167	0.18
2/19/2014	5.1*	1.0*	140	0.45
9/10/2014	2.7*	1.4*	330	0.21U
1/21/2015	3.7*	1.6*	183	0.64
10/14/2015	2.7*	0.4*	230	0.33
3/23/2016	--	--	--	0.32
9/8/2016	--	--	--	0.3
2/22/2017	5.5*	7*	140	0.36

-- Data not measured
*Vacuum measured at a different date but in the same time frame.
Rotron blower was replaced with Obar fan April 15, 2016

6.2 BUILDING-SPECIFIC TESTING

6.2.1 Site Reconnaissance

A site reconnaissance visit was conducted by Geosyntec on February 20, 2014, including:

1. A walk-through tour inside the building to assess the uses of the building, interior layout and access to planned sample areas;
2. Observations and photographs of the current SSD system configuration;
3. Evaluation of fan power controls (locations of on/off switches) and whether each suction point can be controlled by a balancing valve;
4. Evaluation of existing communication test point availability and condition; and,
5. Measurement of the flow rate from each of the 3 vent pipes;

To monitor the current system operating parameters, Geosyntec measured the velocities of the discharge from the vent pipes in August 2014, which were 94, 40 and 81 feet per minute (fpm) for V-1, V-2 and V-3, respectively. The diameter of the vent-pipes is 3 inches, therefore, the flow rates were 4.8, 2.0 and 4.8 standard cubic feet per minute (scfm), respectively or a total of 11.6 scfm (dramatically less than the maximum blower capacity of about 300 scfm).

6.2.2 Mass Flux Monitoring

Waterloo Membrane Samplers (WMS) were deployed in vent-pipes V-1, V-2 and V-3 on July 24, 2015, and retrieved again on August 13, 2015. Flow rates on July 24 were about 1.8 scfm in each vent-pipe. Summa canister samples were also collected on July 24 for analysis by U.S. EPA Method TO-15 open scan.

Radon concentrations were measured in the combined stack effluent and in each of the three individual vent pipes on August 13, 2015 with a combination of the Durridge RAD7 and via Tedlar Bag for analysis by Doug Hammond of USC.

6.2.3 Pneumatic Testing

Static vacuum was measured at subslab probes SSP-1 to SSP-9 with flow rates of 1.8, 1.7 and 1.5 scfm from vent pipes V-1, V-2 and V-3, respectively. The system was cycled on and off while data-loggers recorded the transient vacuum response at SSP-1 through SSP-6 with all three suction points operating at the same time.

Transient pneumatic tests were performed running only one vent pipe at a time and monitoring transient vacuum at SSP-1 (8.6 ft from vent pipe V-1), SSP-3 (8.9 ft from vent pipe V-2 and SSP-2 (8.2 ft from vent pipe V-3). Vacuum was measured as a function of radial distance during each of these tests once the vacuums stabilized.

6.2.4 Subslab Tracer Testing

Helium inter-well tracer tests were performed at SSP-9 (3 ft from vent-pipe V-1), SSP-8 (3 ft from vent-pipe V-2), and SSP-7 (3 ft from vent-pipe V-3). Helium Flood tests were performed at V-1 (6.9 scfm and 3.6% helium with data collected at subslab probe SSP-4, 12 feet away), V-2 (2.9 scfm and 4.3% helium with data collected at subslab probe SSP-3, 9 feet away) and at V-3 (2.7 scfm and 10.8% helium with data collected at subslab probe SSP-5, 10 feet away). For the flood test at V-2, there was no measurable helium at probe SSP-3 after 30 minutes, and time constraints required the test to be discontinued, so no average travel time could be determined.

6.2.5 Cross-Slab Tracer Testing

A cross-slab tracer test was performed by turning off the SSD system, then releasing about 100L of SF_6 from a small compressed gas cylinder into the interior of the building over a period of a few minutes while using large box-fans to disperse and mix the SF_6 into the indoor air. The SF_6 concentration was measured in real-time with a portable Ion Science SF_6 LeakCheck P1:p Portable SF_6 Gas Leak Detector. After the indoor air distribution of SF_6 was essentially uniform, the SSD system fan was turned on and SF_6 concentrations in the vent-pipes were monitored until SF_6 readings stabilized.

The maximum SF_6 level in indoor air was well below the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), which are both 1,000 ppmv.

6.2.6 Building Depressurization Testing

The mass loading through the building during building depressurization testing was measured to be about 0.1 g/day using a blower door as part of ESTCP Project ER201503.

6.2.7 Confirmatory Indoor Air Quality Monitoring

Indoor air radon samples were collected at 6 locations inside Building 200 using EPERM Electrets starting on August 16, 2015 and retrieved on September 15, 2015.

Indoor air sampling via individually-certified Summa canister and analysis by U.S. EPA Method TO-15 SIM were performed by Avatar as part of routine monitoring in October, 2015, September 2016 and February 2016 at 2 locations in Building 200.

6.3 RESULTS AND DISCUSSION

6.3.1 Specific Capacity and Mass Flux

The specific capacity of the three vent-pipes is shown in Figure 6-6, for all monitoring events since January 2014 and including 5 events after replacement of the Rotron blower with a smaller fan. Vent pipe V-2 has a slightly lower specific capacity at 0.6 scfm/in-H_2O, compared to 1.0 and 0.9 for V-1 and V-3, respectively. Recall that the specific capacities for Building 205 vent-pipes ranged from 0.35 to 9.15 scfm/in-H_2O, so the Building 200 values are comparable.

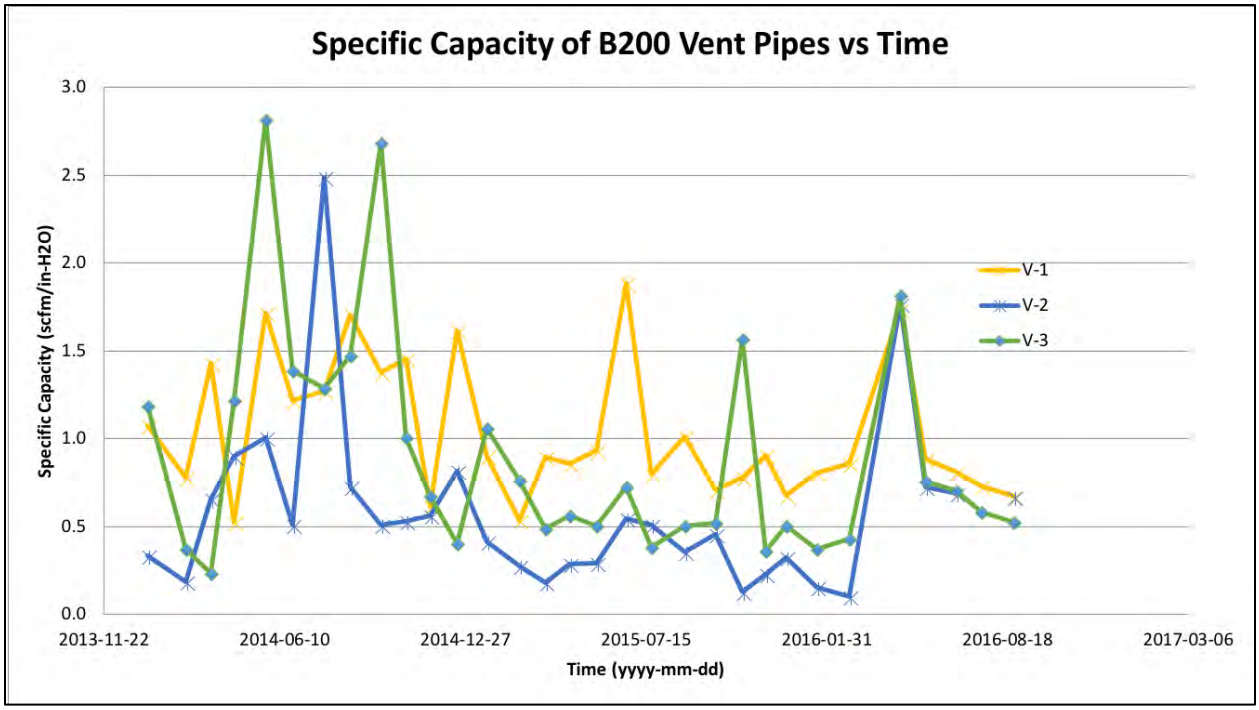


Figure 6-6: Specific capacities for vent pipes at Building 200

Table 6-3 provides the TCE mass removal rate data. The WMS samplers showed lower results than the Summa canisters by an average of about 2X, similar to the ratio observed at Building 205, so this appears to be a consistent calibration bias. Regardless of which data set is used to calculate the mass removal rate of the system, the result is greater than the rate of mass loading through the building when depressurized with a blower door, as measured by ESTCP Project ER201503 (0.1 g/day).

Table 6-3: TCE Mass Flux from SSD System 2015

Date	Location	Method	TCE ($\mu g/m^3$)	Flow Rate (scfm)	Vacuum (in.-H_2O)	Mass Loading (g/day)
07/24/2015	VP1	Summa	1200	1.8	2.9	0.09
07/24/2015	VP2	Summa	300	1.8	2.9	0.02
07/24/2015	VP3	Summa	1600	1.7	2.2	0.11
	TOTAL					0.22
07/24/2015 - 08/13/2015	VP1	WMS	290	1.8	2.8	0.02
07/24/2015 - 08/13/2015	VP2	WMS	190	1.7	2.7	0.01
07/24/2015 - 08/13/2015	VP3	WMS	1000	1.5	2.8	0.06
	TOTAL					0.09

Vent pipe activity readings and removal rates for radon and thoron are presented in Table 6-4.

Table 6-4: Radon and thoron readings and removal rates in Building 200 vent pipes

	Method	Radon (Bq/m^3)	Thoron (Bq/m^3)	Flow rate (scfm)	Radon Removal Rate (MBq/day)	Thoron Removal Rate (MBq/day)
Combined	RAD7	2820	6940	5.1	580	1400
Vent Pipe V-1	RAD7	4690	21500	1.8	340	1600
Vent Pipe V-2	RAD7	3560	16800	1.7	250	1200
Vent Pipe V-2	Scintillation Cell (USC)	3996	--	1.7	277	--
Vent Pipe V-3	RAD7	2990	13100	1.5	180	800
Total emissions (MBq/day)					780	3600

6.3.2 Static Vacuum Testing

Static vacuum levels under normal operating conditions are presented in Table 6-5. It is notable that SSP-8, located only 3 ft from vent-pipe V-2, measured only 2.5 Pa vacuum. This is in stark contrast to the vacuum measured at probes SSP-7 (25.4 Pa, 3 ft from vent-pipe V-3) and SSP-9 (224 Pa, 3 ft from vent-pipe V-1). Considering the similarities in the flow rates and specific capacities of the three vent-pipes, the vacuum at a radius of 3 ft is very different. This was not identified in the initial system installation and diagnostic testing because the three probes at radial distances of 3-ft (SSP-7 through 9) were only installed as part of this research. The importance of measuring vacuum at small radial distances as well as large radial distances is that it provides a better opportunity for a unique fit of T and B values when comparing vacuum vs distance data to Equation 4. In this case, it would have provided a valuable early warning that vent-pipe V-2 was not performing normally.

Table 6-5: Static vacuum measured during operation of the SSD system

Probe	Static Vacuum (Pa)
SSP-01	50.1
SSP-02	36.3
SSP-03	2.5
SSP-04	10.4
SSP-05	0.4
SSP-06	1.6
SSP-07	25.4
SSP-08	2.7
SSP-09	224

The building air conditioning system ran intermittently and there was a 1 to 3 pascal difference recorded at the subslab probes in response, as shown in the chart of subslab differential pressure over a period of two weeks measured after the field sampling activities in August 2015 (Figure 6-7). For comparison, Figure 6-8 shows the differential pressure measured across the rear door (indoor-outdoor) over the same period of time. In both cases, a negative value indicates a gradient into the building. The indoor-outdoor differential pressure ranges from -10 to +20 Pa, whereas the indoor-subslab differential pressure ranges only from -3 to +1 Pa. This may be partly attributable to wind-effects on the exterior port of the indoor-outdoor differential pressure measurement.

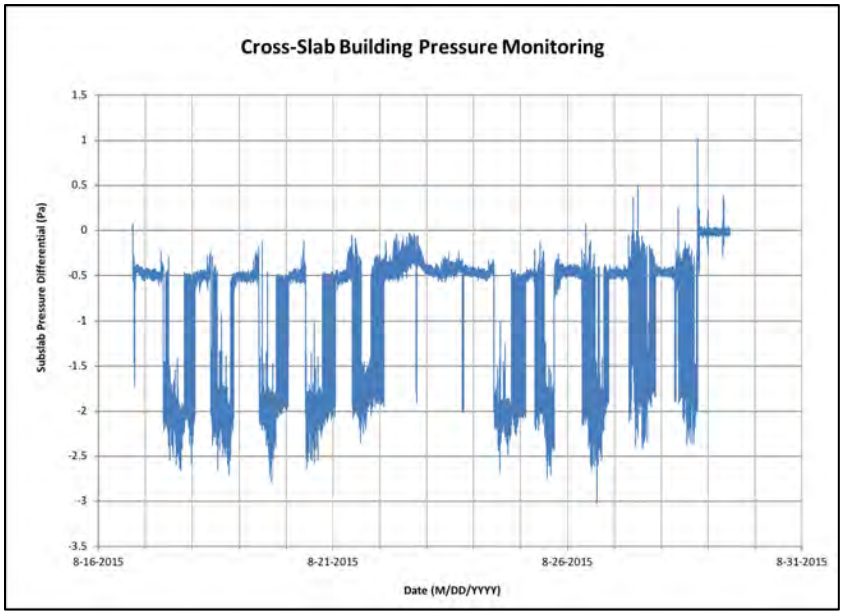


Figure 6-7: Cross-slab differential pressure over a 2-week period at location SSP-5

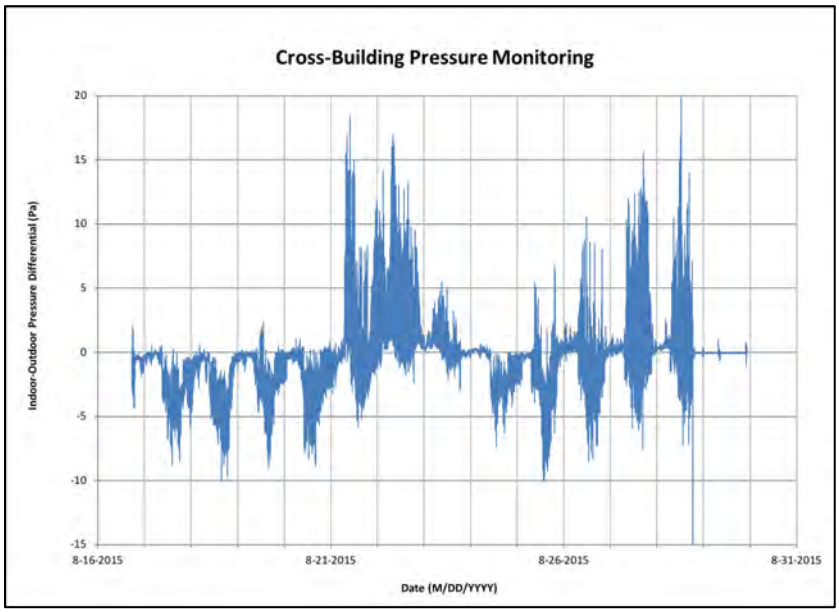


Figure 6-8: Indoor-outdoor differential pressure over a 2-week period at Building 200

The long-term static vacuum of the SSD vent pipes is shown on Figure 6-9. There were some adjustments made to the variable frequency drive and recirculation loop after the installation of the Rotron blower, but after that, the vacuum levels were relatively consistent in the range of 3 to 4 in-H_2O. On April 15, 2016 the Rotron blower was replaced with a smaller variable speed OBAR 76 SOE fan, and since then, the applied vacuum has consistently been in the range of 4 to 5 in-H_2O. The new fan draws 0.5 amps from a 120v/60w power source. The combined flow of the three vent-pipes during the same time is shown on Figure 6-10, and is generally in the range of 10 to 20 scfm.

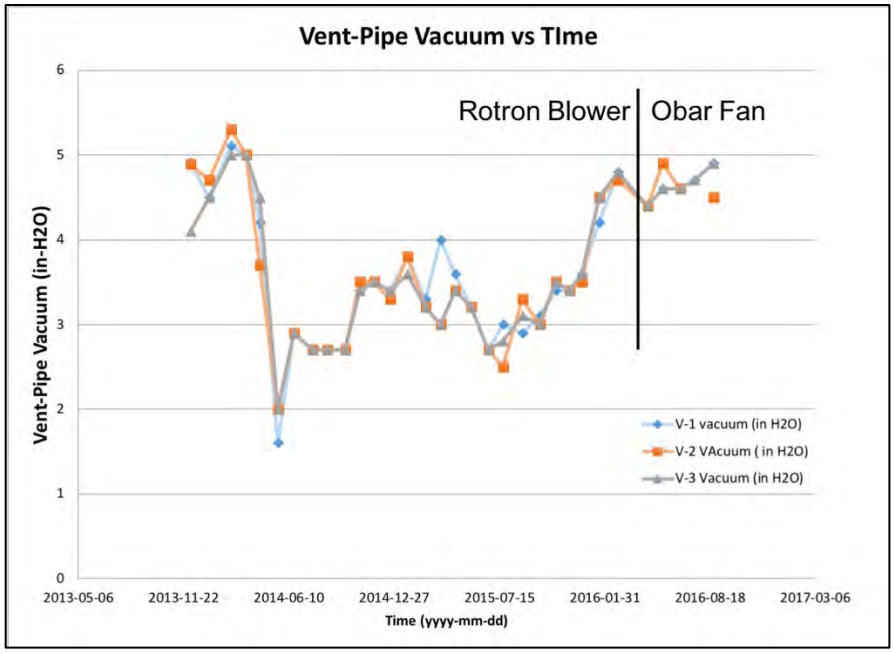


Figure 6-9: Building 200 vent pipe vacuum versus time

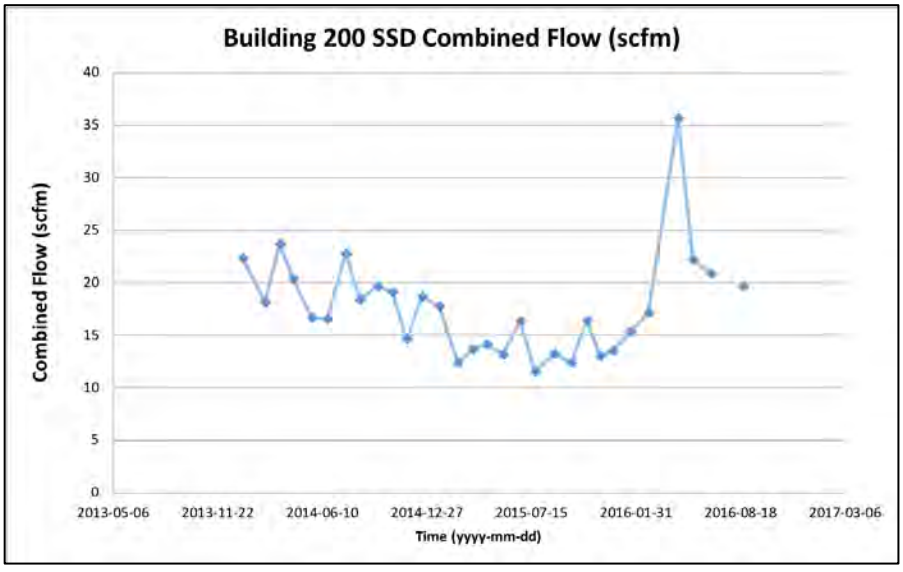


Figure 6-10: Building 200 total system flow rate versus time

6.3.3 Transient Pneumatic Testing and Analysis

The response of subslab probes SSP-1 to SSP-6 to cycling the SSD system off and on is shown in Figure 6-11. Vacuum dissipates within about 30 seconds after turning the fan off, and re-establishes steady readings within about 20 seconds after turning the fan back on. This slight asymmetry could be because the fan spins down slower than it spins up during a power cycle. Ball valves were only available to impose a more instantaneous start or stop to flow for the individual vent pipes, and not the combined system.

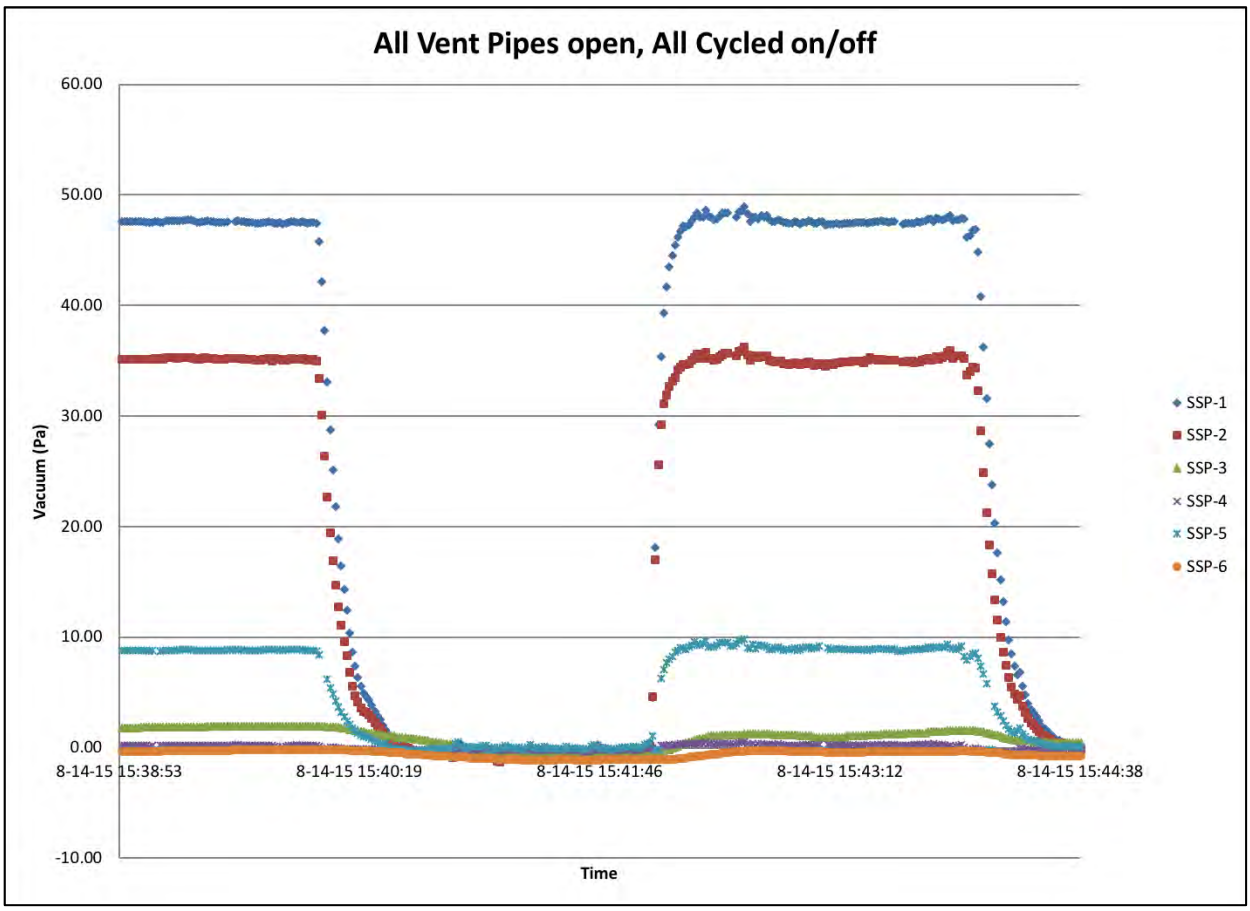
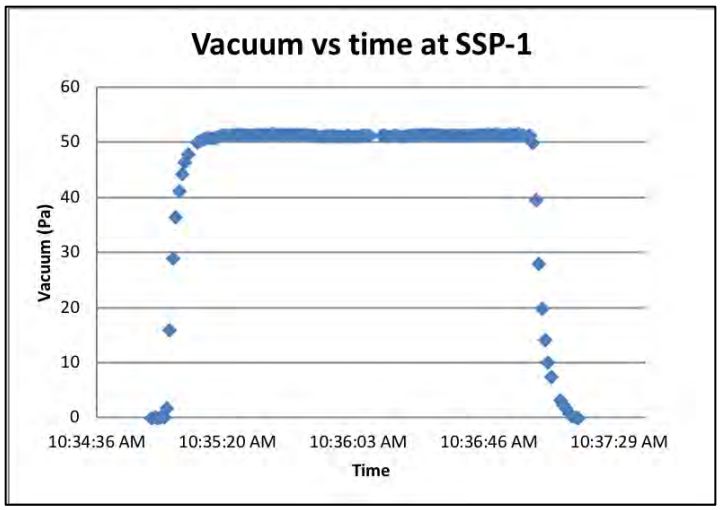
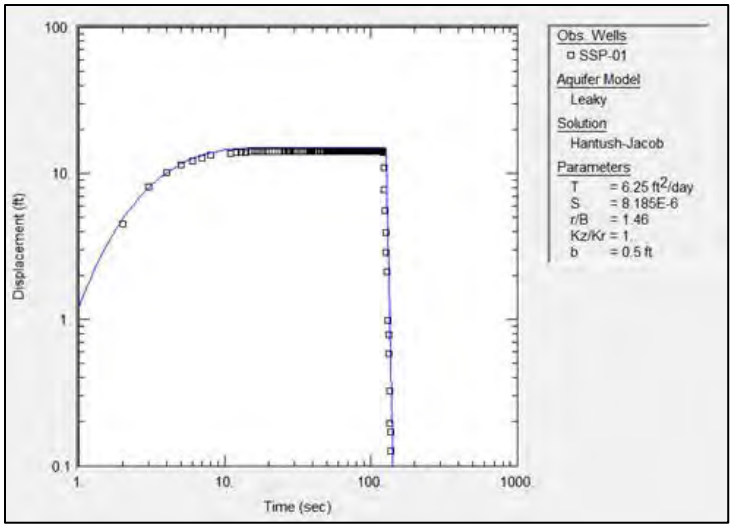


Figure 6-11: Transient pneumatic response to cycling the SSD system at Building 200

Each vent pipe is fitted with a ball valve, so they can be independently balanced. With only one vent-pipe operating at a time, the monitoring of vacuum vs time and distance and mathematical analysis of T and B values using Equations 1 and 4 is simplified. Figures 6-12, 6-13 and 6-14 show the transient vacuum data and Hantush Jacob Model curve fits from AQTESOLV for each of vent pipes V1, V2 and V3, respectively and the pneumatic properties are listed in Table 6-5.





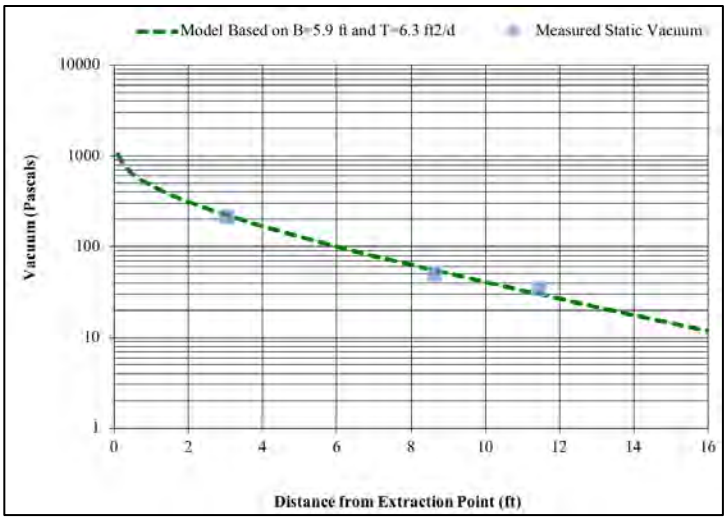
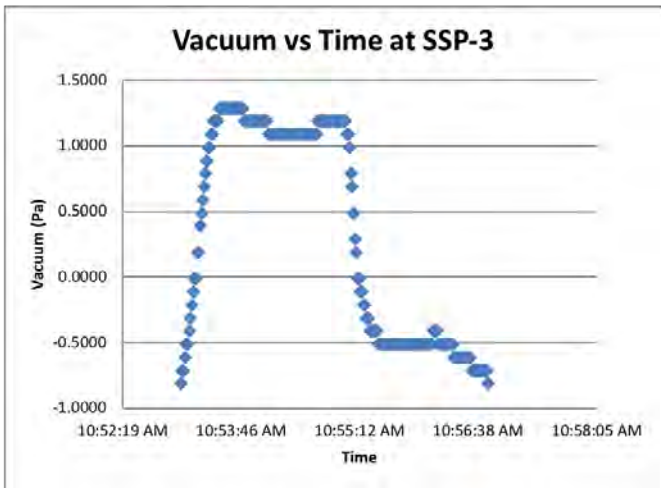
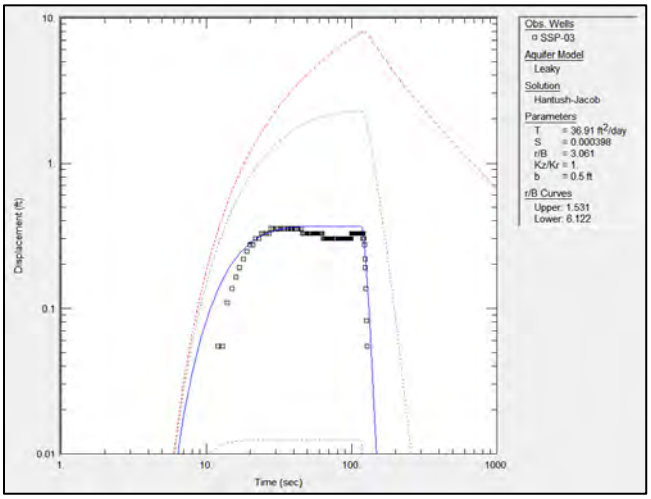


Figure 6-12: Transient vacuum data and analysis at SSP-1 (8.6 ft from vent pipe V-1)





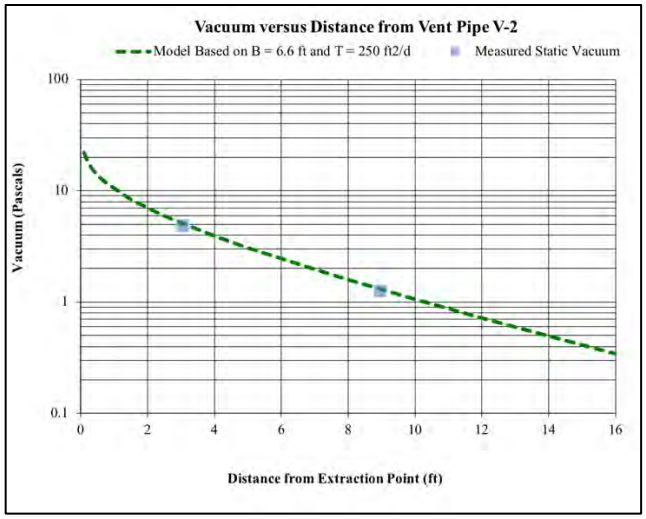


Figure 6-13: Transient vacuum data and analysis at SSP-2 (8.9 ft from vent pipe V-2)

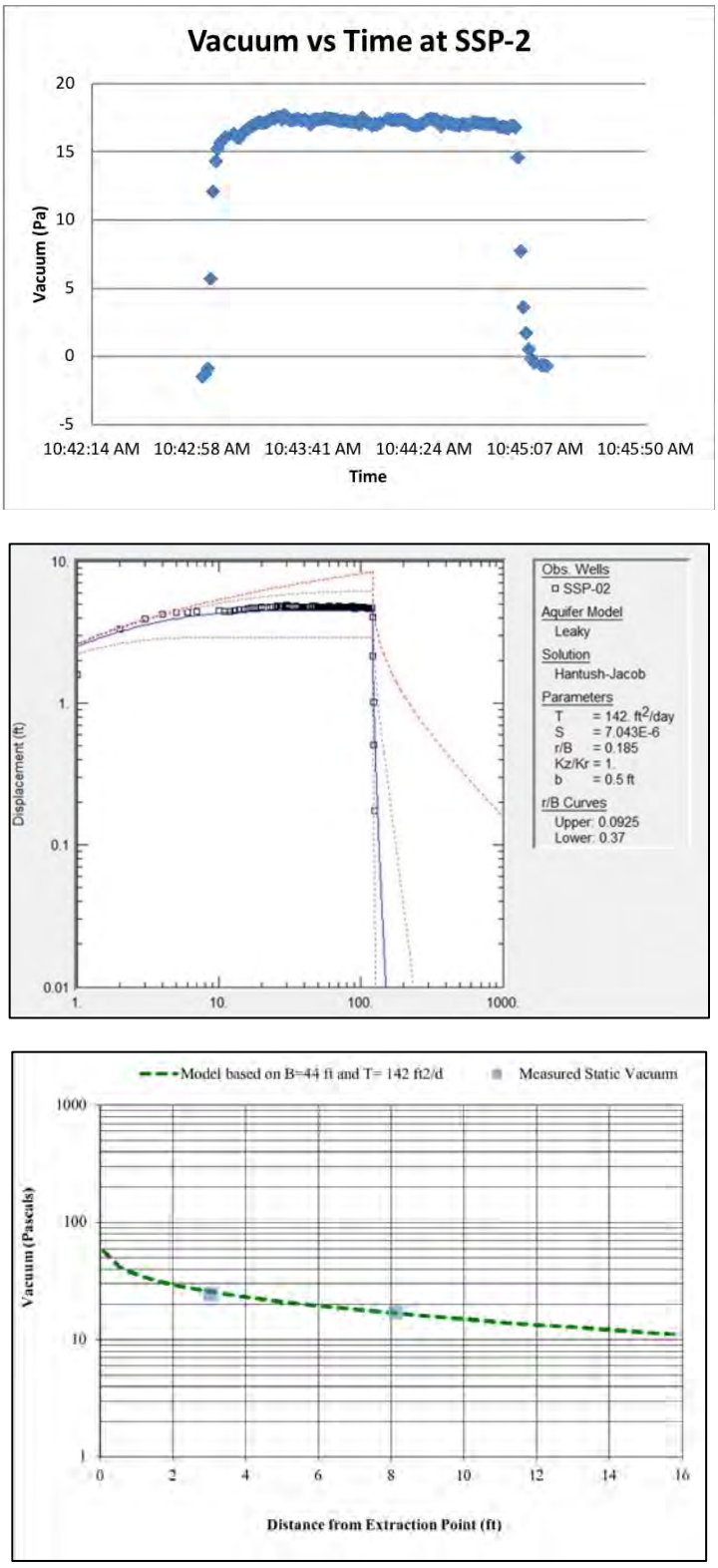


Figure 6-14: Transient vacuum data and analysis at SSP-2 (8.2 ft from vent pipe V-3)

Table 6-6: Summary for Pneumatic Properties for Building 200 Vent Pipes

Fan	Subslab Probe	Transmissivity (T)	r/B	Radius (r)	Leakance (B)	Thickness of flow zone (b)	K´
		(ft^2/day)	(dim)	(ft)	(ft)	(ft)	(ft/day)
V-1	SSP-1	6.3	1.46	8.6	5.9	0.3	0.090
V-2	SSP-3	250*	1.35*	8.9	6.6*	6.5*	2.9*
V-2	SSP-3	37*	3.1*	8.9	2.9*	Not Assessed	2.2*
V-3	SSP-2	142	0.15	8.2	44	0.4	0.037

The vacuum versus time and vacuum versus distance data matched reasonably well to Equations 1 and 4 with one unique pair of T and B values for vent-pipes V1 (B = 5.9 ft and T = 6.3 ft^2/day) and V3 (B = 44 ft and T = 142 ft^2/day). This was not true for vent pipe V-2, so Table 6-5 includes two sets of T and B values for vent pipe V-2, one derived from fitting the vacuum vs time data to Equation 1 using AQTESOLV (B = 2.9 ft and T = 37 ft^2/day) and the other by fitting the vacuum vs distance data to Equation 4 using a spreadsheet (B = 6.6 ft and T = 250 ft^2/day), neither of which is considered ideal, so they are marked with asterisks in Table 6-5. The K' values (bulk average vertical gas conductivity of the floor slab) calculated from Equation 3 are within the range calculated in Table 5-5 for Building 205 when using the T and B values in Table 6-5 and a b' (floor thickness) value of 0.5 ft.

Note that for vent pipe V-2, the T and B values are very different for the two rows in Table 6-6, but the K' values are very similar, so in both cases, a high degree of floor permeability is indicated. This is not consistent with the results of the cross-slab tracer test, so the high value calculated for leakage in this case is a clear indication that flow to vent pipe V-2 is attributable to a subsurface pathway (not cross-floor leakage). Recall from Figure 6-6 that vent pipe V-2 has a similar (perhaps slightly lower) specific capacity compared to vent pipes V-1 and V-3. The TCE mass removal rate for vent pipe V-2 is lower than for vent pipes V-1 or V-3 (Table 6-3), but the radon and thoron activities are mid-range between vent pipes V-1 and V-2 (Table 6-4), so the supply of gas to vent-pipe V-2 appears to be from the subsurface through material of a similar or slightly lower permeability than V-1 or V-3, and not direct short-circuiting to atmospheric air. Through these multiple lines of evidence, the understanding of conditions at vent pipe V-2 is improved, although not completely resolved.

6.3.4 Subslab Tracer Testing and Analysis

The results of tracer testing at vent pipe V-1 are shown in Figures 6-15 (inter-well test from probe SSP-9 at r = 3 ft) and 6-16 (flood test to SSP-4 at r = 12 ft). These tests showed average travel times of 2 min 58 sec from a radius of 3 ft and 29 min 18 sec from a radius of 12 ft.

The results of tracer testing at vent pipe V-2 are shown in Figures 6-17 (inter-well test from probe SSP-8 at r = 3 ft), which showed an average travel time of about 19 minutes from a radius of 3 ft. With a flow rate of 1.5 scfm a much faster arrival would be expected. For example, if flow was occurring through a 4-inch gravel bed with 25% air-filled porosity with no slab leakage, an arrival time of 1.6 minutes would be expected. This is comparable to the result for vent pipe V-3 (Figure

6-18), which had the highest B value (least leakage) in Table 6-5. The very slow inter-well test at vent pipe V-2 clearly indicates that radial flow from a granular fill layer is not occurring (i.e., the conditions are not consistent with the model assumptions). Note that the peak concentration of helium in the inter-well test at V-2 (2,500 ppmv) is lower than the tests at V-1 (~7000 ppmv) and V-3 (12,500 ppmv for a 1L injection), but only by a factor of 5 or less, which indicates that most of the injected helium was recovered.

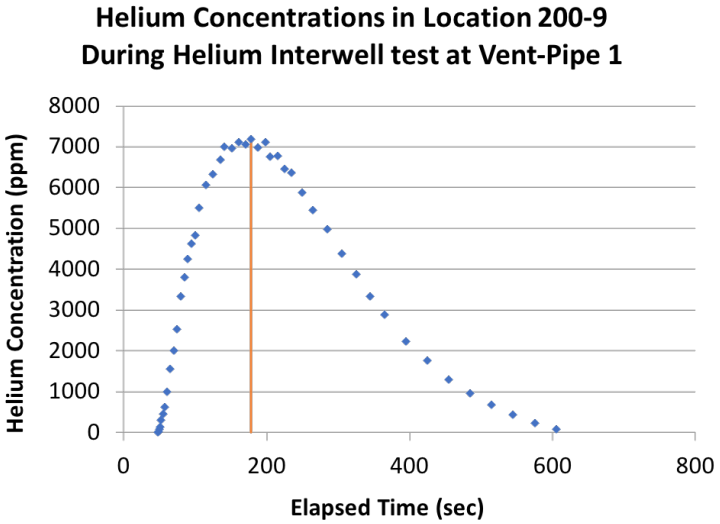


Figure 6-15: Inter-well tracer test data from vent pipe V-1 after injection at SSP-9 (r=3ft), showing an average travel time of 2 minutes and 58 seconds

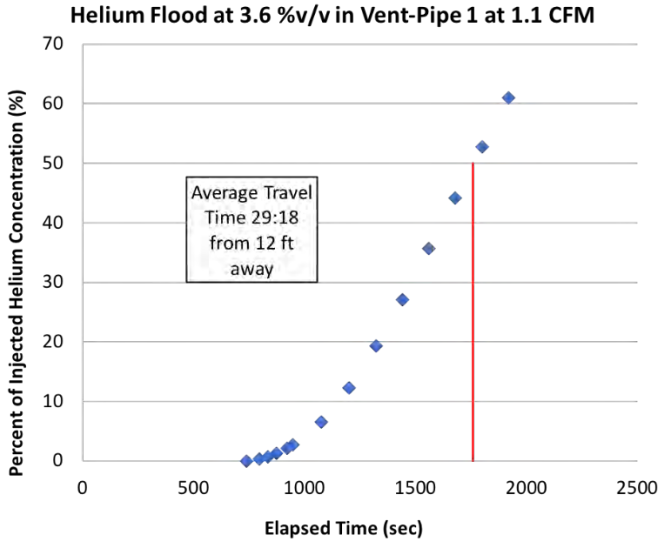


Figure 6-16: Helium Flood from vent pipe V-1 to SSP-4 (r=12 ft), showing an average travel time of 29 minutes and 18 seconds

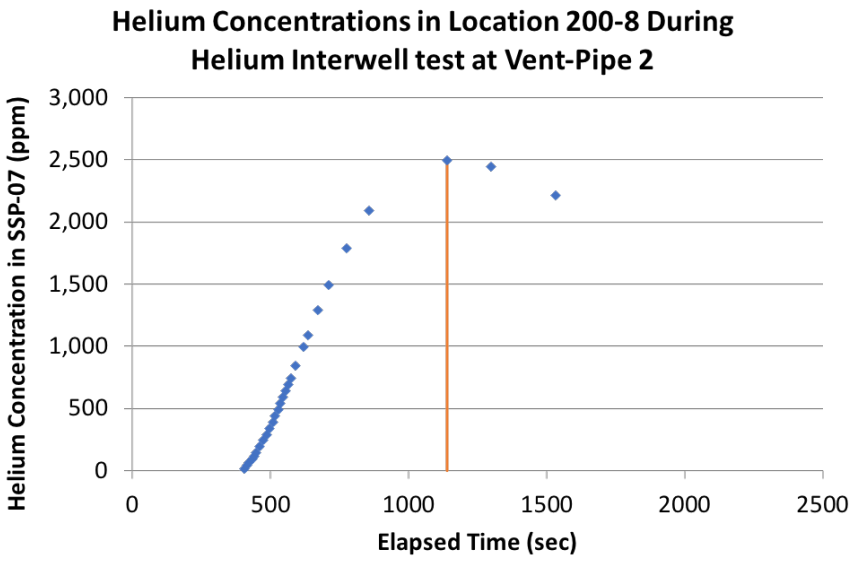


Figure 6-17: Inter-well tracer test data from vent pipe V-2 after injection of helium at SSP-8 (r=3 ft) showing an average travel time of 18 minutes and 58 seconds

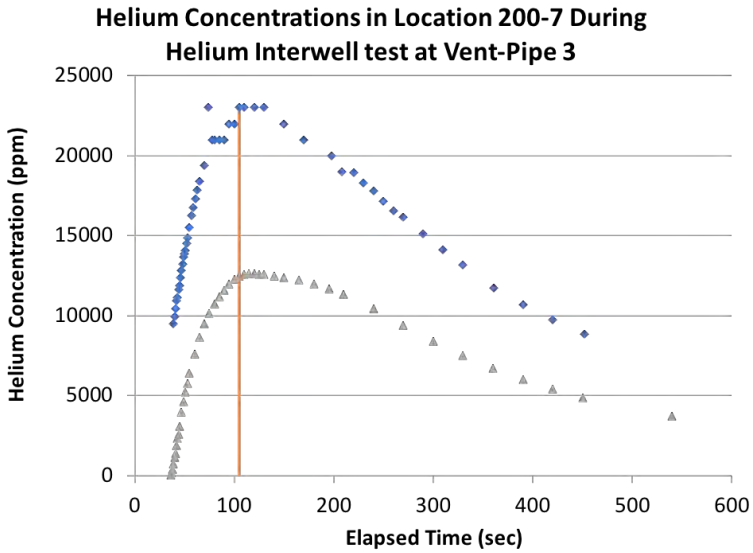


Figure 6-18: Two inter-well tracer tests from vent pipe V-3 after injection of 1L and 3L of helium at SSP-7 (r=3 ft), showing travel times of 1 minute and 45 seconds for both tests

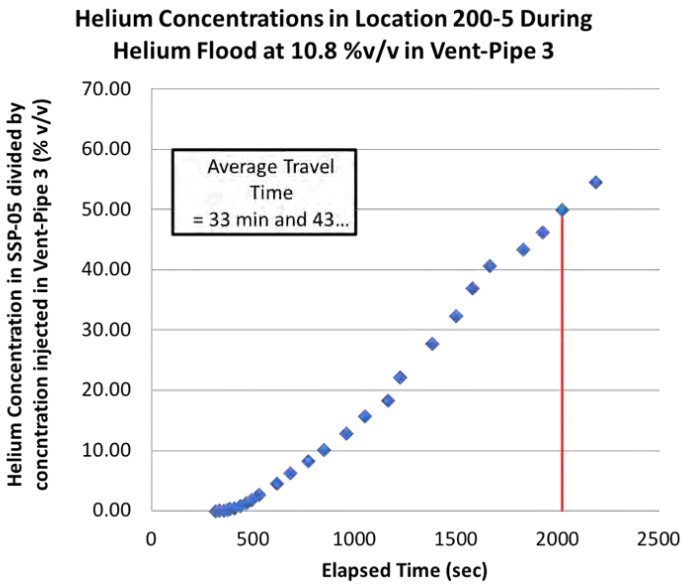


Figure 6-19: Helium flood from vent pipe V-3 to SSP-5 (r=10 ft), showing an average travel time of 33 minutes and 43 seconds

The inter-well and flood tracer data sets were used to calibrate the thickness (b) of the zone of active flow through the subsurface needed to solve Equation 5, as shown in Figures 6-20, 6-21 and 6-22 for vent pipes V-1, V-2 and V-3, respectively. For vent-pipes V-1 and V-3, the b value that provided the best fit to the tracer data using the T and B values calibrated to the vacuum vs time and vacuum vs distance data were 0.3 and 0.4 ft, respectively. This is consistent with an assumed granular fill layer of about 4-inch (0.33 ft) thickness. For vent pipe V-2, Equation 5 and 6 could only be matched to the inter-well tracer test travel time if the b value was set at 6.5 ft, which is considered misleading because the tracer was injected through a subslab probe 3 feet from the vent pipe, so it is unlikely that it would flow to the vent pipe uniformly through an interval with depth up to 6.5 feet. This further supports the interpretation that the supply of gas to vent pipe V-2 occurs through a pathway that is not radial flow through a granular fill layer.

The fitted travel time model for V-1 and V-3 provides reasonable confidence in the profile of velocity as a function of radial distance calculated using Equation 5 and the T, B and b values calibrated via the pneumatic and tracer testing (Table 6-5). For vent pipe V-1 and V-3, the induced velocities below the floor at a radial distance of 16 feet from the suction point were calculated to be 50 ft/day and 170 ft/day, respectively, which is considered more than ample for capture. A chart showing the calculated profile for vent pipe V-2 is also included in Figure 6-21, but it is not considered representative, for the reason described in the preceding paragraph, and is included only for completeness.

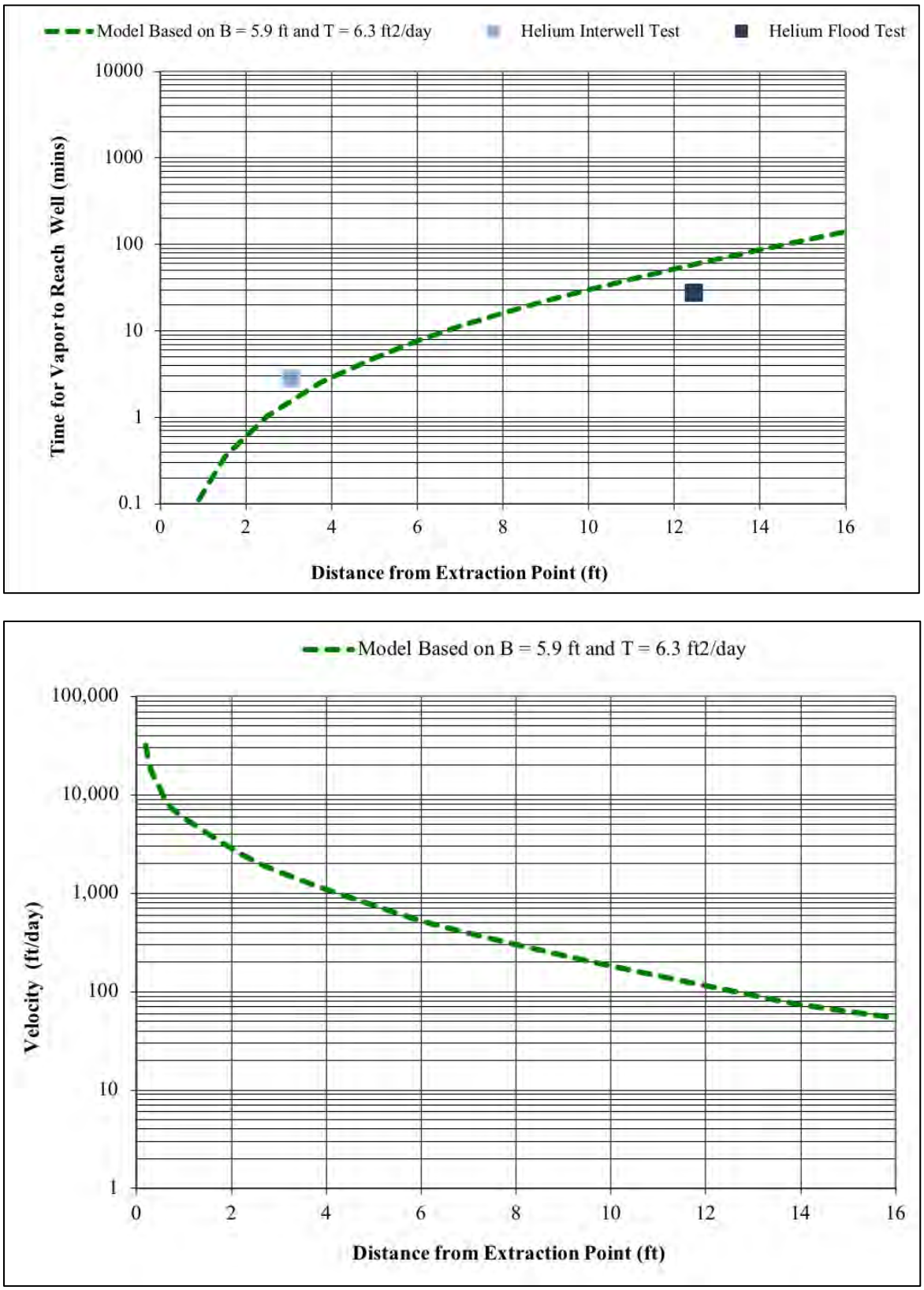
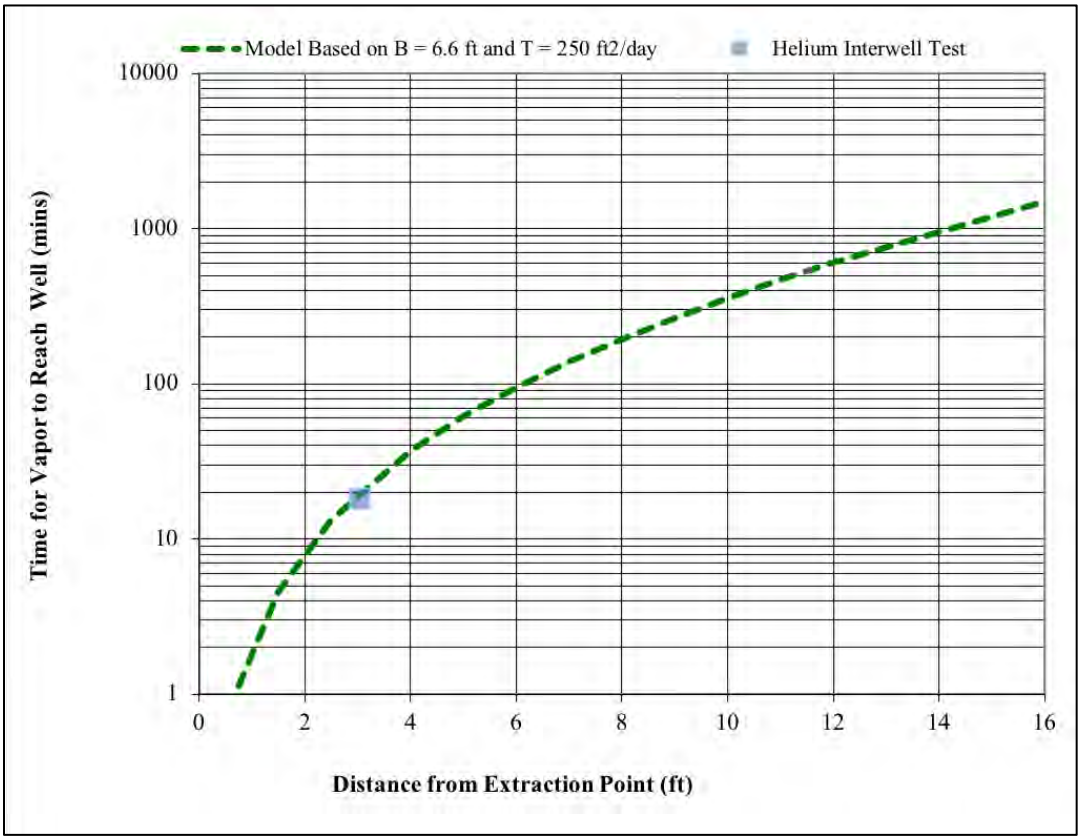


Figure 6-20: Velocity (top) and travel time (bottom) vs radius for V1 at 1.8 scfm flow rate



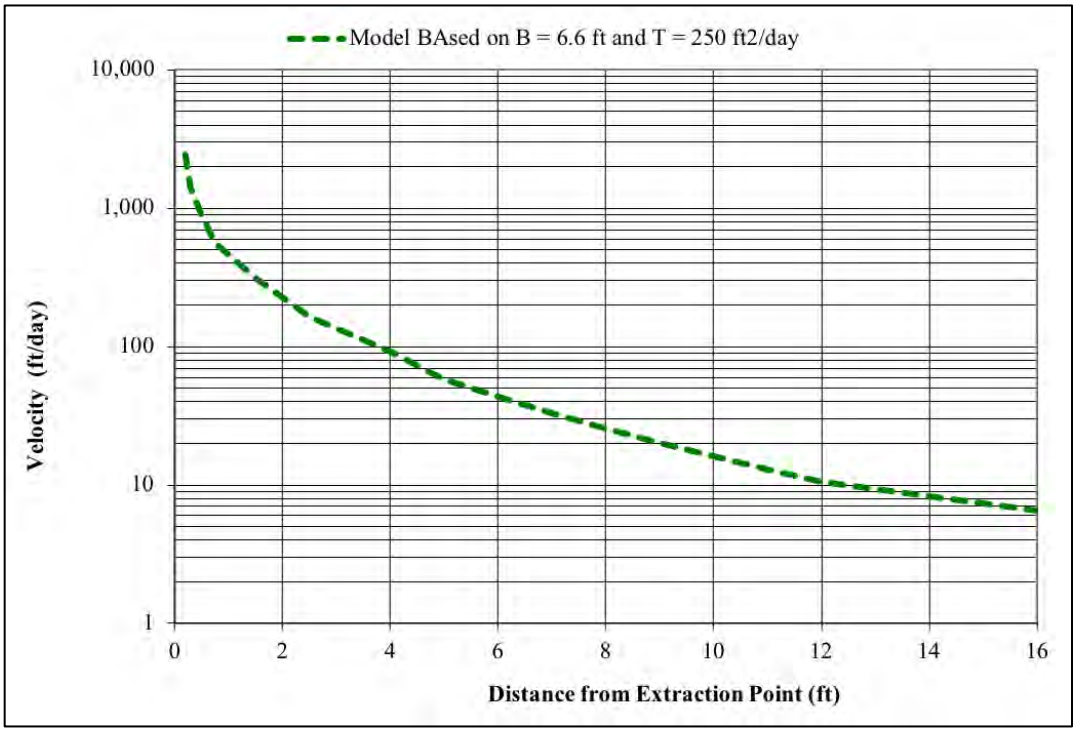
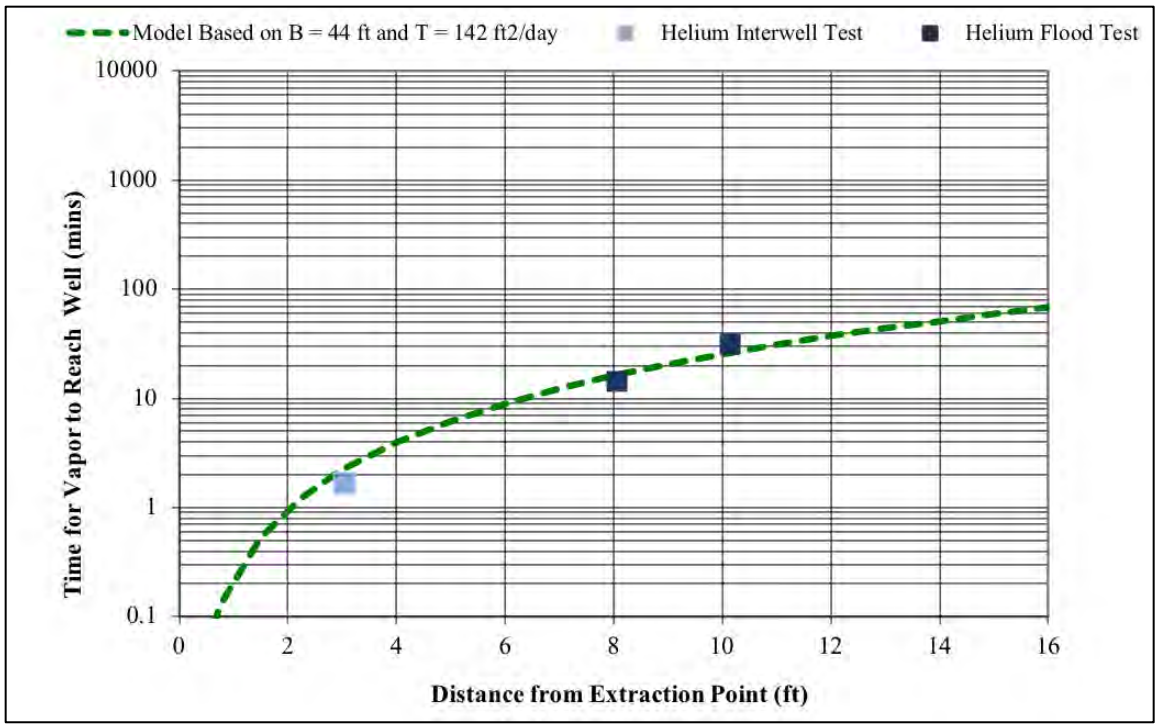


Figure 6-21: Velocity (top) and travel time (bottom) vs radius for V2 at 1.5 scfm flow rate



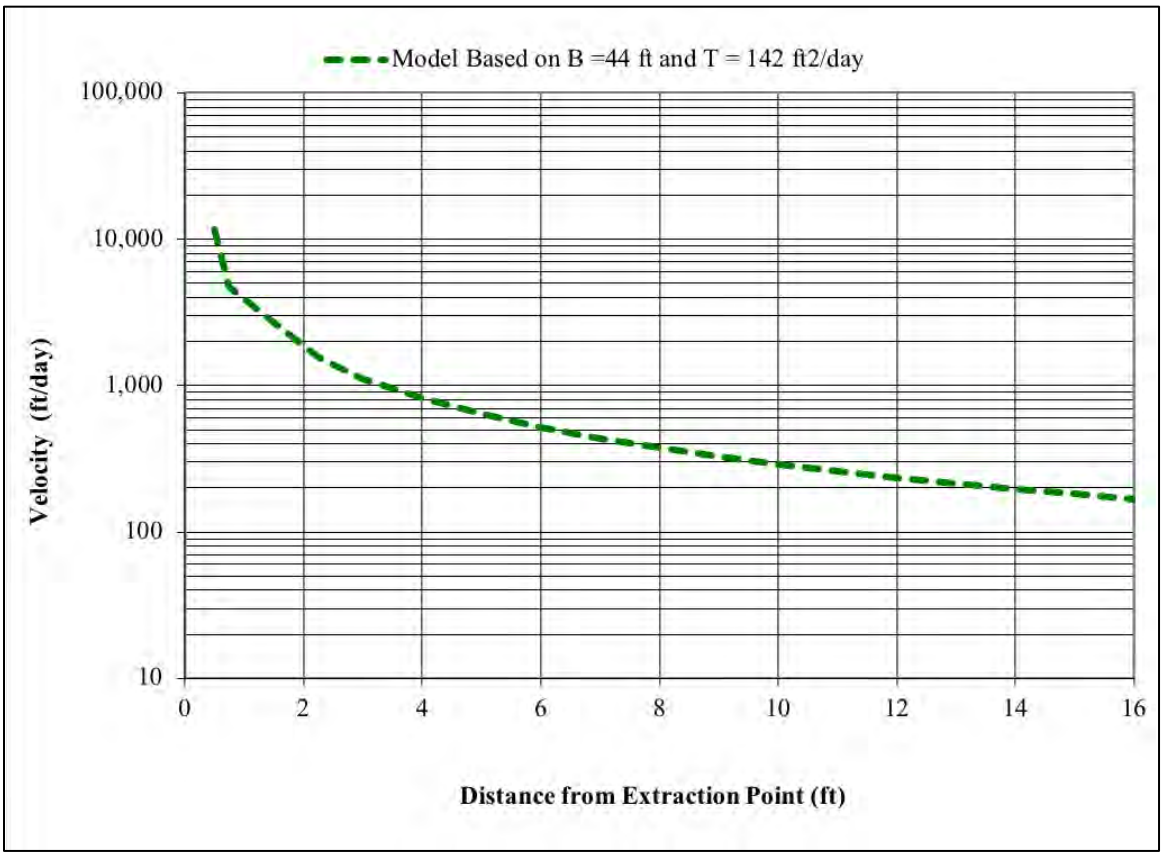


Figure 6-22: Velocity (top) and travel time (bottom) vs radius for V3 at 1.5 scfm flow rate

6.3.5 Cross-Slab Tracer Test

The data collected in the cross-slab tracer test is presented in Table 6-6. The indoor air concentrations decreased slightly over time, so additional SF_6 was added after about ~50 minutes.

The vent-pipe concentrations of SF_6 in V-1 gradually increased to about 90 ppmv after about 46 minutes, indicating about 55% indoor air in the extracted gas. Figure 6-23a (top) shows the profile of gas withdrawn from the subsurface as a function of radial distance calculated using Equation 7 and the T, B and b values in Table 6-5. Recall from Figure 6-15 that a travel time of just over 29 minutes was recorded for the helium flood at a radius of 12 ft. At r = 12 ft on Figure 6-23b, the calculated proportion of flow from the subsurface is 25%, meaning indoor air would be 75% of the total. The SF_6 tracer data shows that at 25 minutes, the proportion of indoor air was about 38%, so the model tends to overestimate the leakage across the floor slab, so this slightly overpredicts the cross slab leakage. Fitting Equation 7 to the cross-slab tracer test and maintaining a reasonable match of the vacuum vs distance data to Equation 4 yielded a T value of 12 ft^2/day and a B value of 9 ft, which are within a factor of 2 of the values in Table 6-5.

The vent-pipe concentration of SF_6 in V-2 was not detectable throughout the entire test (87.5 min). If a leakance value were to be calculated from this result it would be over 100 ft. This is markedly different than the B value calculated from vacuum vs time (2.9 ft) or vacuum vs distance (6.6 ft) analysis and further proof that the conditions at V-2 are not consistent with the model assumptions.

At vent pipe V-3, the SF_6 concentration was within 16-20 % of the indoor air concentration in the range of 18-47 minutes of the cross-slab tracer test. Figure 6-19 shows a ~34 minute travel time to a radius of 10 ft, at which radius, Figure 6-23c indicates 5% indoor air in the extracted gas, which also shows the B value from the pneumatic testing tends to overpredict leakage. A T value of 100 ft^2/day and a B value of 20 ft provides a reasonable fit to the cross-slab tracer, subslab tracer, and vacuum vs distance data, which is also within about a factor of 2 of the values in Table 6-5.

Table 6-7: Cross-Slab Tracer Test Data Building 200

Vent Pipe ID	Elapsed Time	Indoor SF_6 (ppmv)	Vent Pipe SF_6 (ppmv)	% indoor air
1	18:21	128	48	38
1	25:00	160	60	38
1	45:52	165	90	55
3	18:21	128	20	16
3	41:22	126	20	16
3	47:20	128	26	20
Additional SF6 added to indoor air				
2	64:25	150		
2	67:00	141		
2	73:00	164	0.0	0
2	81:45	108		
2	87:32	100	0.0	0

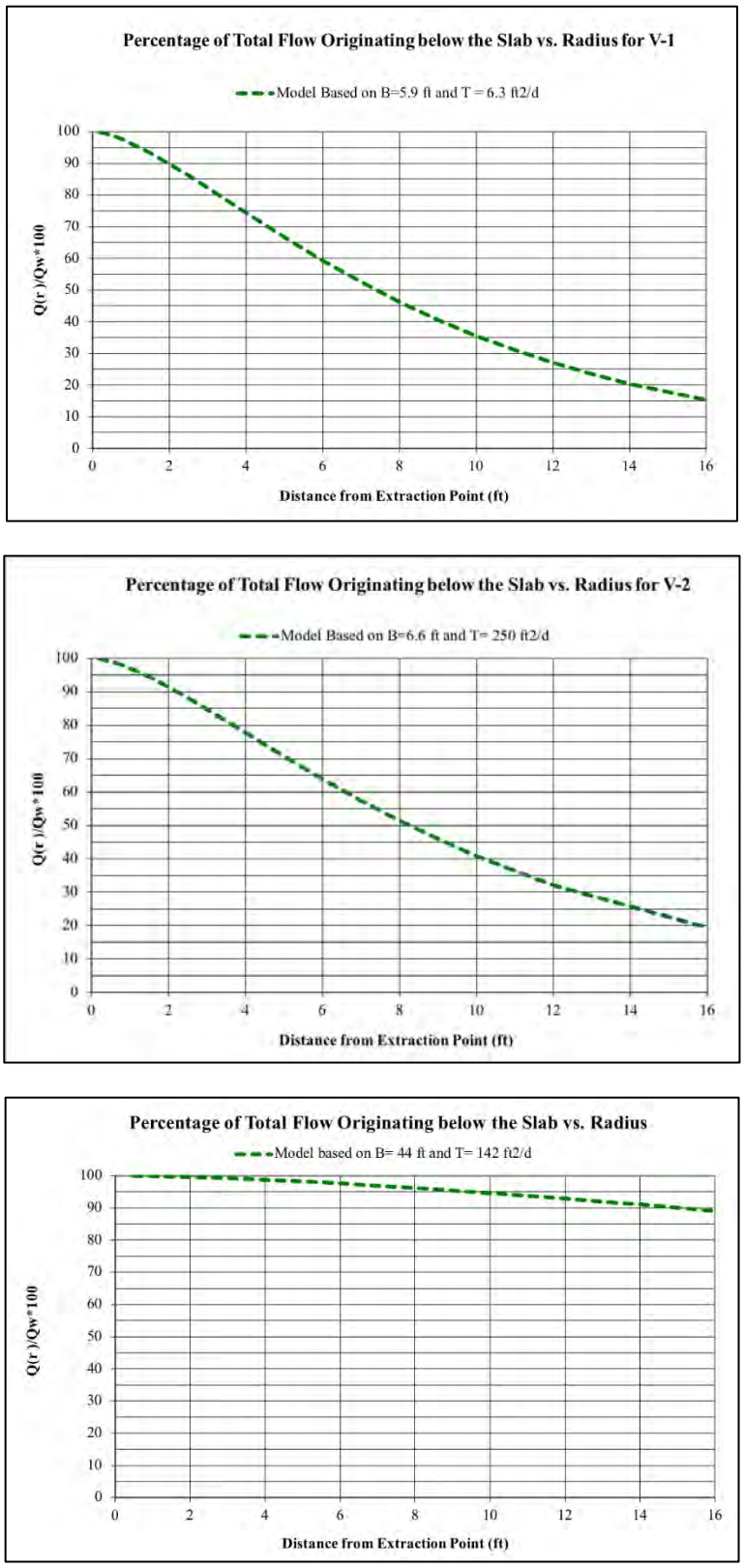


Figure 6-23: Proportion of flow originating below the floor versus radius calculated using Equation 6 for vent pipes V1 (a, top), V2, (b, middle) and V3 (c, bottom)

6.3.6 Radon Measurements

Radon activity measured in indoor air via 30-day EPERM Electrets in September 2015 with the SSD system operating were in the range of 0.3 to 0.6 pCi/L, well below the target level of 4 pCi/L. Concentrations in the vent pipes via Tedlar bag samples were in the range of 81 to 102 pCi/L, as shown in Figure 6-24. These data demonstrate that the system is effective at protecting occupants from unacceptable radon exposures.

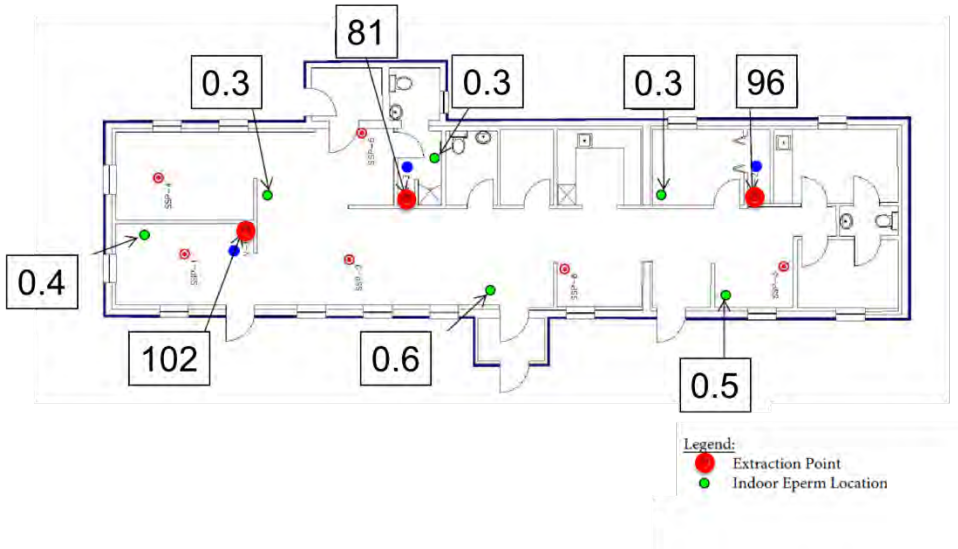


Figure 6-24: Radon activity (pCi/L) measured in indoor air and vent-pipe samples with system operating

Radon was removed at a rate of about $6x10^6$ pCi/day, which would be sufficient to pose indoor air concentrations as high as 18 pCi/L in indoor air, but only if the Qsoil value was equal to the SSV extraction rate (i.e., AF ~ 0.25). With a building-specific AF calculated at 0.002, the indoor air radon concentration would be expected to be below 0.18 pCi/L, similar to typical outdoor air concentrations and more than an order of magnitude below the target level of 4 pCi/L.

6.3.7 Building-Specific Attenuation Factor

Building-specific attenuation factors were calculated using Equation 17 using the T and B values calibrated for vent pipes V-1 and V-3 and are provided in Table 6-7. The mean AF was 0.002, which is 15 times lower than the generic subslab attenuation factor of 0.03 recommended in U.S. EPA guidance (U.S. EPA, 2012).

Table 6-8: Building-Specific Attenuation Factors for Building 200

Fan	Supporting Data	T	B	h	deltaP	AER	AF
		(ft^2/day)	(ft)	(ft)	(ft)	(/day)	(-)
V-1	Pneumatic data	6.3	5.9	10	0.7	6	2E-03
V-1	SF6 Tracer	12	9	10	0.7	6	2E-03
V-3	Pneumatic data	142	44	10	0.7	6	8E-04
V-3	SF6 Tracer	100	20	10	0.7	6	2E-03

The maximum indoor air concentration of TCE prior to mitigation was about 70 µg/m^3 and the maximum subslab concentrations was about 29,000 µg/m^3, so the empirical attenuation factor would have be on the order of 2E-3, which is consistent with the calculations in Table 6-8.

6.3.8 Long-Term Monitoring

The combined effluent from all three vent pipes was monitored on several occasions to verify that the mass removal rate from the SSD system continued to be protective. Table 6-8 shows TCE mass removal rates were consistently around 0.2 g/day.

Table 6-9: Long-term monitoring of post-optimization system performance at Building 200

Date	Test	TCE Concentration	Flow Velocity	Vacuum	Stack Area	Flow Rate	Mass Rate	Loading
		µg/m^3	ft/min	in H2O	sq ft	cfm	µg/min	g/day
23-Dec-15	Baseline	1000	97	3.8	0.049	4.8	135	0.19
6-Jan-16	Step 1	910	134	8.5	0.049	6.6	169	0.24
20-Jan-16	Step 2	700	134	8.3	0.049	6.6	130	0.19

Indoor air sampling and analysis conducted as part of routine base-wide monitoring by Avatar was conducted on several occasions. Table 6-9 shows that TCE concentrations were consistently below the NJDEP screening level of 3 µg/m^3.

Table 6-10: Long-term monitoring of indoor air quality at Building 200

Date	North End		South End	
	TCE (µg/m^3)	PCE (µg/m^3)	TCE (µg/m^3)	PCE (µg/m^3)
14-Oct-2015	0.33	<1.4	0.23/0.38	<1.4
23-Mar-2016	0.28	<1.4	0.32	<1.4
8-Sept-2016	0.3/1.5	0.76J/0.67J	0.33	0.6J
22-Feb-2017	<0.21	<0.14	<0.21	<0.14

6.4 COST CONSIDERATIONS

The SSD system at Building 200 was originally installed with two suction points, which would appear to be necessary because the building footprint is long and narrow, and also sufficient based on the fact that V-1 and V-3 both show strong performance metrics at a radius of 16 feet (vacuum >10 Pa, velocity >50 ft/day, travel time < 140 min and a high proportion of flow originating from the subsurface). Unfortunately, vent pipe V-2 does not behave the same way, and this was not apparent based on conventional diagnostics because V-2 yielded a similar flow at a similar vacuum as V-1 and little other data was included in the assessment. Two years of quarterly indoor air quality monitoring in 2006 and 2007 repeatedly confirmed that the system was not achieving the goal of maintaining indoor air concentrations below regulatory screening levels. This monitoring and reporting could have been reduced considerably if the system had been effective at startup.

The initial revision to the system design (install V-3 and replace the fan with a Rotron Blower to enhance subslab vacuum) was only partially justified. V-3 yields about half of the total TCE mass removal, so it was a valuable addition. But the Rotron Blower was unnecessary, and was a waste of both capital cost and operating electricity draw. If the initial diagnostics had included any one of the following lines of evidence, the performance issues with V-2 would have been apparent:

1. A “near-field” vacuum monitoring point (SSP-8 at a radius of 3 ft showed <3Pa vacuum);
2. An inter-well tracer test (the travel time was almost 19 minutes for a radius of 3 feet); or
3. Comparison of T and B values calculated from vacuum vs time and vacuum vs distance measurements (no unique pair of T and B values could fit both data sets of data to Equations 1 and 4).

Any one of these tests can be performed in a matter of a few minutes and the need for a third (or replacement) suction point would have been identified immediately. This would have prevented two years of ongoing exposures of occupants to VOCs at concentrations near the regulatory screening level and unnecessary expenditures for a Rotron blower, variable frequency drive and electricity costs that were predominantly driving air flow through a recirculation loop, which was a waste of energy.

Table 6-11 provides a summary of the cost comparison for the conventional vs optimized mitigation system for Building 200. The incremental cost of the optimization testing and analysis service (assuming a production level of detail and not a research level of detail) would be about $9,600, but would result in a net savings of $54,000 over a 30 year lifecycle, which is a return on investment of 5.6 times. The cost differential between the conventional and optimized system is a factor of about 1.5.

Table 6-11: Building 200 Cost Consideration Summary

Cost Components	Conventional	Optimized
Initiation	$ 4,690	$ 4,690
Reconnaissance	$ 3,620	$ 4,320
Pilot Test	$ 2,900	$ 11,500
Installation	$ 20,775	$ 17,150
Operation	$ 115,355	$ 50,795
Maintenance	$ 300	$ 600
Fan Replacement	$ 4,000	$ 8,000
Training	$ 5,000	$ 6,000
TOTALS	$ 156,640	$ 103,055
Total incremental cost of optimization activities		$ 9,600
Net Savings		$ 53,585
Return on Investment		5.6
Ratio of Conventional Costs vs Optimized Costs		1.5

7.0 SUN DEVIL MANOR

7.1 SITE DESCRIPTION AND HISTORY

Sun Devil Manor (SDM, Figure 7-1) is a residential property currently owned by Arizona State University (ASU) in Layton, Utah, hydraulically downgradient of Hill Air Force Base (Hill AFB). This building is being used for vapor intrusion research as part of the Strategic Environmental Research and Development Program (SERDP) Project 1686. This building has also been referred to as the ASU vapor research house or the Layton house.

SDM is one of the most extensively characterized buildings in the world for vapor intrusion assessment (Guo, 2015, Guo et al., 2015, Holton et al., 2013, Holton et al., 2015, Holton, 2015). The house also has an existing subslab depressurization (SSD) system that was designed similar to a traditional radon mitigation system. Dissolved TCE and 11DCE are present below the building and ASU has confirmed that vapor intrusion of these compounds into the building is occurring (Johnson et al., 2013).

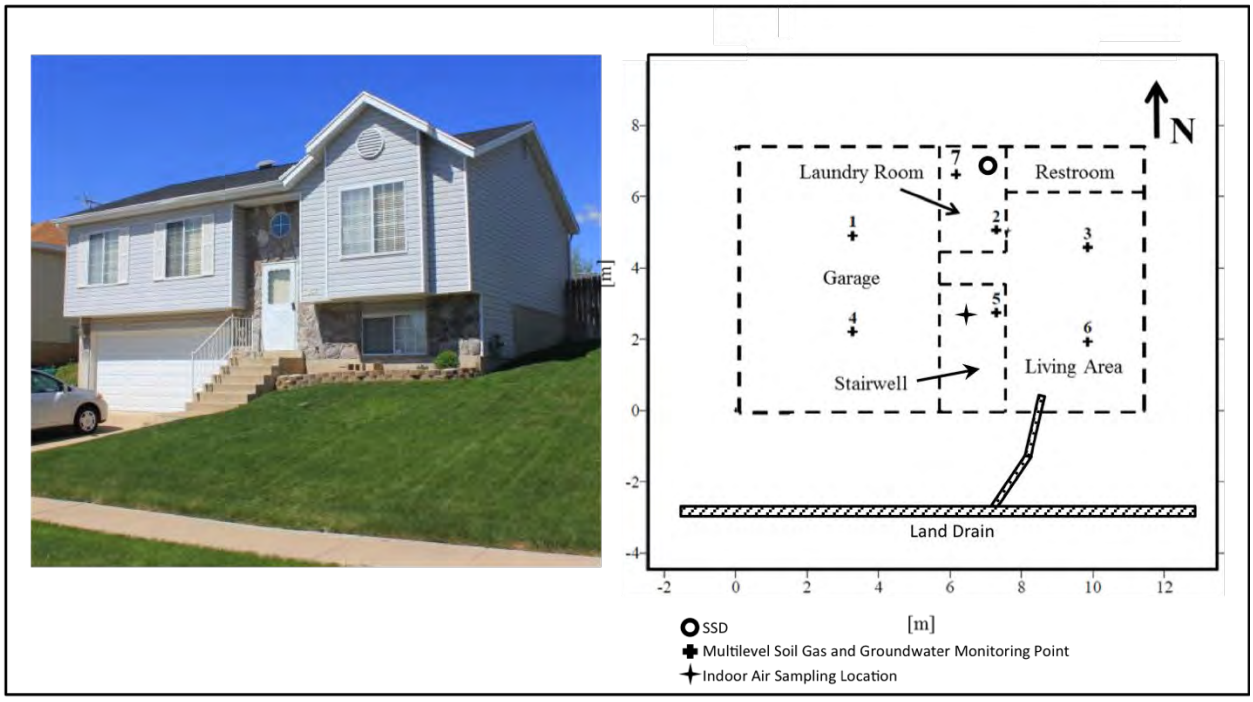


Figure 7-1: Sun Devil Manor exterior photograph and interior layout (after SERDP 1686)

The Layton house is a split-level, two-story house with the lower story partially below grade. The house is on a slope with an elevation decrease of approximately 2.5 m from the back to the front of the property. It has a concrete slab on grade foundation at the front of the house and is below grade at the back of the house. The sub-grade area of the building consists of a garage, a laundry room, a restroom and a living area. The slab footprint is approximately 900 ft^2 (84 m^2).

Multi-level soil vapor monitoring probes were installed by ASU in 6 locations, with subslab probes and probes at 3, 6 and 9 ft depths. A subslab probe was also installed close the vent pipe (SSP-7).

Figure 7-2 shows the instrumentation isometrically. ASU also equipped the garage with analytical instruments for real-time on-site monitoring (Figure 7-3).

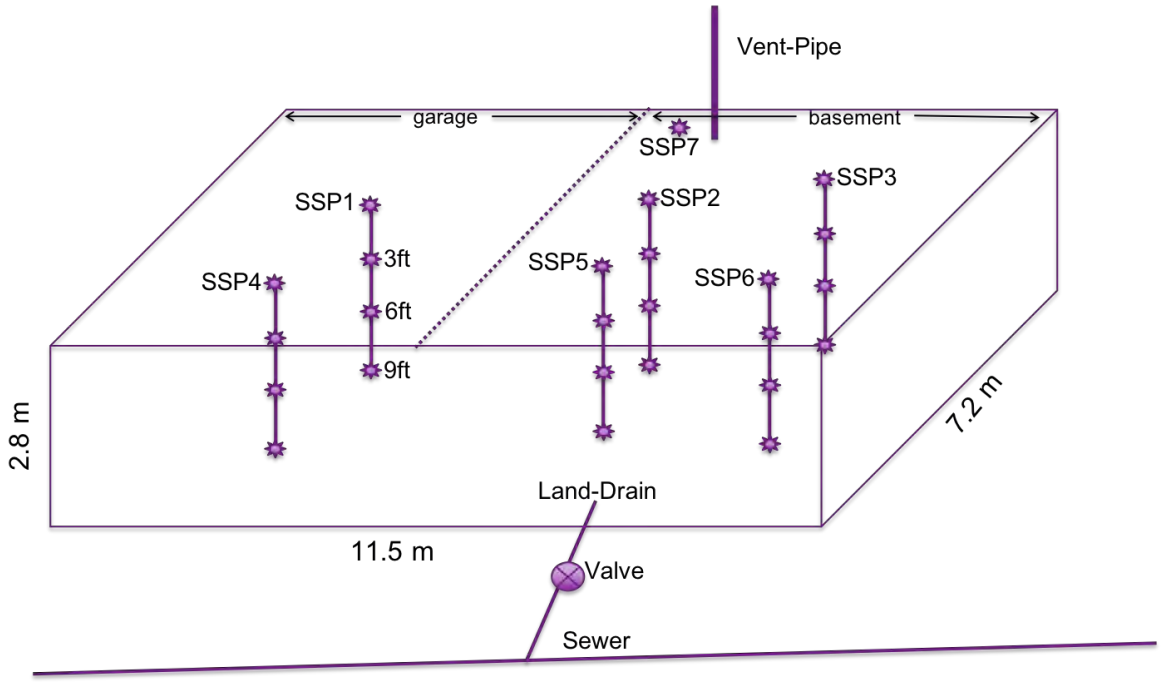


Figure 7-2: Isometric representation of nested soil gas probes, the land drain and the vent pipe of the SSD system at SDM

Figure 7-4 (left) shows a photograph of the mitigation system vent pipe, which has been fitted with a shut-off valve just above the floor slab, and a T-fitting to allow connection to other fans. The valve just above the floor was used to cycle the flow on and off during the transient pneumatic tests because the response was very fast compared to the time required for the fan to run up to full speed after being turned on or spin down to a stop after the power was turned off. The T-fitting was used to connect a Shop-Vac (Figure 7-4, right) for enhanced extraction during the step-test and with the flow reversed for the helium flood test.

The lower level indoor air exchange rates measured by ASU varied from 10 – 35 per day (~ 0.4 to 1.5 air exchanges per hour) (Holton 2015). Assuming an effective air exchange volume of 350 m^3, the building ventilation rate (Qbuild) is about 2.3 to 8.75 cubic meters per minute (m^3/min). Note that in most residential buildings, the subslab to indoor air attenuation factor is about 0.01 or less, so the volumetric flow of soil gas into the building (Qsoil) would be expected to be about 0.023 to 0.088 m^3/min (3.1 cfm) or less. The flow rate of the SSV system as configured was about 100 scfm (2.83 m^3/min).

Figure 7-3: Analytical instruments in the garage of SDM

Figure 7-4: Photographs of the vent pipe (left) and Shop Vac hose assembly (right)

7.1.1 Site Geology/Hydrogeology

The soil beneath SDM is predominantly fine sandy silt with >70% fines (<0.0063mm particle diameter). Soil borings through the floor of the basement showed a 20 to 30 cm (8 to 12 inch) thick layer of granular fill beneath the building; however, the floor of the garage is 9 inches lower than the floor of the basement and does not have a granular fill layer beneath it. The soil moisture was typically 0.22 to 0.30 grams of water per gram of soil from the water table to about 1 m below the floor slab (Guo, 2015). The water table typically ranges in depth seasonally from about 3.1 to 3.5 m below the slab.

7.1.2 Contaminant Distribution

Groundwater, subslab soil gas, and indoor air have been monitored extensively for years (Holton et al., 2013). The primary volatile organic compound of concern is TCE, which occurs in the greatest concentrations. The TCE concentrations ranged up to 50 µg/L in subslab groundwater (sampled directly below the foundation), up to 300 µg/m^3 in deep soil gas and less than 2 µg/m^3 in subslab soil gas.

Indoor air concentrations in SDM were demonstrated to be highly variable over time via a series of samples collected over 4-hour intervals for about 2 years. Daily (24-hour) averages were calculated and are shown on Figure 7-5. The range is from <0.01 to >10 parts per billion by volume (ppbv), which spans a factor >1,000. Considering this range of indoor air concentrations, it is very challenging to calculate an empirical attenuation factor.

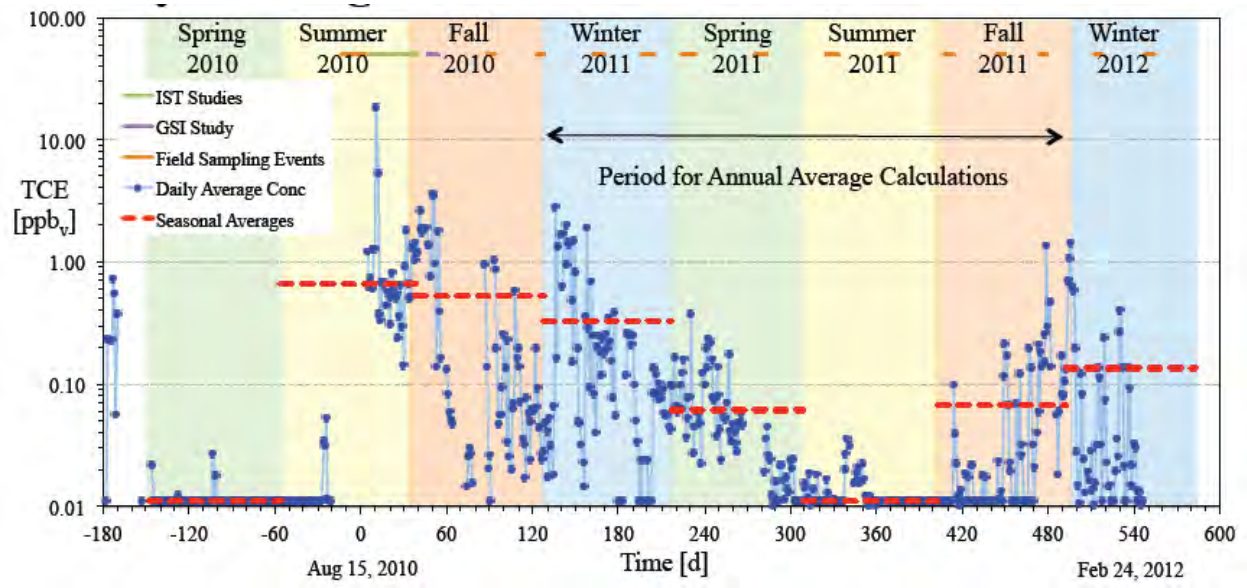


Figure 7-5: Calculated 24-hour average concentrations for TCE in indoor air at SDM (Johnson et al., 2015)

SDM was also monitored over a period of about 9 months via building depressurization testing to assess the mass flux of VOC vapors entering the building. This yielded an average flux of about 0.2 g/day for TCE (Figure 7-6), which was much higher than expected based on vertical profiles

of vapor concentrations beneath the building. This unexpectedly high emission rate through the building is what prompted ASU to discover a land drain beneath the building, which was acting as a preferential pathway for vapor transport. ASU subsequently installed a valve in the land drain to allow the drain to be either open or closed. Note that the span in the emission rates in Figure 7-6 is about a factor of 3, dramatically less than the span of indoor air concentrations in Figure 7-5. Also note that the scale on the radon plot in Figure 7-6 is in units of Ci/d, but should be in milliCi/d.

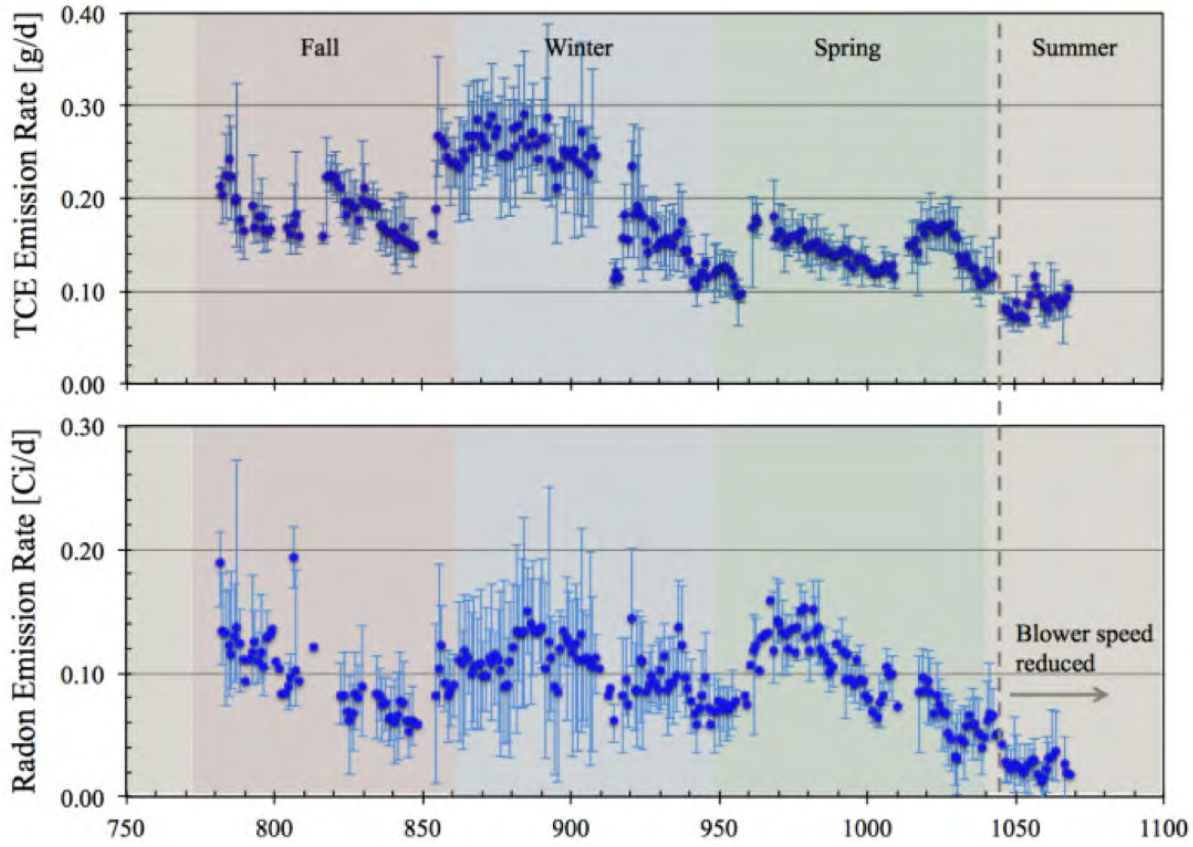


Figure 7-6: TCE (top) and Radon (bottom) emission rates from SDM during controlled building pressure testing (Johnson, et al., 2015)

7.2 BUILDING-SPECIFIC TESTING

Testing conducted at SDM included the lines of evidence described for Buildings 205 and 200, but at SDM, the tests were performed twice, once with the land drain open and once with the land drain closed.

7.2.1 Mass Flux Step-Test

The rate of mass removal from the vent-pipe was characterized by setting the flow rate of the SSD system to a range of different levels using the valve just above the floor. At each of four steps, samples of the effluent were collected for on-site analysis by a gas chromatograph with an electron capture detector (GC/ECD) until concentrations stabilized. At the end of each step, a Tedlar bag sample was collected from the vent pipe via vacuum chamber and sent to Doug Hammond at the

University of Southern California for analysis of the radon activity using alpha scintillation in a Lucas cell (McHugh et al., 2008). The vent pipe velocity was measured with a Dwyer 471 thermal anemometer and multiplied by the interior cross sectional area of the pipe to quantify the flow rate. The mass removal rates for both TCE and radon were compared to the mass emission rates measured by ASU using controlled pressure monitoring (Figure 7-6).

7.2.2 Pneumatic Tests

Single-point constant discharge tests were performed at all 18 nested soil gas probes and 7 subslab probes, to assess spatial distribution of pneumatic conductivity. Flow rates were set at 0.1, 0.3 and 0.5 L/min and the corresponding vacuum was measured with a Dwyer Magnehelic gauge. The gas conductivity (K) was calculated using Equation 11 from Johnson et al., 1990.

Transient pneumatic tests were conducted at all probe locations. Data was collected from subslab, 3 ft, 6 ft, and 9 ft depth probes at SSP-02, SSP-4, SSP-5 and SSP-07 with the land drain open and closed. Digital micromanometers with data loggers (TEC DG-700) were connected to the subslab and deeper soil gas probes and set to record data at 1 second intervals. Transient pneumatic tests were also conducted at the subslab locations at SSP-01, SSP-03 and SSP-06 with the land drain open and closed, using pressure transducers provided by ASU. The fan was turned on with the ball-valve closed and after a few seconds to allow the fan to spin up to speed, the ball valve was opened to record the drawdown part of the cycle. After vacuums stabilized, recovery was recorded by closing the ball valve, then turning off the fan. The vacuum readings were converted into units of feet of air head (1 pascal = 0.27 feet of air head at 15 ^{o}C) and imported into AQTESOLV for analysis by the Hantush-Jacob Leaky Aquifer Model. The curve matching was performed using linear-linear and log-log plots because the transient response was very fast, as a result there were fewer points to fit the curve to. An example of the fit between the transient data and Equation 1 using the two different scales is shown in Figure 7-7.

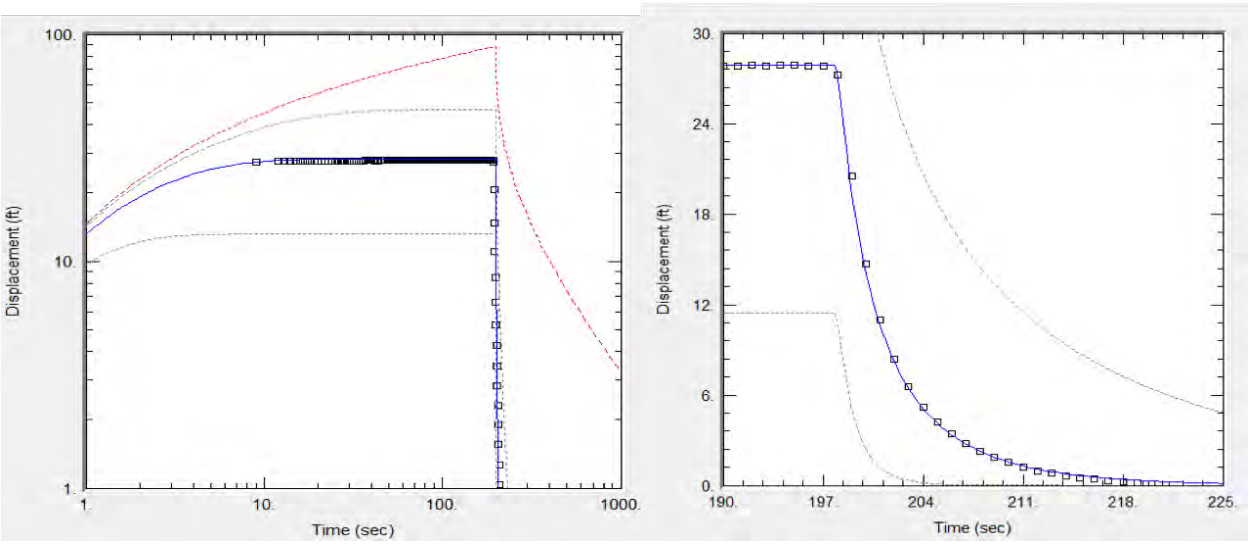


Figure 7-7: Log-log (left) and linear-linear (right, recovery only) plots of transient response data and curve fitting for subslab probe SSP2

Steady state vacuum vs radial distance was also measured as a second line of evidence for deriving T and B values. Steady vacuum levels were plotted vs radial distance, compared to Equation 4, and the T and B values were iteratively adjusted as needed to provide the best fit to both vacuum vs time and vacuum vs distance.

7.2.3 Subslab Tracer Testing

Inter-well helium tracer tests were performed by injecting a slug of about 10 L of 100% helium into a subslab probe and monitoring its arrival at the SSD system. The average travel time from the SSP to the vent-pipe was taken as the time between the midpoint of the helium injection interval and the time of the maximum vent-pipe concentration. There is a slight lag in the instrument reading (5 to 10 seconds), but this is only significant if the travel time is very short. Helium inter-well tracer tests were conducted from SS probes 3, 5 and 6, and the land drain. SS probes 3, 5 and 6 were each tested at an SSD system flow rate of 100 scfm with the land drain closed (twice to provide data regarding reproducibility) and open (to compare and contrast the LDO vs LDC flow regimes). Probes SS3 and SS5 were also tested with the land drain closed and a flow of 21 scfm to assess the linearity of the flow/velocity relationship. The land drain was tested in the open position for 29 and 91 scfm flow rates and helium was injected into the land drain at the location of the valve in the front yard of the house.

Helium floods were performed with the land drain open and closed (LDO and LDC) by blowing air into the SSD system using a ShopVac and adding helium at a concentration of about 0.8% by volume. The direction of flow is reversed compared to the normal operation, but the flow rate was set at the maximum fan output (100 scfm) in both cases (LDO and LDC), so the flow paths would be similar but opposite in direction to the normal SSD operation.

7.2.4 Cross-slab Tracer Test

SF_6 tracer testing was performed by ASU to determine the amount of indoor air leakage across the floor slab during operation of the SSD system. SF_6 was released into the house and dispersed with a bank of mixing fans. Concentrations of SF_6 were measured in the house and in the vent-pipe by GC/ECD during the step tests at multiple flow rates to assess trend of leakage vs SSD system flowrate. The results represent the amount of indoor air that is drawn down through the slab and pulled out by the SSD system, which was compared to calculations using Equation 7.

7.2.5 Mathematical Analysis

The Hantush-Jacob model assumes radial flow with semi-infinite lateral extent to the layered system, which is not strictly applicable at SDM. The suction point is very near an exterior wall, and it is uncertain whether there is a footing beneath the wall that might act as a barrier to flow or whether the proximity to the edge of the building allows additional leakage of outdoor air to the suction point. The model assumes uniform thickness of the transmissive layer with an impermeable base; however, at SDM there is 20-30 cm of granular fill below the interior lower level of the house (but not below the garage floor), and about 9 ft of moderate permeability soil above the water table, which is a departure from the model assumptions. The model also assumes homogenous leakage through the overlying layer (i.e., the floor slab), but leakage across the floor slab is not expected to be uniform and as a result, vacuum levels measured in probes near the

perimeter expansion joint between the floor slab and the wall or near the land drain are expected to be lower magnitude than predicted by the model. Note that SSP-5 is near a visible perimeter crack between the floor and wall with a large aperture and SSP6 is closest to the land drain. Regardless of these challenges, the mathematical analysis was performed and the interpretation included consideration for the disparities between the field measurement and model predictions, which provide clues regarding where and to what degree the model assumptions are more or less applicable.

7.3 RESULTS AND DISCUSSION

7.3.1 Spatial Distribution of Gas Conductivity

Table 7-1 provides measured specific capacity (defined as the flow rate [Q] divided by applied vacuum [ΔP]) and gas conductivity (K) values (calculated using Equation 11 of Johnson et al., 1990) for each probe and Figure 7-8 shows the K values graphically in a box and whisker style plot. All locations showed decreasing gas conductivity with depth. The subslab gas K in the living section was about an order of magnitude higher on average than the native soils (deeper probes), which reflects granular fill below the floor slab in the basement.

Table 7-1: Calculated Specific Capacity, Permeability, Gas Conductivity and Transmissivity

Probe ID	Specific Capacity	Calculated Permeability	Gas Conductivity	Transmissivity	
	(L/min/in. H_2O)	(m^2)	(m/day)	(m^2/day)	(ft^2/day)
1-SS	0.71	1.3E-07	7.3	13	140
1-3BS	0.63	1.1E-07	6.4		
1-6BS	0.45	8.2E-08	4.6		
2-SS	8.33	1.5E-06	85	40	430
2-3BS	1.19	2.1E-07	12		
2-6BS	0.63	1.1E-07	6.4		
3-SS	10.00	1.8E-06	100	39	420
3-3BS	1.00	1.8E-07	10		
3-6BS	0.38	6.9E-08	3.9		
4-SS	5.56	1.0E-06	57	24	260
4-3BS	0.56	1.0E-07	5.6		
4-6BS	0.42	7.5E-08	4.2		
5-SS	8.33	1.5E-06	85	33	360
5-3BS	0.83	1.5E-07	8.5		
5-6BS	0.33	6.0E-08	3.4		
6-SS	8.33	1.5E-06	85	34	370
6-3BS	0.71	1.3E-07	7.3		
6-6BS	0.56	1.0E-07	5.6		
7-SS	7.14	1.3E-06	73	>18	>200

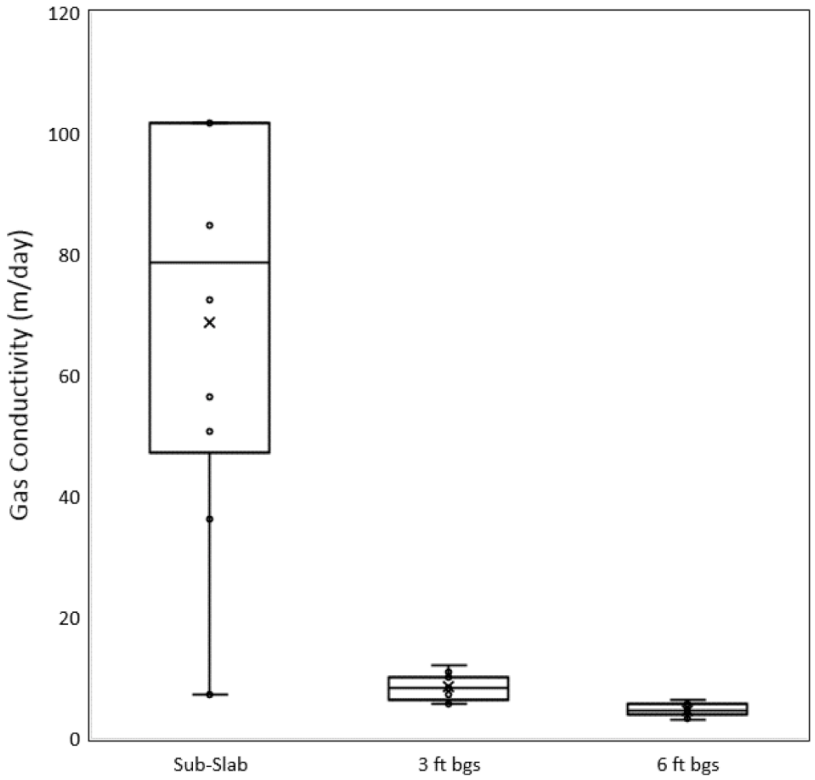


Figure 7-8: Comparison of gas K calculated from the subslab, 3ft and 6ft probes

The 2.7 m (9 ft) deep probes all generated >100 in-H_20 vacuum at a flow rate of 0.1 L/min, and appeared to be saturated, so the flow and vacuum data was not used to calculate gas conductivity. Some of the deep probes had static pressure of up to 45 pascals, likely attributable to saturated conditions and a rising water table.

These measurements were completed with the land drain open and closed and the relative percent difference between the gas conductivity values was less than 3 % on average, which is to be expected because these tests respond only to the gas conductivity of materials in very close proximity to the probe. In all locations, the gas conductivity value decreased with increasing depth.

The gas conductivity values in Table 7-1 were multiplied by a thickness of 0.25 m for the subslab probe, and 1 m for each of the deeper probes to calculate the transmissivity of each interval. The total transmissivity of the unsaturated zone can be calculated by addition of the T values for each vertical interval, which yielded a range of 140 to 430 ft^2/day, slightly less than determined by the analysis of vacuum vs time and vacuum vs distance data. The gas conductivity of the granular fill layer is about an order of magnitude higher than the native soil, but the native soil has a thickness that is about an order of magnitude higher than the granular fill, so both layers would have a similar contribution to the transmissivity.

7.3.2 Steady state vacuum distribution

Steady vacuum readings in all probes at maximum system flow (2.8 m^3/min or 100 scfm) are presented in Table 7-2. Vacuum decreased with increasing depth at locations 2 and 3, showed

minimal vertical trend at locations 1 and 4 and increased with depth at locations 5 and 6. Leakage across the perimeter crack in the floor slab beside location 5 and leakage associated with the land drain near location 6 appears to have contributed to diminished vacuum in the subslab probes, relative to the 3 and 6 ft probes.

Table 7-2: Steady vacuum measured with the venting system operating at full flow

Location and depth	Radial Distance	Vacuum with Land Drain Open	Vacuum with Land Drain Closed	Difference
	(m)	(Pa)	(Pa)	(Pa)
1 - 0.1m	4.6	42	41	-1
1 - 1m		52		
1 - 2m		53		
2 - 0.1m	1.8	109	108	-1
2 - 1m		91	91	0
2 - 2m		78	78	0
3 - 0.1m	3.7	60	61	1
3 - 1m		49	52	3
3 - 2m		48	49	1
4 - 0.1m	5.8	14	13	-1
4 - 1m		13	13	0
4 - 2m		14	15	1
5 - 0.1m	4.3	13	17	2
5 - 1m		26	28	2
5 - 2m		28	29	1
6 - 0.1m	5.2	5.2	8.3	3.1
6 - 1m		9.5	12	2.5
6 - 2m		12	13	1
7 - 0.1m	0.61	134	134	0

7.3.3 Transient vacuum tests

The transient responses were very rapid at all depths, indicating a relatively high transmissivity. Vacuum vs time charts for all four depths (subslab, 3, 6 and 9 ft) at locations 2 and 5 are presented in Figures 7-9 and 7-10 to compare and contrast the two trends, which are notably different. Location 2 is 1.8 meters (m) (6 feet [ft]) from the vent-pipe and not near the land drain. Location 5 is 14 feet from the vent-pipe and closer to the land drain. There is also a visible expansion joint between the floor slab and the wall adjacent to location 5. Location 2 showed diminishing vacuum response with increasing depth, but Location 5 showed almost double the vacuum at 3 and 6 ft

depths compared to the subslab probe. The diminished vacuum in subslab probe SSP5 is attributable to leakage of air across the nearby perimeter crack.

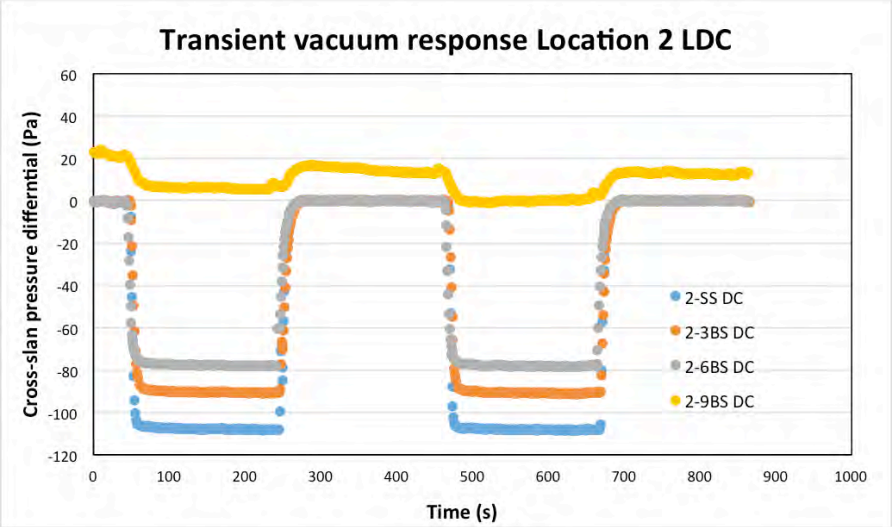


Figure 7-9: Transient vacuum at different depths at location 2

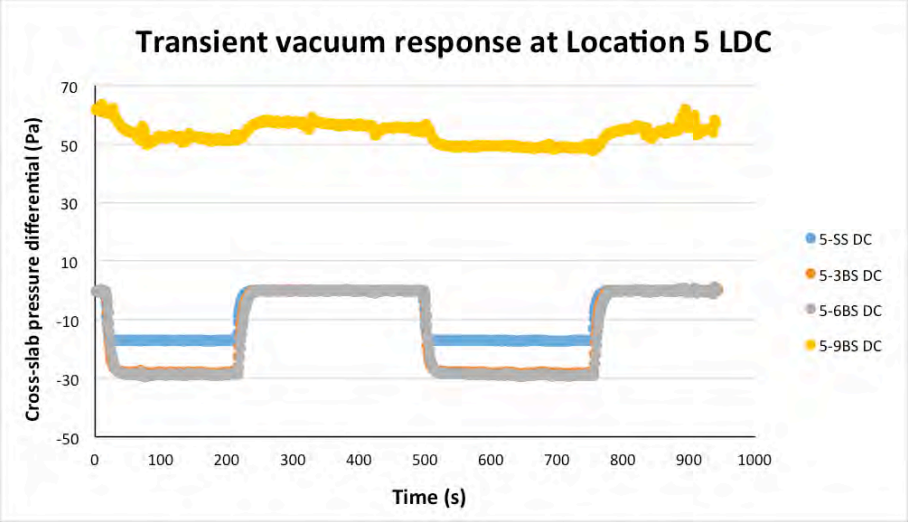


Figure 7-10: Transient vacuum at different depths at location 5

Note that all subslab, 3 ft and 6 ft deep probes had initial and final vacuum of essentially zero gauge. The 9 ft deep probes had baseline pressure, which indicates that the water table was likely high enough to saturate the region around the probe tips. Nevertheless, the 9 ft deep probes did show a response to cyclic operation of the fan, and a rapid response, although with a lower magnitude than at shallower depths.

The magnitude of the vacuum response was identical with the land drain open (LDO) or closed (LDC) at SSP2 (Figure 7-11), but SSP5 showed notably less vacuum with the land drain open (13 Pa) compared to closed (17 Pa) (Figure 7-12). The subslab probe at location 6 showed 8.3 Pa vacuum with the land drain closed and 5.2 Pa with the land drain open. SSP5 and SSP6 are located

closest to the land drain (see Figure 7-1). This demonstrates that a preferential pathway (whether it be across the floor slab or through the subfloor region) that facilitates gas flow will also dissipate vacuum, which provides an opportunity to identify the presence and possibly general location of a preferential pathway by comparison of measured vacuum to expected vacuum levels based on trends in other locations and the mathematical model.

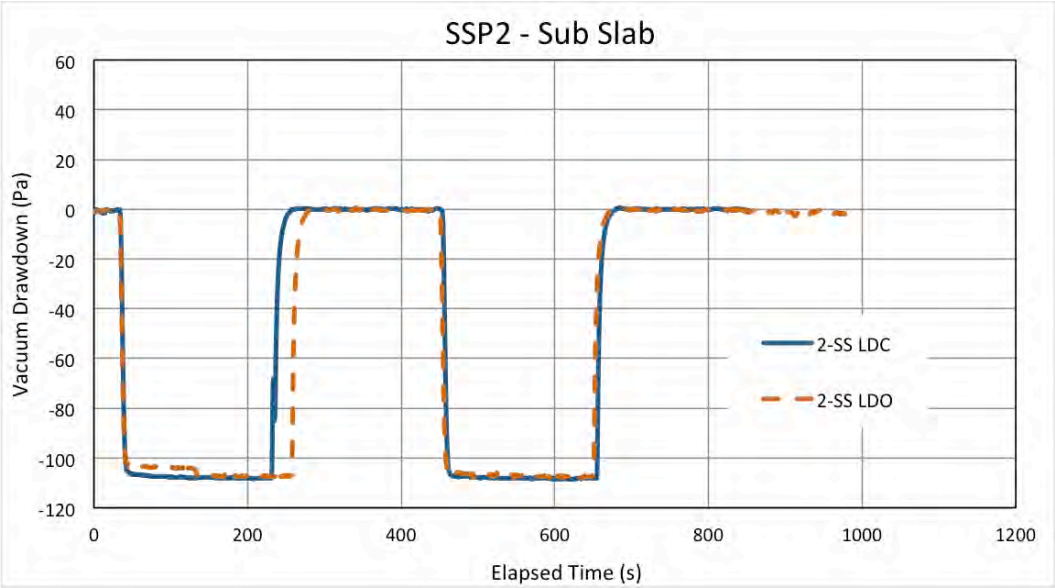


Figure 7-11: SSP2 transient pneumatic response with land drain open and closed

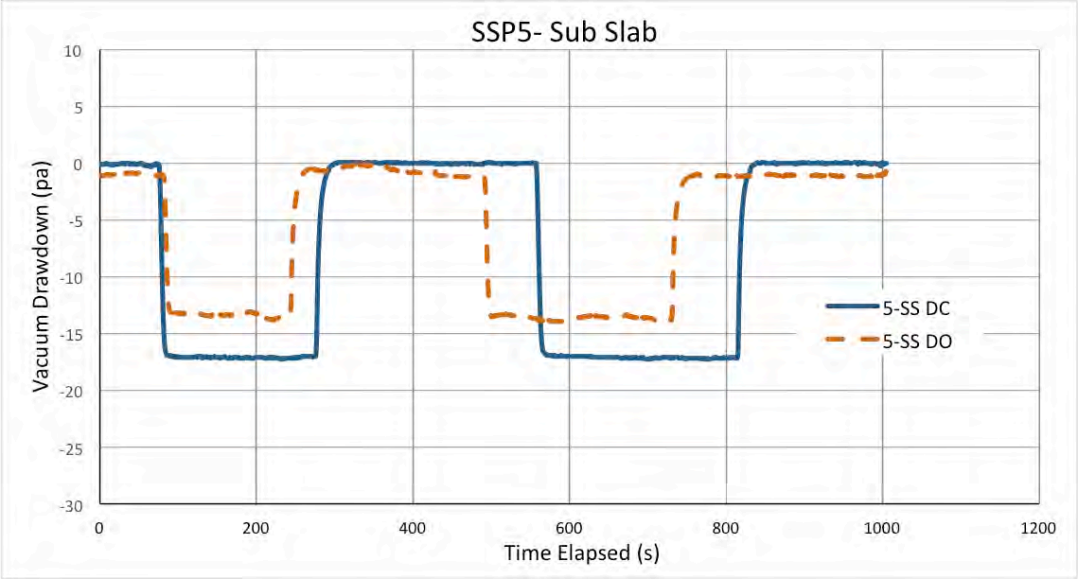


Figure 7-12: SSP5 transient pneumatic response with land drain open and closed

Figure 7-13 to 7-22 show the transient and steady data matches for SSP2, SSP3, SSP4, SSP5 and SSP6, each with the land drain open and closed. The T value depends primarily on the subsurface materials near the point of suction. The B value depends on flow through the floor slab or other

preferential pathways, and would be expected to vary somewhat between locations. A T value of 1200 ft^2/day was found to provide a good match to all of the data, which was higher than calculated in Table 7-1 by a factor of 3 or more. The B value was adjusted to fit the transient and steady vacuum data in each of the 20 data sets (5 probes, transient and steady, land drain open and closed). The average relative percent difference (RBD) between the B values fit using transient versus steady vacuum data was 6% and the average RPD between the B values fit with the land drain open versus closed was 16% (slightly more leakage with the land drain open on average). The B values are summarized in Table 7-3.

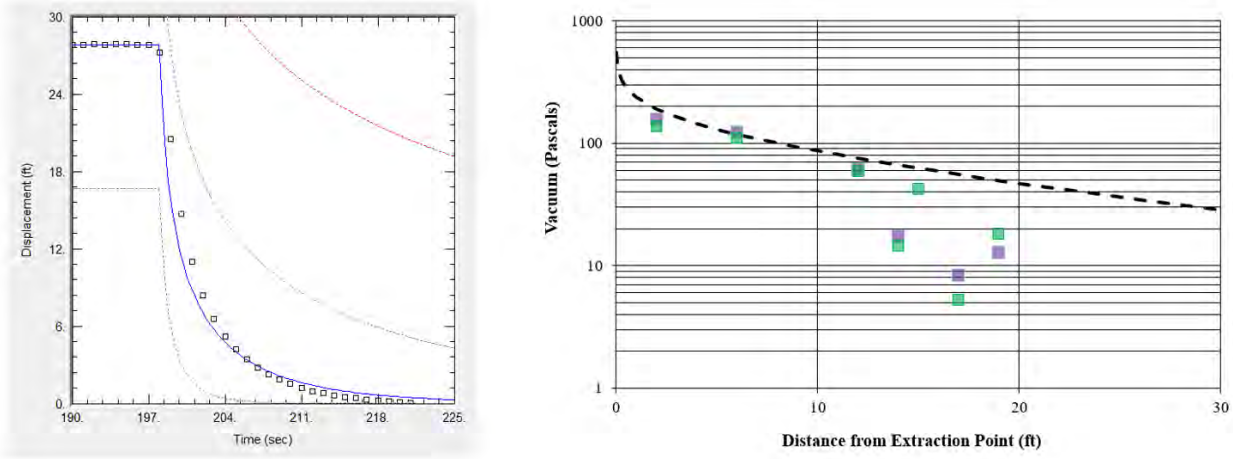


Figure 7-13: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP2, T=1200 ft2/day, land drain closed

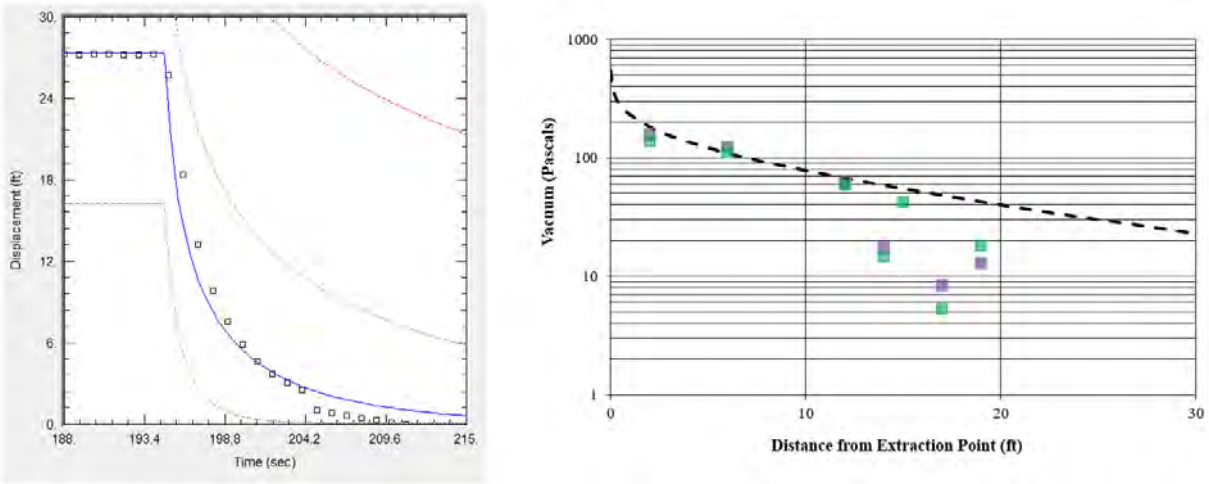


Figure 7-14: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP2, T=1200 ft2/day, land drain open

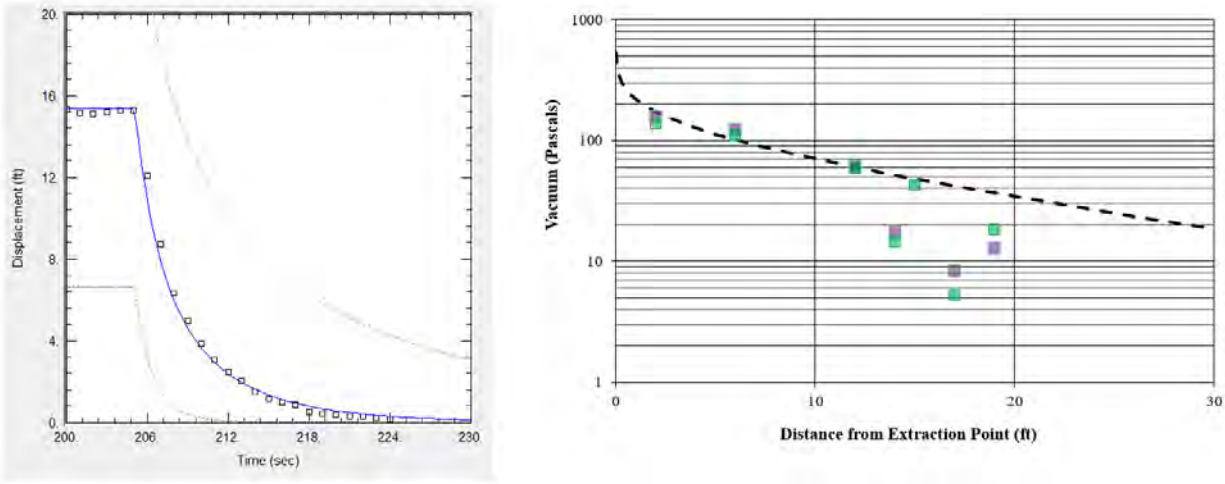


Figure 7-15: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP3, T=1200 ft2/day, land drain closed

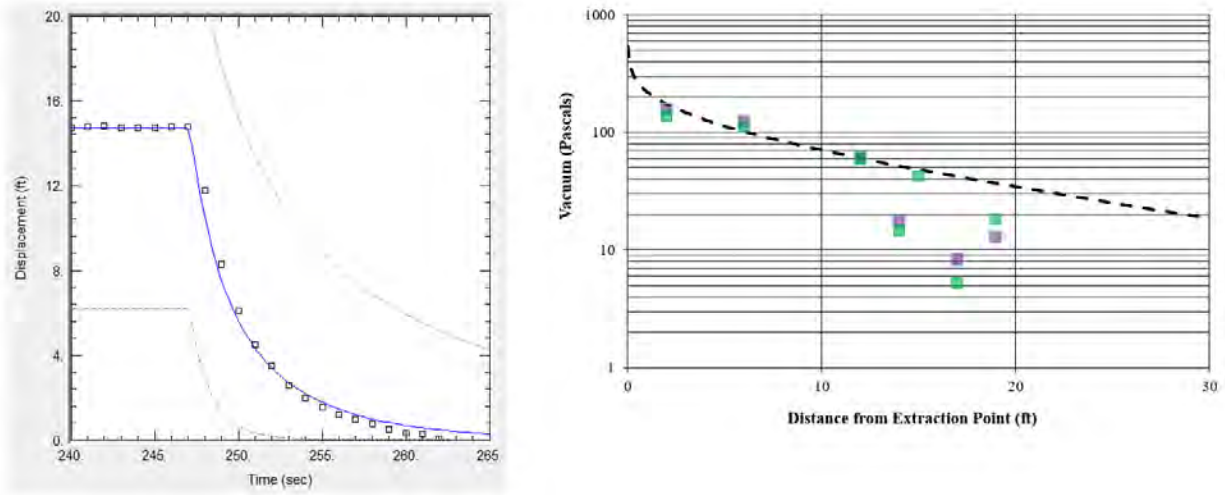


Figure 7-16: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP3, T=1200 ft2/day, land drain open

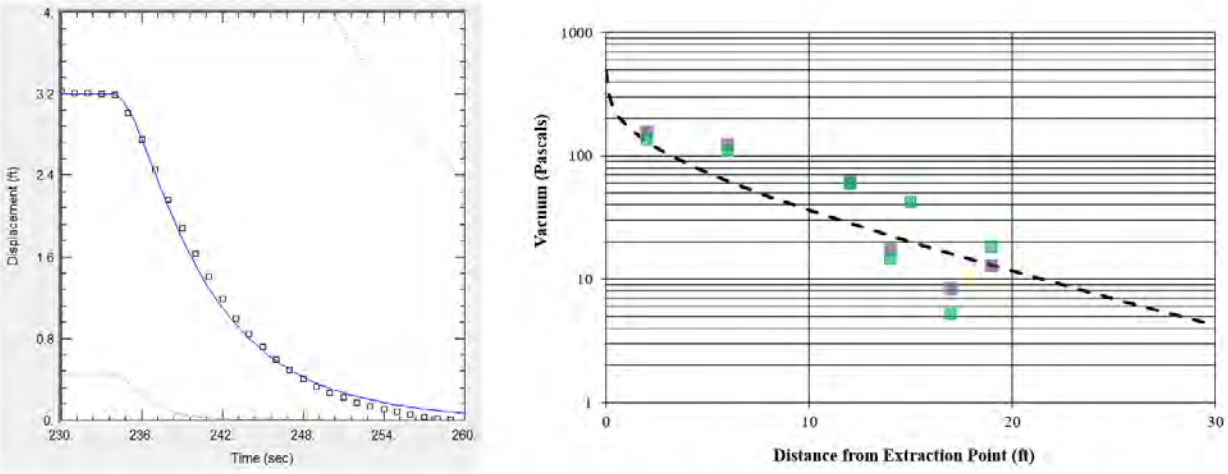


Figure 7-17: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP4, T=1200 ft2/day, land drain closed

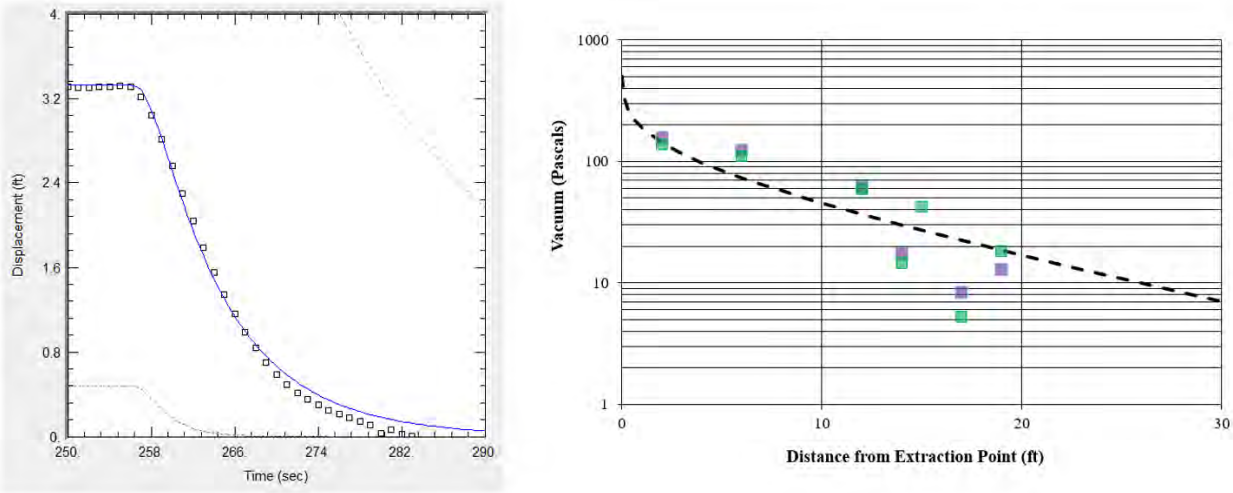


Figure 7-18: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP4, T=1200 ft2/day, land drain open

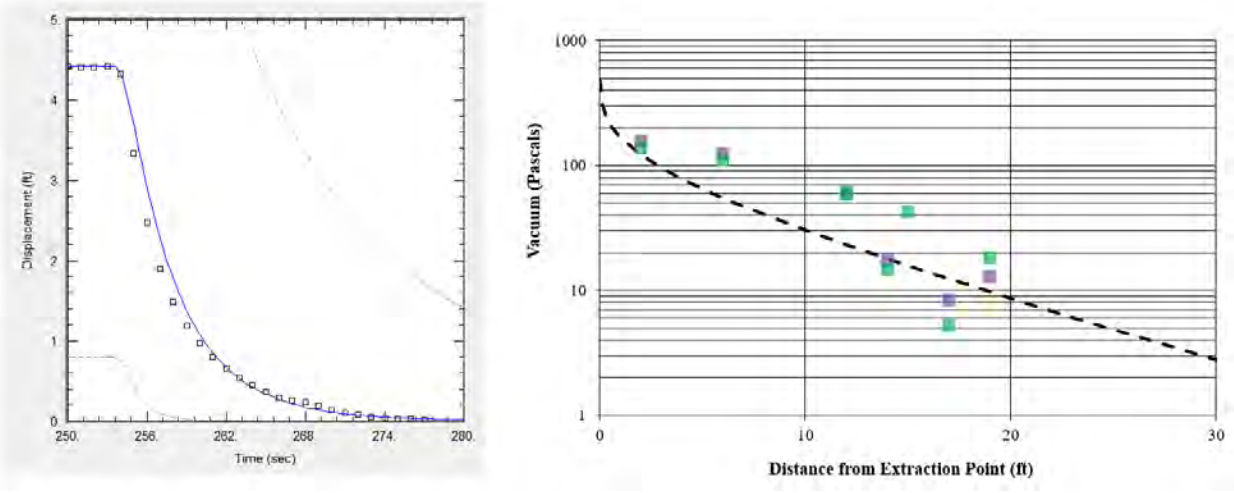


Figure 7-19: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP5, T=1200 ft2/day, land drain closed

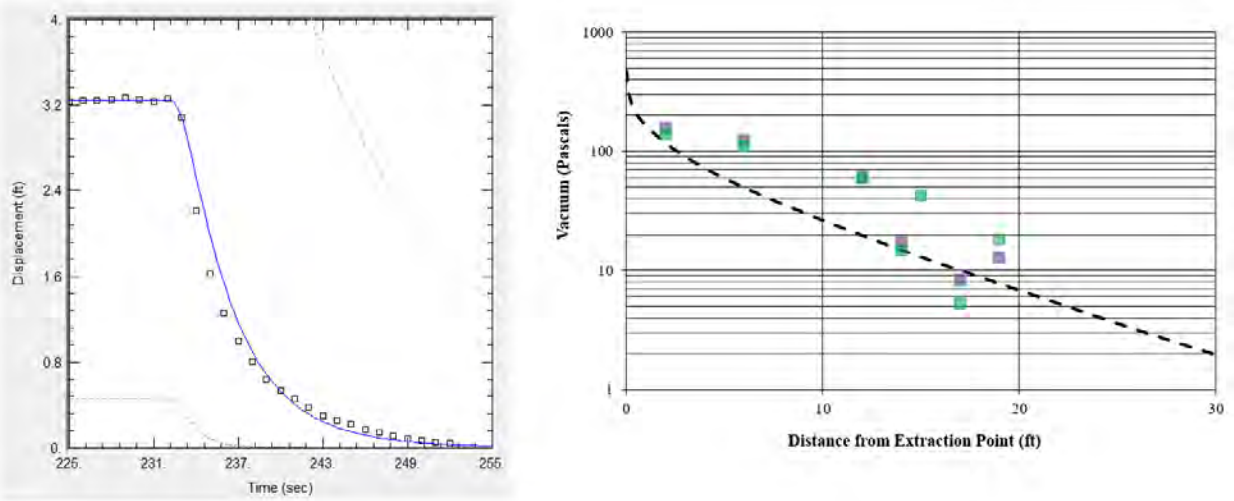


Figure 7-20: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP5, T=1200 ft2/day, land drain open

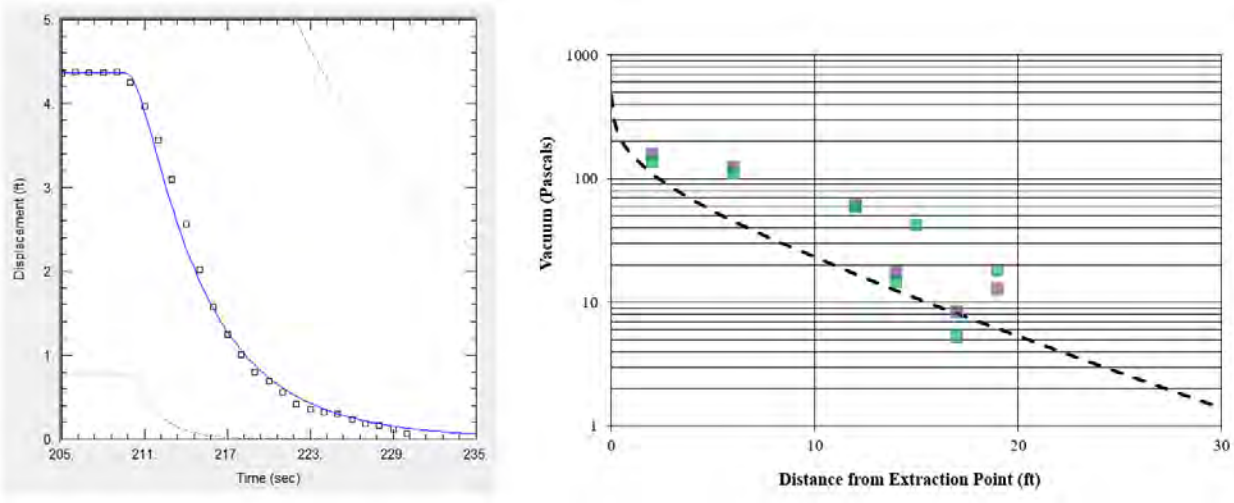


Figure 7-21: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP6, T=1200 ft2/day, land drain closed

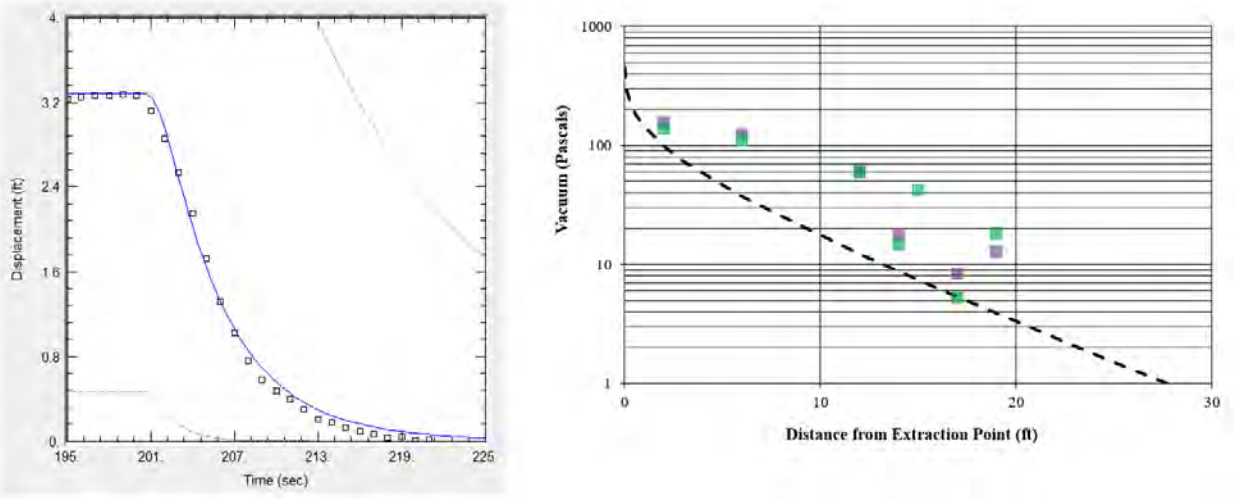


Figure 7-22: Time-drawdown (left) and distance-drawdown (right) models fit to the recovery data from SSP6, T=1200 ft2/day, land drain open

Table 7-3: Summary of Transmissivity and Leakance Values from analysis of Vacuum vs Time and Vacuum vs Distance data

Probe ID	Radial Distance (m)	Land Drain Valve Position	Vacuum v Time or Vacuum v Distance	Transmissivity (T) (ft^2/day)	Leakance (B) (ft)	RPD between Methods
SSP2	1.8	Closed	Time	1200	23.8	21%
			Distance		30.0	
		Open	Time		23.1	11%
			Distance		26.0	
SSP3	3.7	Closed	Time	1200	21.8	16%
			Distance		26.0	
		Open	Time		21.1	19%
			Distance		26.0	
SSP4	5.8	Closed	Time	1200	11.5	4%
			Distance		12.0	
		Open	Time		11.7	19%
			Distance		14.5	
SSP5	4.3	Closed	Time	1200	10.0	5%
			Distance		10.5	
		Open	Time		8.5	10%
			Distance		9.5	
SSP6	5.2	Closed	Time	1200	12.1	28%
			Distance		8.7	
		Open	Time		10.4	29%
			Distance		7.4	

Figure 7-23 shows the subslab vacuum versus distance data along with model profiles calculated using Equation 4, a T value of 1200 ft^2/day and the highest and lowest B values form Table 7-3 (30 ft and 7.4 ft, respectively). The model curves bound the measured data. SSP1, SSP2, SSP3 and SSP7 are very close to the curve calculating using a B value of 30 ft, which indicates they are responding to similar amounts of leakage. SSP4, SSP5 and SSP6 show much lower static vacuum by comparison to the trend for the other probes (note that these probes are near the front of the house and the land drain is also near the front of the house). Figure 7-23 also shows the measured static vacuum levels with the land drain open and closed, and the largest differences were observed at SSP4, 5 and 6. Note also that the vacuum measured at 3 and 6 ft depths at location 5 were about 30 pascals, which agree much more closely with the trend fitting probes SSP1, 2 3 and 7, which further supports the interpretation that the vacuum at the subslab probe is biased low by air flow across the perimeter crack.

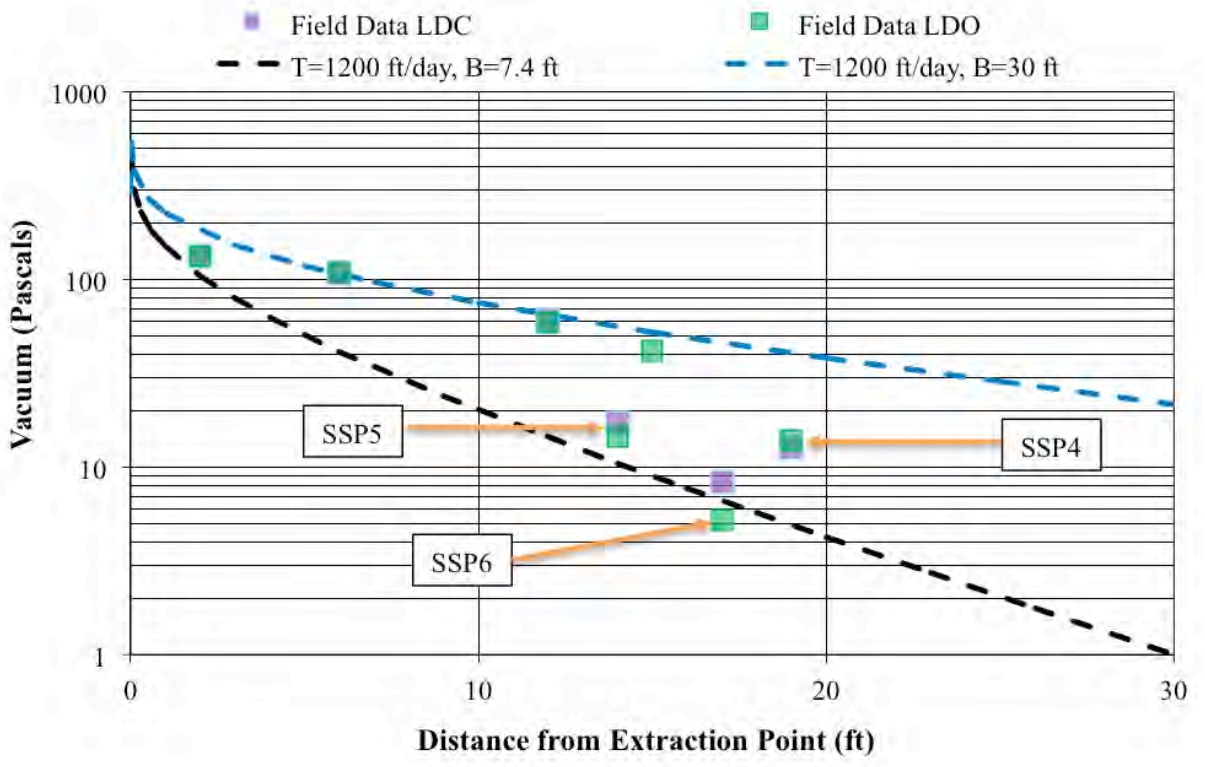


Figure 7-23: Vacuum versus distance measurements and model curves using Equation 4

7.3.4 Subslab Helium Tracer tests

Inter-well tracer test data are shown on Figures 7-24 to 7-26. The travel times from subslab probes at locations 3, 5 and 6 were similar for tests whether the land drain was open or closed. Travel times generally increased with distance as expected, except for the test at the land-drain, which had a travel time that was faster than from SSP6, indicating the land drain may extend under the building to a location closer to the suction point than SSP6.

The tests done at 21 scfm (LDC) and 29 scfm (LDO) had about 3.6 to 5.7 times slower arrival time at a flow rate about 4.6 times lower then with the system running at full speed (91-99 scfm), which shows that the velocity varies essentially linearly with the flow rate, as would be expected if the flowpaths are the same in both cases. The tests done at full speed were very fast, so they were repeated for the land drain closed scenario, to verify the reproducibility.

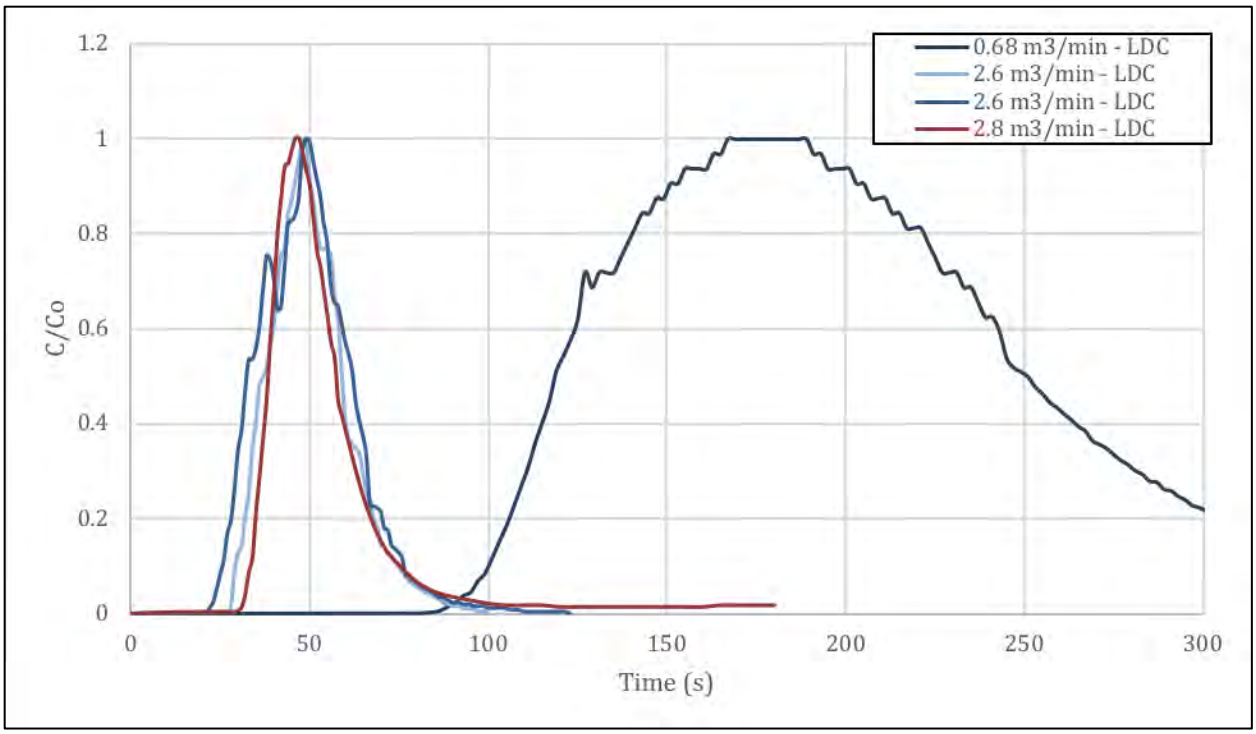


Figure 7-24: Helium inter-well tracer tests data from location SSP3

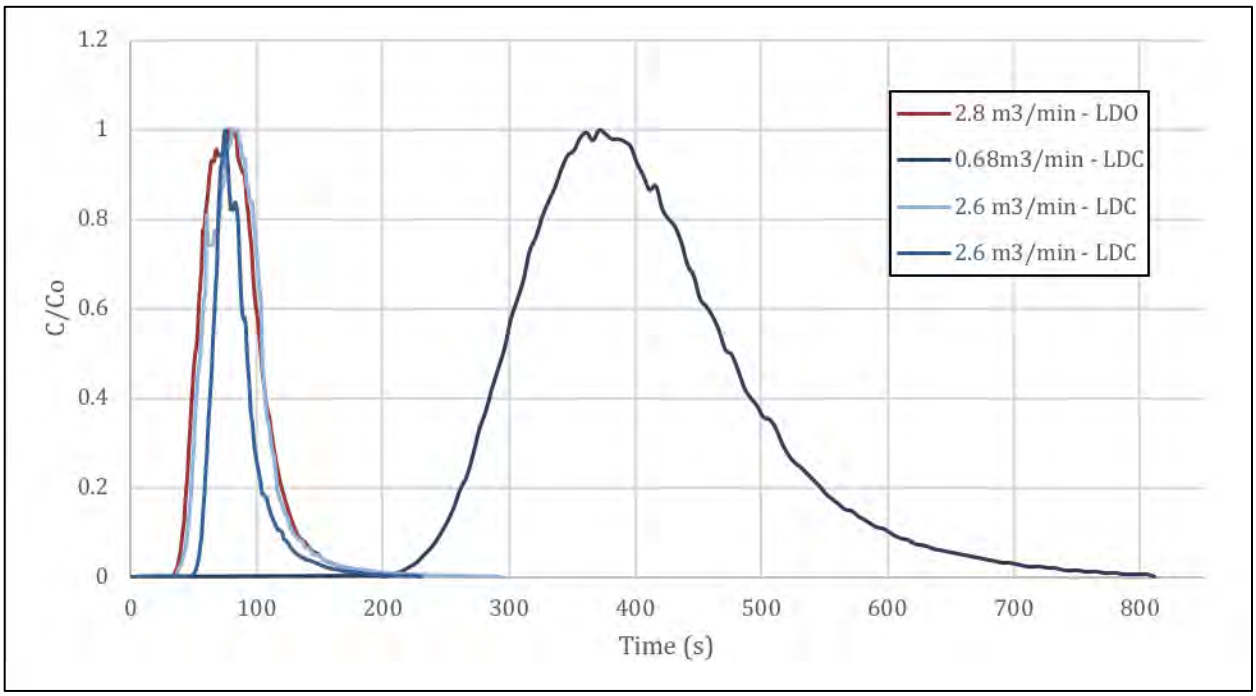


Figure 7-25: Helium inter-well tracer tests data from location SSP5

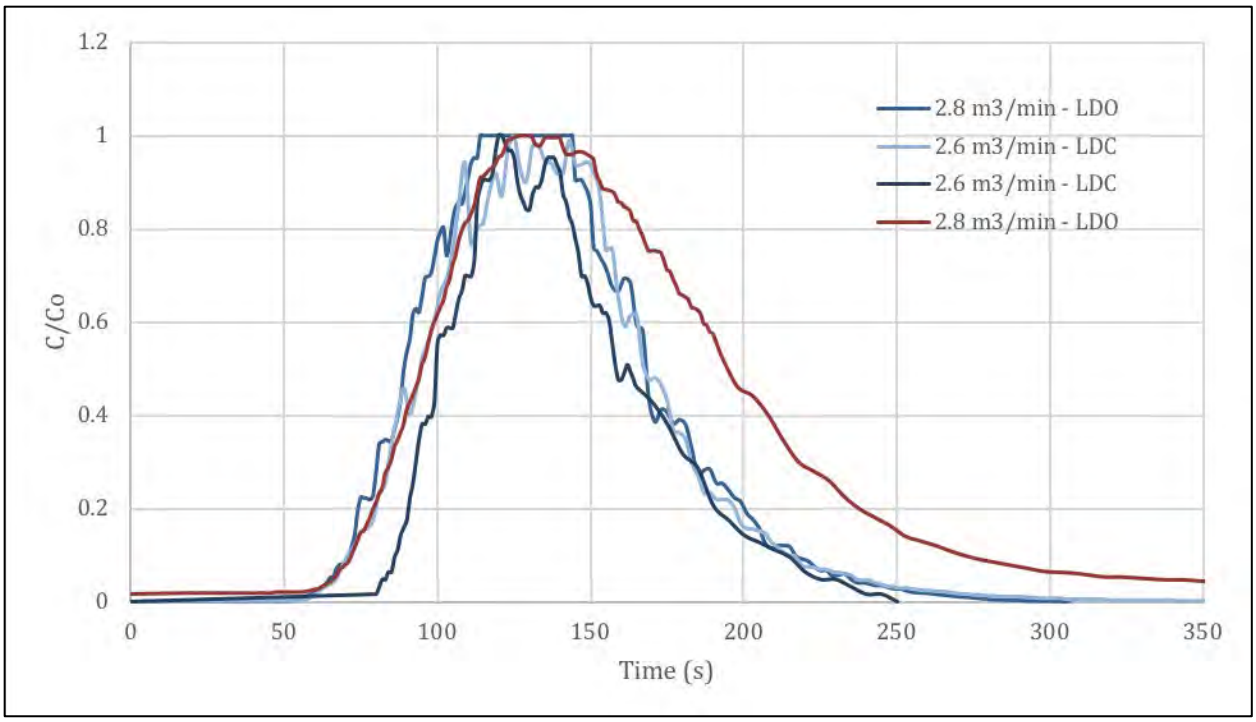


Figure 7-26: Helium inter-well tracer tests data from location SSP6

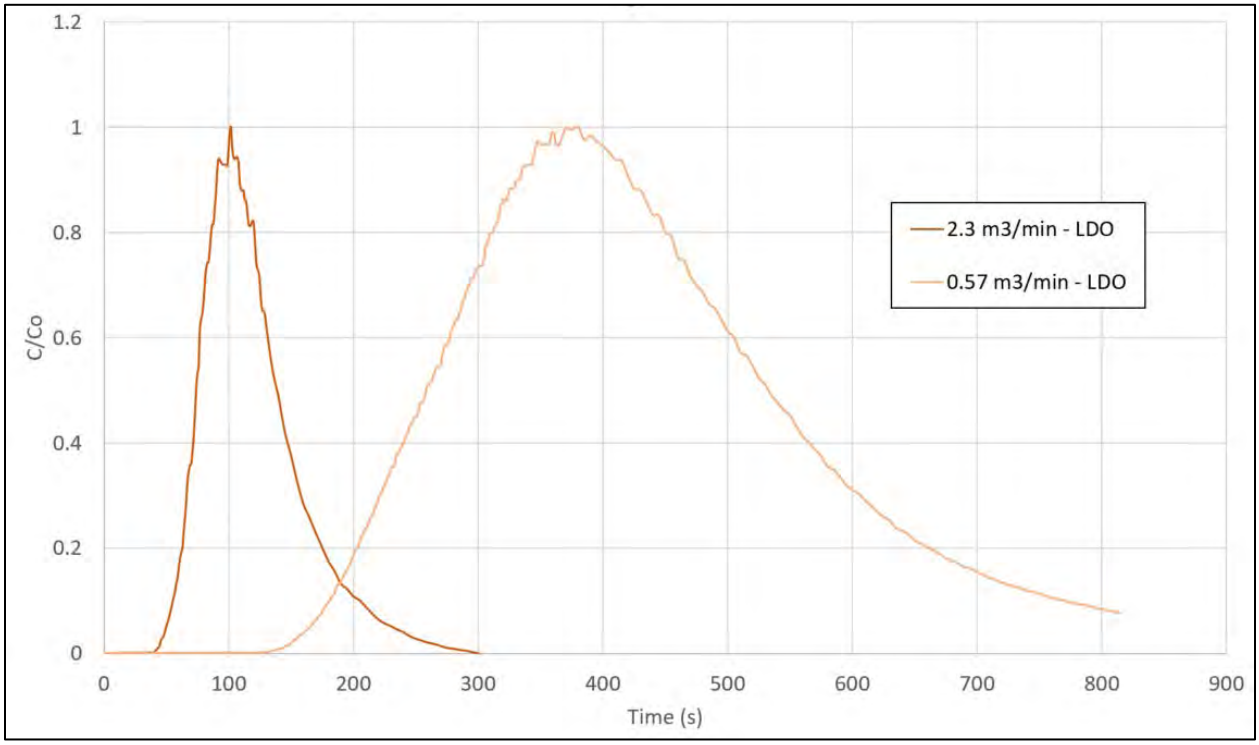


Figure 7-27: Helium inter-well tracer test data from land drain

7.3.5 Helium Flood Tests

The helium flood test data are shown on Figures 7-27 to 7-29. With the land drain open, the test proceeded as planned with an injection concentration of 8,000 ppm. However, with the land drain closed, the test did not proceed as planned because one of the helium meters was out of calibration and as a result, the helium concentration in the injected air was initially about 5,000 ppmv. When this discrepancy was discovered (less than a minute after the start of the test), the helium supply rate was adjusted, and as a result, the breakthrough curves show an approach to a peak, followed by a second increase in helium concentrations. Figures 7-27 to 7-29 show an interpolated segment where the helium concentrations would have leveled off if the helium concentration had not been changed during the test, which is based on the curvature observed for the tests conducted with the land drain open, which are essentially ideal breakthrough curves. For both LDC and LDO tests, the travel time is taken as the elapsed time from the start of helium injection to the midpoint of the breakthrough curve (helium concentration in the probe equal to 50% of the injected concentration).

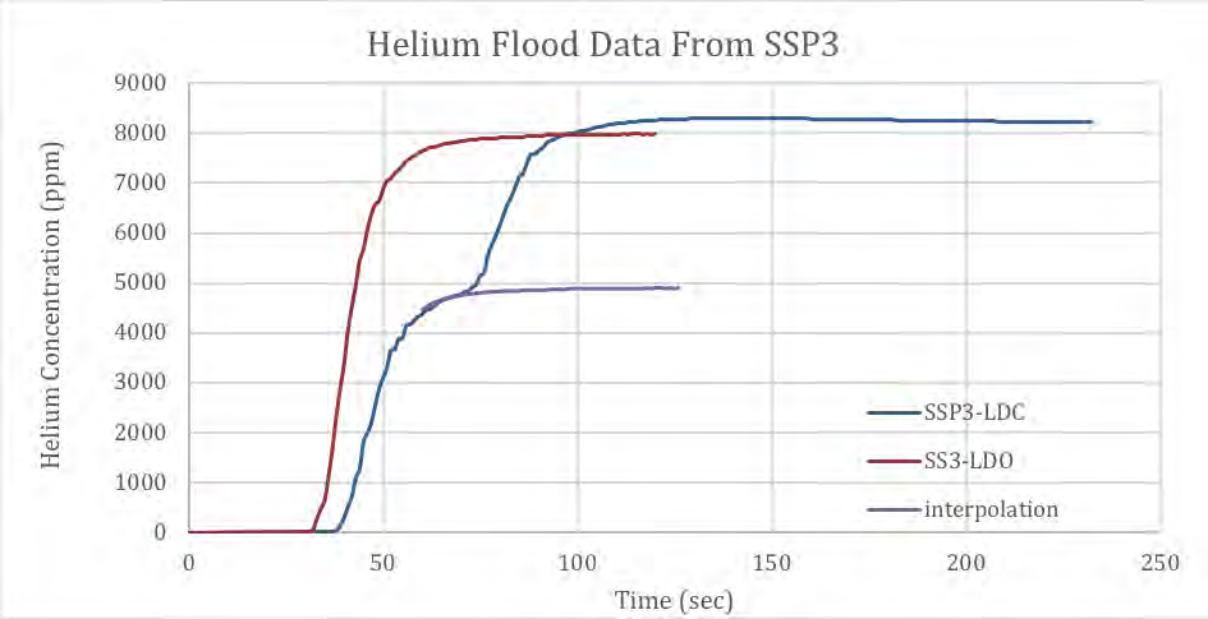


Figure 7-28: Helium flood test data from location SSP3

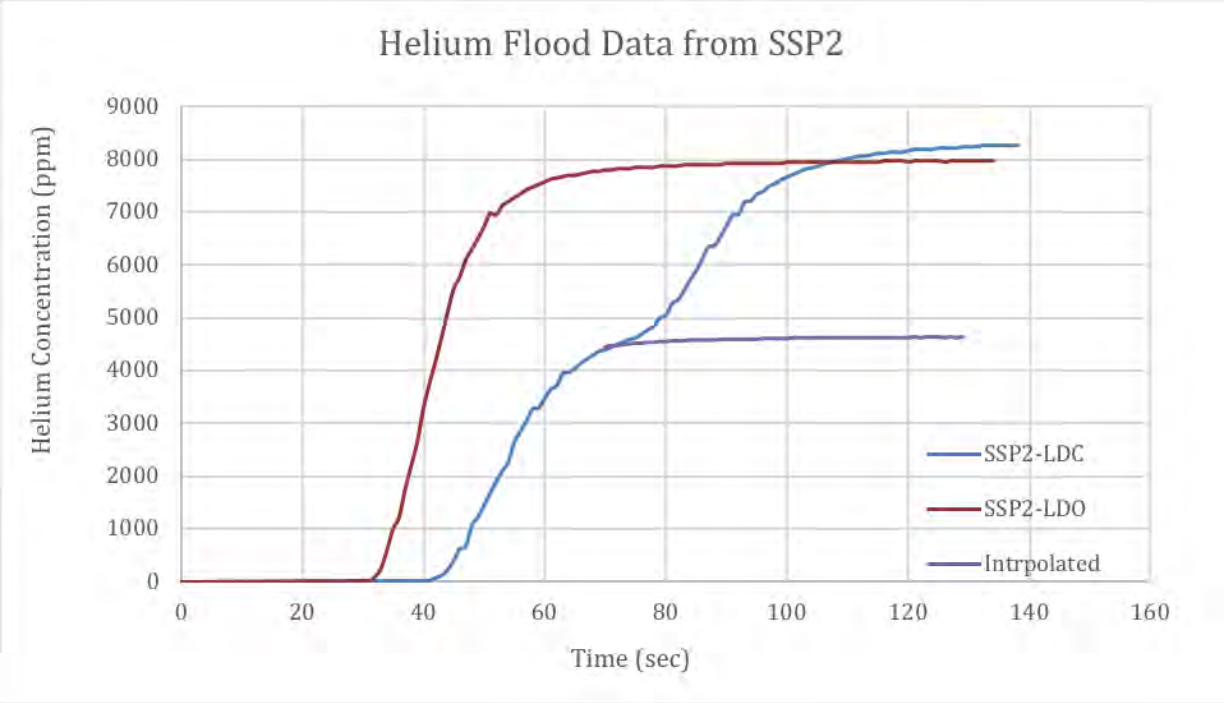


Figure 7-29: Helium flood test data from location SSP2

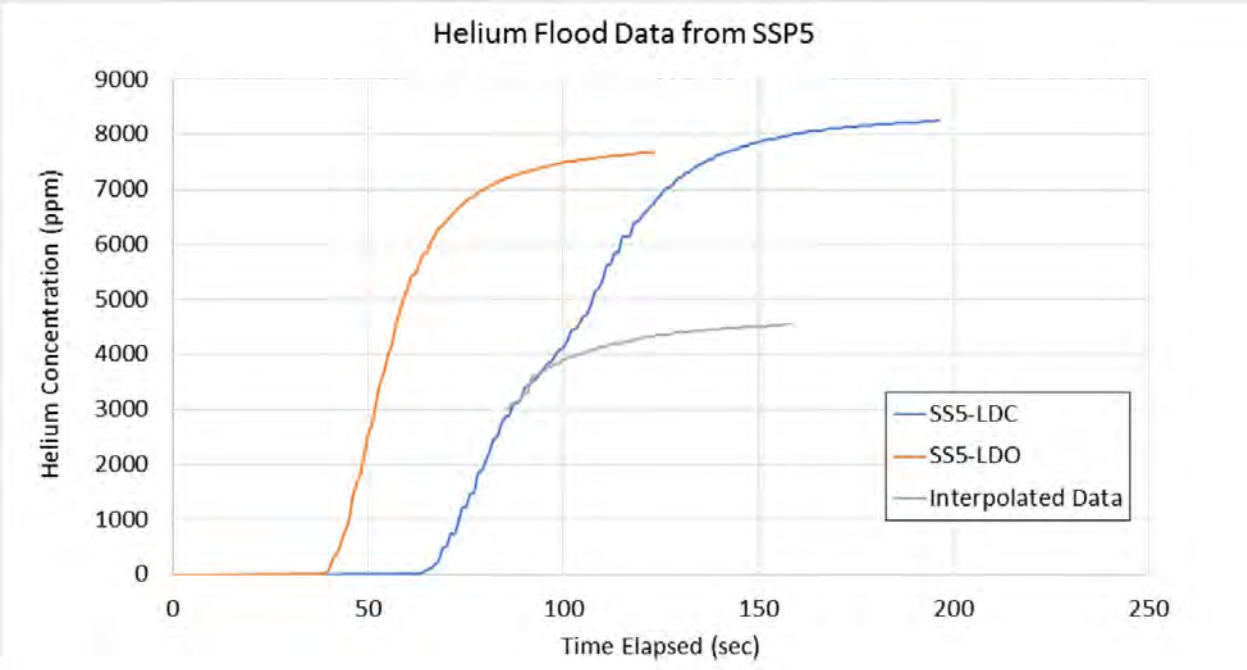


Figure 7-30: Helium flood test data from location SSP5

After each helium flood test was completed, helium was removed from the sub-surface by changing the SSV system to regular operation (extraction at about 2.7 m^3/min) and running until helium concentrations were no longer measurable.

Table 7-5 provides a summary of all the travel times measured with the inter-well tests and helium floods. The helium flood for SSP2 (the closest location monitored during the flood) showed an arrival time of 54 seconds with the LDC and 42 seconds with LDO. This is slower than expected for a radial distance of 6 feet, based on Equations 3 and 4, which yielded estimates closer to about 12 seconds. The suspected cause of this is that the helium meter has three settings (high, medium and low flow rates), and the lag-time required for gas to flush through the line between the detector and the probe tip increases at lower flow rates. Measurements were intended to be made at the high flow setting, but the instruments were occasionally turned to the low setting to conserve battery life and in this instance may not have been returned to the high flow setting. The helium flood showed communication to the 3 and 6 ft bgs probes at SSP2 and SSP5 with travel time to the 3 ft bgs probes being ~20-50x longer than the travel time to the subslab probes. The gas K values were about 7-10x lower in the 3 ft bgs probes (Table 7-1). This indicates shallow flow is dominant more than expected based on K alone. This is likely because the vent pipe does not have a fully penetrating well screen.

The agreement between the inter-well test and the flood tests are good for SSP3 (LDO and LDC), SSP5 (LDO and LDC) and at SSP6 (LDO). However, the SSP6 flood test result with LDC showed approximately 4x slower travel than inter-well tests (LDO or LDC) and flood test with LDO, which may have been attributable to the meter being left on the low flow rate setting, as described above. The results for the inter-well and flood tests otherwise showed good agreement, which indicates that both tracer testing methods are representative. The flood tests showed travel times to SSP1 and SSP4 were much longer than for locations under the occupied part of the structure. This is consistent with the CSM because there is no granular fill layer below the floor slab in the garage, and the native soil has a much lower gas conductivity.

Table 7-4: Results of Inter-Well and Flood Subslab Gas Velocity Tracer Tests

Probe ID	Land Drain Valve	Radius (ft)	Flow (scfm)	Travel Times (s)		
				Interwell	Flood	RPD (%)
SSP1	Open	15	91		>4200	
SSP1	Closed	15	99		~2300	
SSP2	Closed	6	99		54	
SSP2	Open	6	91		42	
SSP2-3 ft bgs	Open	6	91		2500	
SSP2-3 ft bgs	Closed	6	99		1300	
SSP2-6 ft bgs	Open	6	91		3500	
SSP3	Closed	12	21	177		
SSP3	Closed	12	91	49	48	-2%
SSP3	Closed	12	91	49		
SSP3	Open	12	99	47	41	-14%
SSP4	Open	19	91		>3900	
SSP5	Open	14	29	380		
SSP5	Open	14	91	67	54	-21%
SSP5	Open	14	91	79		
SSP5	Closed	14	99	82	81	-1%
SSP5	Closed	14	99	75		
SSP5 - 3 ft bgs	Open	14	91		3700	
SSP6	Closed	17	99	128	~500	
SSP6	Closed	17	99	125		
SSP6	Closed	17	99	121		
SSP6	Open	17	91	128	<210	
Land Drain	Open	26	29	375		
Land Drain	Open	26	91	102		

The subslab tracer test results were compared to calculated travel times using Equation 3 and 4 and the calibrated transmissivity (T) and leakance (B) values, the measured flow rate (Q) and an estimated porosity (n) of 25%. The thickness (b) of the active flow zone was adjusted until the model matched the field data. The best fit was obtained with a b value of 15 cm, which is similar to the 20 to 30 cm range that was observed in boreholes through the floor. Helium inter-well and flood tracer test data are plotted on Figure 7-30, along with model curves for B=7.4 and 30 ft, Q=95 CFM and b=0.5 ft, using Equations 3 and 4. Note that the travel time is much less than the target of 3 to 4 hours.

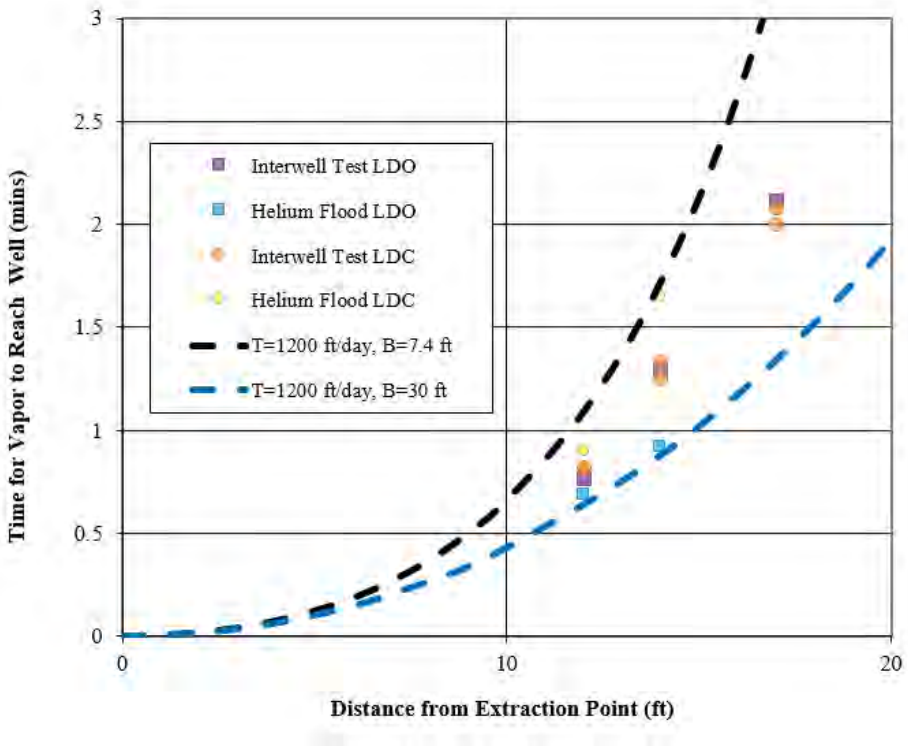


Figure 7-31: Modeled Travel Times vs Distance with Helium Inter-well and Helium Flood Data Plotted

With the calibrated model, a profile of velocity versus radial distance can also be calculated using Equation 5, as shown in Figure 7-31. Note that the velocity is much greater than 3 ft/day.

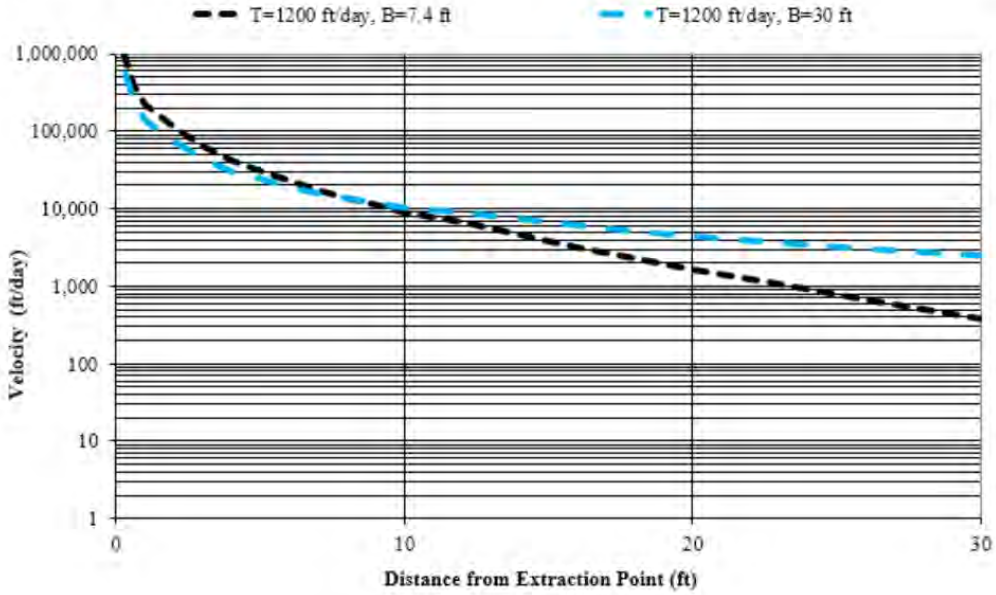


Figure 7-32: Velocity versus radial distance from the vent pipe calculated with Equation 5

7.3.6 Cross-Slab SF_6 Tracer Test Results

The SF_6 tracer test data for both land-drain open and closed conditions is shown on Figure 7-32. The SF_6 concentrations measured in the vent pipe were approximately 95%-48% of the concentrations measured in indoor air, with an average value of about 80%. There was no apparent trend as a function of the flow rate. The amount of leakage was also not notably influenced by the position of the valve on the land drain (open or closed). This indicates that about 4/5ths of all gas extracted by the system originated from leakage of indoor air across the floor slab. This is noteworthy considering the vent-pipe is located only about 1 foot from an exterior wall of the building, and it was not known whether outdoor air would flow to the suction point by passing beneath the footing, and this data proves that component must have been minimal. The measured proportion of SF_6 in the vent-pipe was compared to the leakage calculated using Equation 7 to provide an additional line of evidence to verify the model. The SF_6 data demonstrated that the floor must be relatively leaky, which has implications for the calculation of a building-specific attenuation factor.

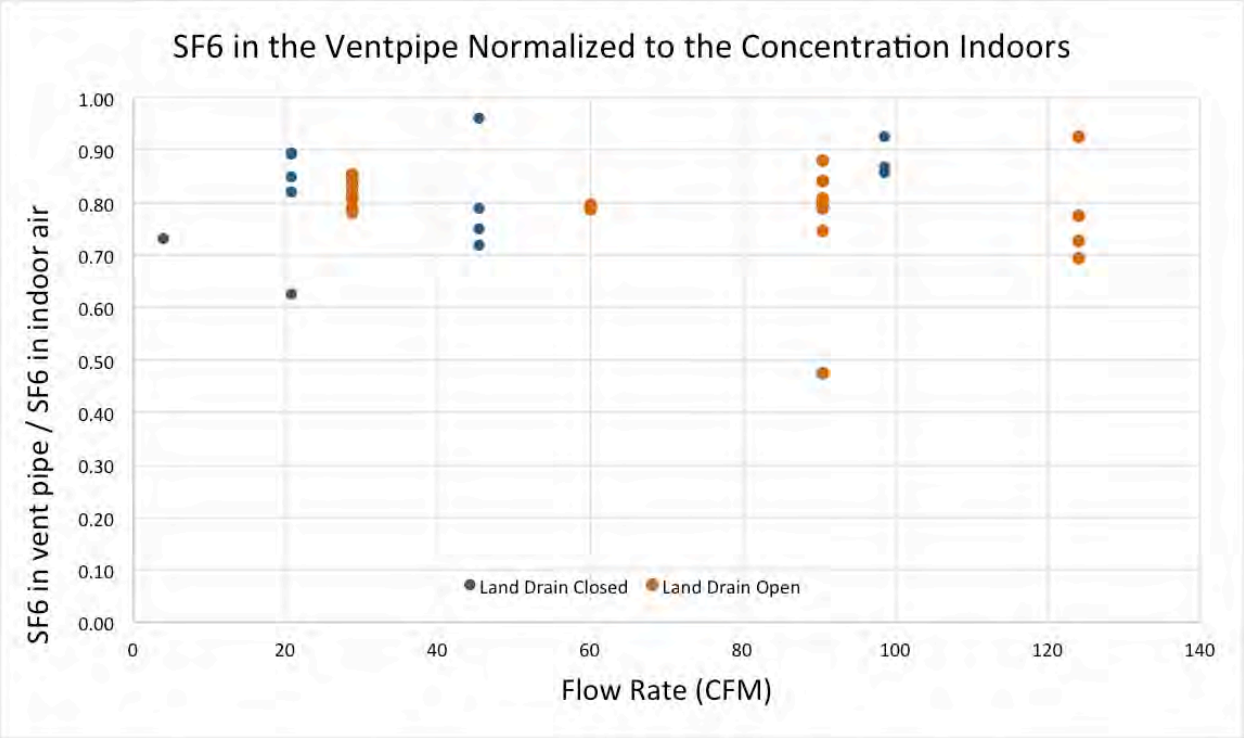


Figure 7-33: SF_6 concentration in the vent-pipe as a fraction of the indoor air concentration

Figure 7-33 shows the calculated proportion of soil gas versus indoor air in the extracted gas as a function of radial distance from the suction point, calculated using the calibrated range of B values and Equation 7. The percentage of soil gas is represented on the Y-axis of Figure 7-33, whereas the percentage of indoor air is represented in Figure SI-32. The sum of the two equal 100%, so one value is simply 1 minus the other. The walls furthest from the extraction point are about 30 ft away from the suction point. At that radius, the model shows a range of 95% to 40% leakage of indoor air for the calibrated range of B values, similar to the range that was measured using the SF_6 tracer test. These data indicate that the calibrated Hantush-Jacob Model provides a reasonable

estimate of the leakage of air across the floor slab. This can be used to estimate the cost of energy losses of air drawn across the floor by the mitigation system.

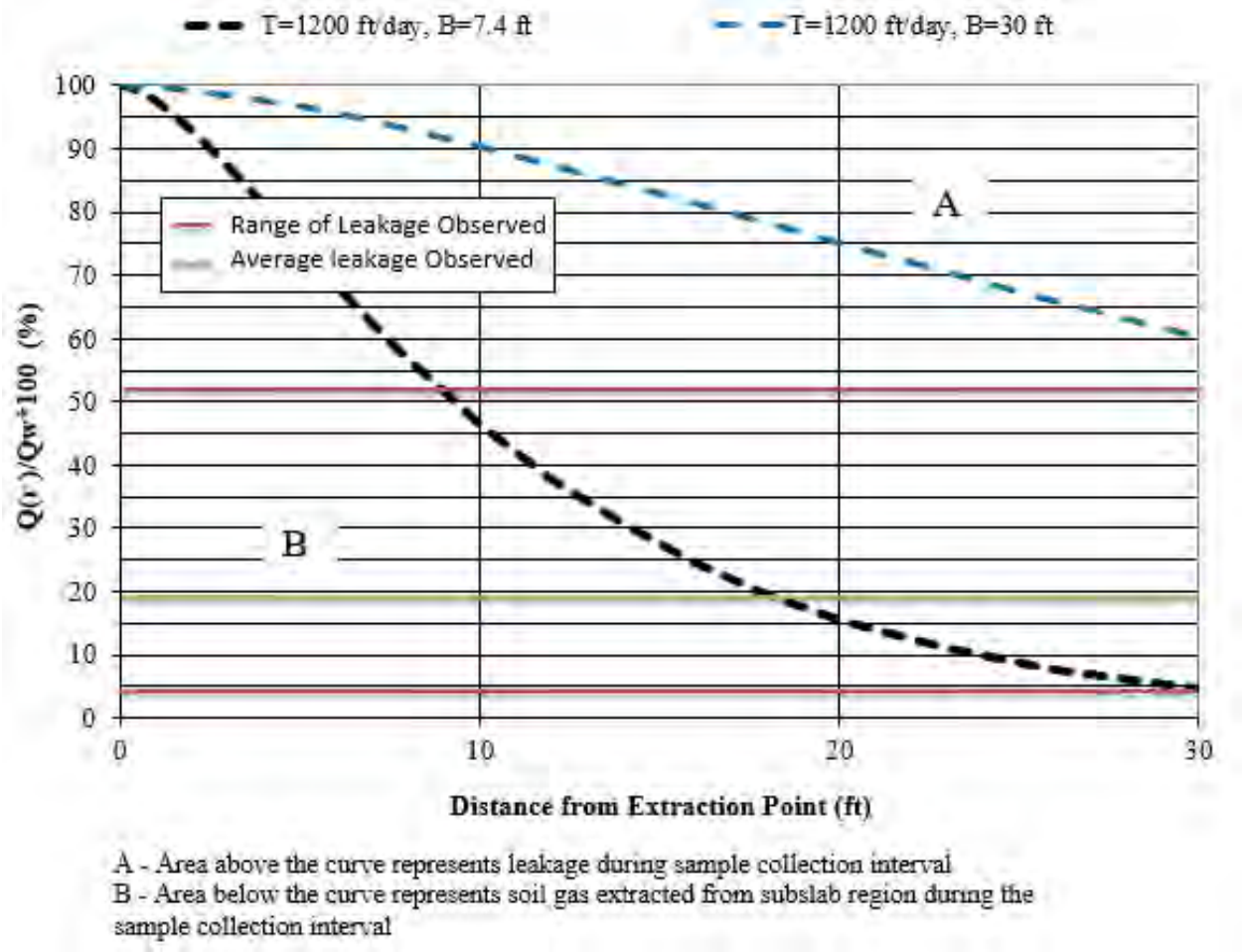


Figure 7-34: Percentage of Flow originating from the sub-surface vs distance (Eqn 7)

7.3.7 Mass Removal Rates

With the land drain open, the Controlled Pressure Method (CPM) (Guo et al., 2015) resulted in TCE mass removal rates of between 0.1-0.3 g/day, as shown in Figure 7-6. The corresponding Radon mass removal rates were between 0.03 and 0.2 mCi/day. These values provide a benchmark for comparison to the mass removal rates measured during the step test and can be used to select an optimal flow rate for the SSV system to capture all or nearly all of the available mass of TCE and radon. Figure 7-34 shows the mass removal rate of TCE from the vent-pipe with the land drain open. A flow rate of 2.8 m^3/min (100 scfm) would capture 0.3 g/day of TCE, which is the upper range value measured during the CPM test. Coincidentally, this is the flow rate achieved by the current system as designed, so it is already optimized for TCE removal. With a porosity (n) of 25%, a leakage rate of 80%, and a flow rate of 60 scfm, the pore volume of the fill material under the occupied part of the house would be flushed approximately every 16 minutes and one pore volume of the entire vadose zone beneath the building would be flushed every 6 hours on average.

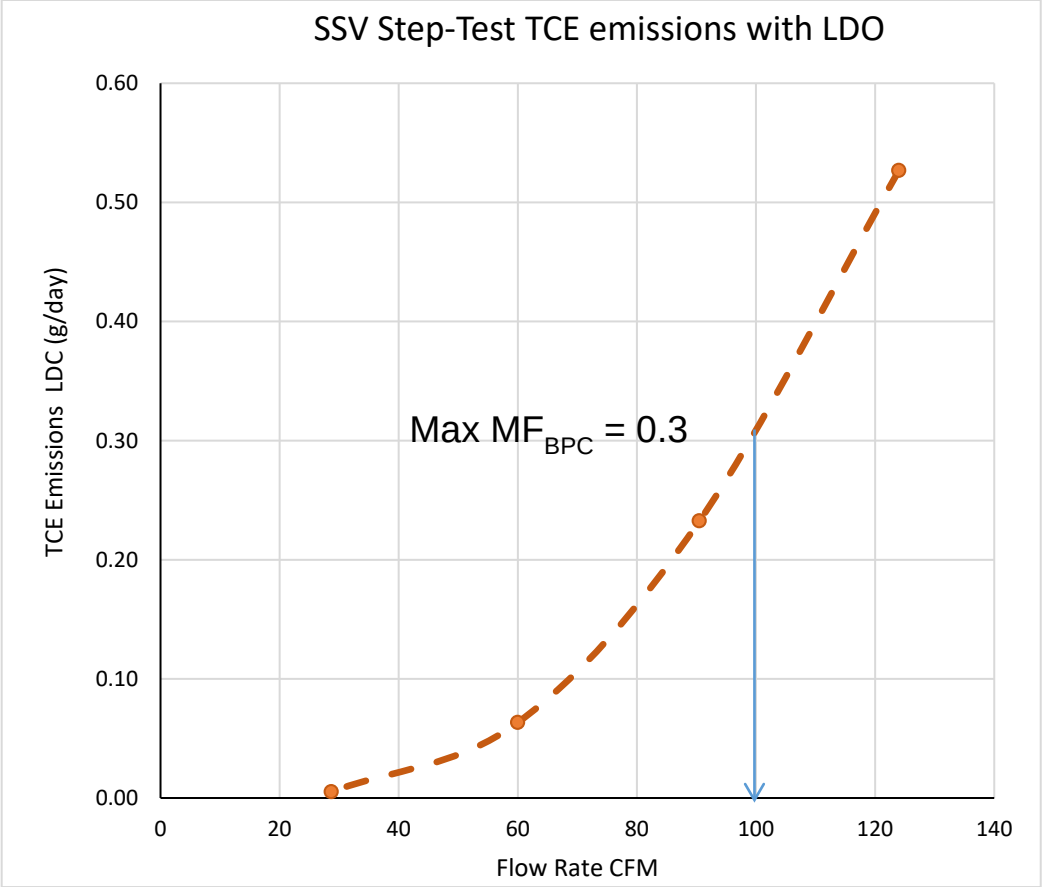


Figure 7-35: Flow rate needed to capture all of the available TCE flux with the LDO, using the CPM as the benchmark

With the land drain closed, the CPM method resulted in TCE mass removal rates of about 0.0001 to 0.006 g/day (although only a few values were above 0.002 g/day and may be outliers), with an average of 0.0013 g/day. The mass removal rate as a function of the vent-pipe flow rate with the LDC is shown on Figure 7-35. By interpolation, a flow rate as low as about 4 scfm would capture the minimum TCE mass flux (0.0001 g/day), a flow rate of about 60 scfm would capture the average mass flux (0.0013 g/day), and 120 scfm would capture 0.002 g/day, which covers the majority of the fluxes quantified by the Controlled Pressure Method. The wide range here may be an artifact of the very low indoor air concentrations measured with the LDC which may result in greater variability in the sampling and analysis of indoor air used to calculate the mass flux.

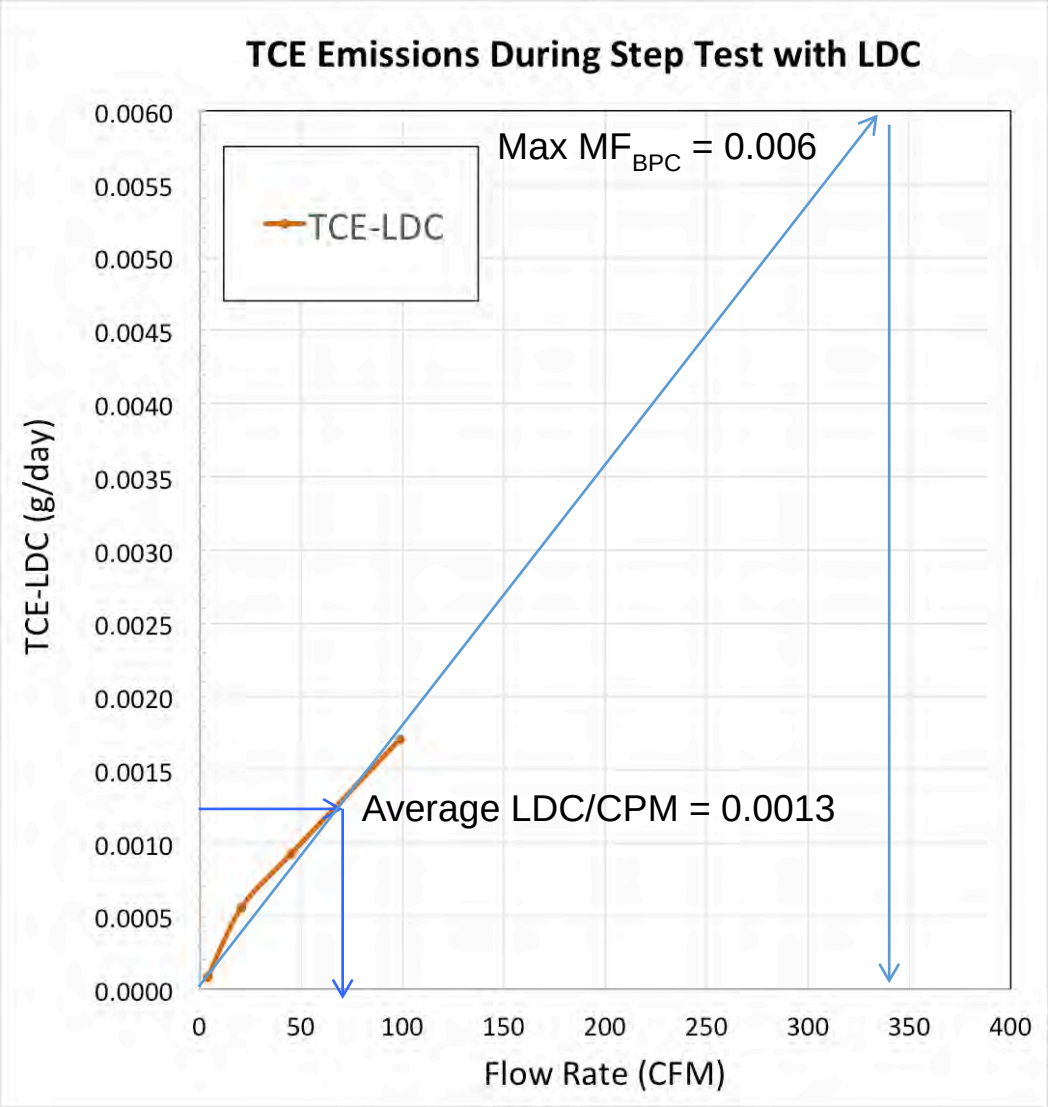


Figure 7-36: Flow rate needed to capture TCE with the LDC, using the CPM as the benchmark

Table 7-4 provides the measured radon concentrations in the SSD effluent as a function of the flow rates during the step tests with the land drain open and closed. Figure 7-36 shows the mass removal rate for radon with the land drain open, and indicates a flow rate up to about 11 m^3/min (400 scfm) would be required to capture all the available radon mass flux (0.2 millicuries per day). This benchmark may be biased, because a flux of 0.2 mCi/day would cause an indoor air concentration of about 25 pCi/L under ambient air exchange rates (about 20 per day) and exchange volume (350 m^3); however, the average measured by Holton (2015) was only 0.45 pCi/L under ambient pressure conditions. The radon concentrations measured by Holton for calculating the radon emissions were from the lower floor of the building, whereas the TCE concentrations were from the attic near where the exhaust fan drew air from the building. The flow rate of air extracted in the CPM test includes air leaking into the building from the upper floor, which would have diluted the TCE samples, but not the radon samples. Radon is also present in outdoor air and to some degree that could have imposed a positive bias in the basement level radon measurements. Therefore, the

analysis of system flow rates needed to capture the radon mass flux are shown for completeness, but are not considered to be representative.

As an alternate benchmark for radon, the average measured indoor air concentration under ambient conditions was 0.45 pCi/L (Holton, 2015), which would correspond to a flux of 0.004 mCi/day, which could be contained with a modest flow rate of about 25 scfm (Figure 7-36).

Table 7-5: Radon Concentrations measured in effluent samples from SDM

	Collection		Analysis	Radon	
ID	**Date**	**Time (MDT)**	**Date**	**pCi/L**	**Bq/m^3**
ST-LDC-80	6/6/2016	11:30	6/10/2016	4.7	174
Lab dupe	6/6/2016	11:30	6/13/2016	4.4	163
ST-LDC-40	6/6/2016	13:25	6/10/2016	4.4	163
ST-LDC-20	6/6/2016	18:56	6/10/2016	3.5	130
ST-LDC-10	6/7/2016	7:30	6/10/2016	2.6	96
Lab dupe	6/7/2016	7:30	6/13/2016	4.0	148
ST-LDO-80	6/9/2016	7:30	6/13/2016	11.2	414
ST-LDO-20	6/7/2016	16:20	6/13/2016	4.8	180
ST-LDO-60	6/7/2016	17:40	6/10/2016	13.9	510

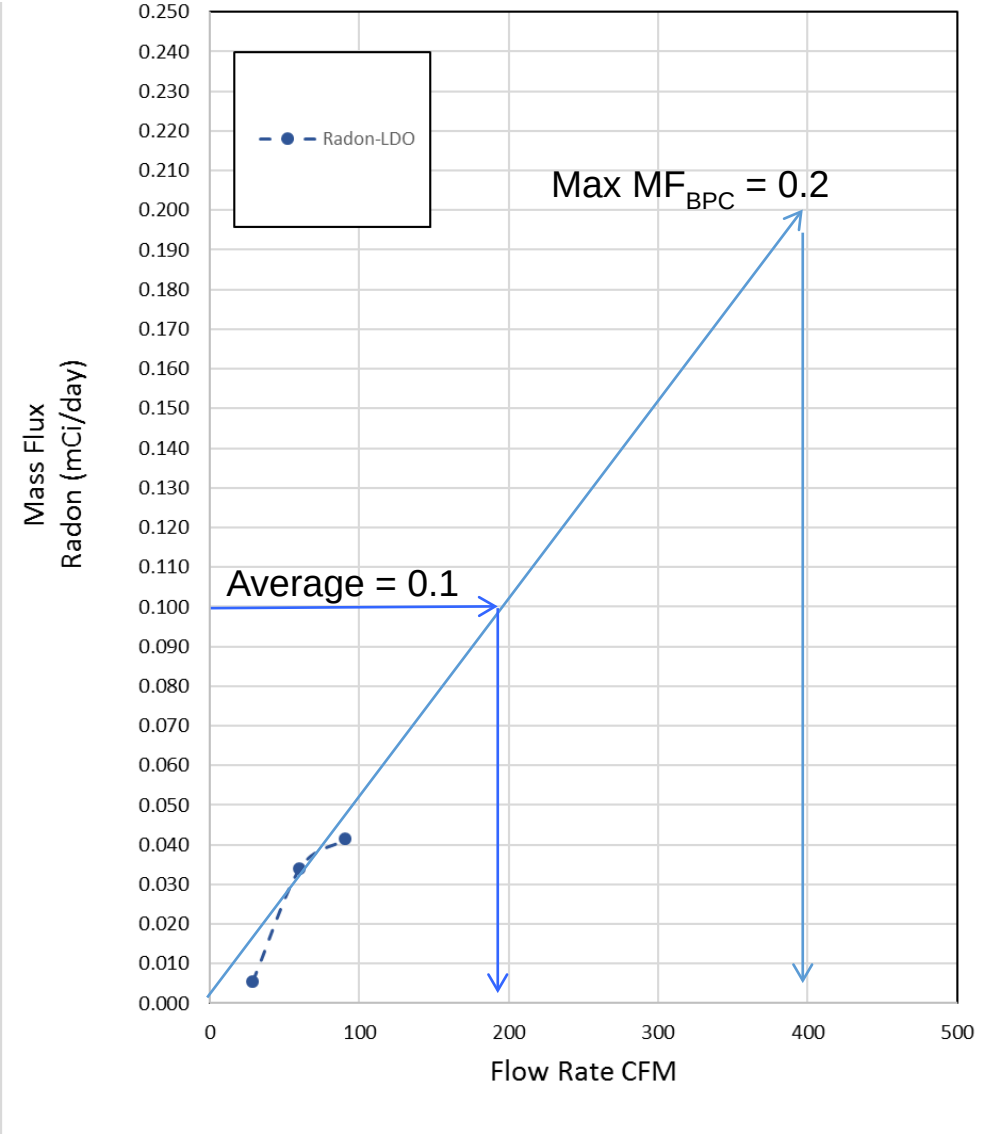


Figure 7-37: Flow rate needed to capture all of the Radon with the LDO, using the CPM as a benchmark and the step test as a way to identify the flow rate

With the land drain closed, Figure 7-37 indicates a flow rate of about 4.8 m^3/min (170 scfm) would be required to capture the maximum radon flux (0.034 mCi/day). Only 25 scfm would be required to capture the alternative benchmark of 0.004 mCi/day.

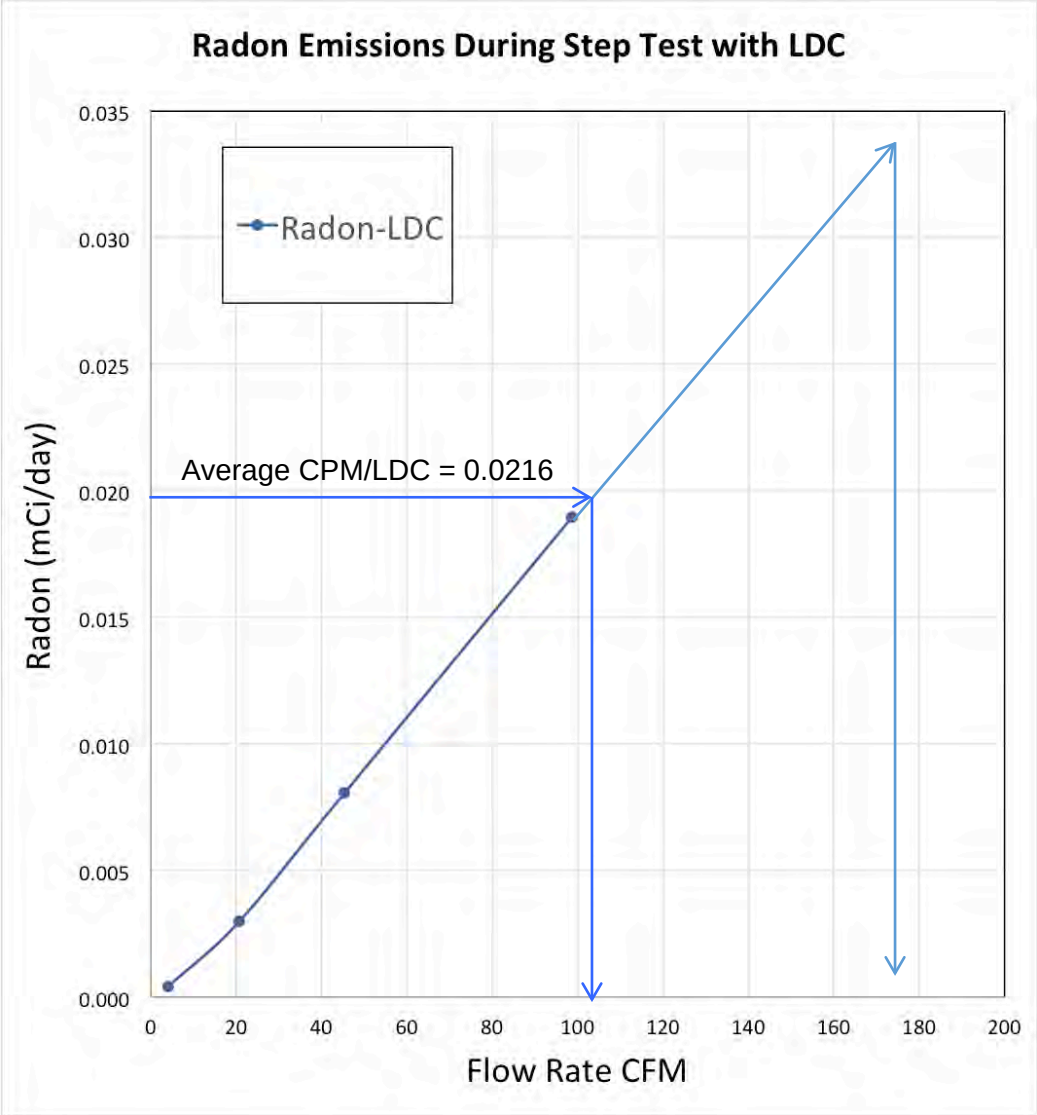


Figure 7-38: Flow rate needed to capture all of the Radon with the LDC, using the CPM as a benchmark and the step test as a way to identify the flow rate

7.4 BUILDING-SPECIFIC ATTENUATION FACTORS

Building-specific attenuation factors calculated using Equation 17 and the T and B values calculated from the pneumatic testing are provided in Table 7-5. The building height, differential pressure and air exchange rate were all estimated based on data in Holton, 2015.

Table 7-6: Building-specific attenuation factors calculated for SDM using Equation 17

Probe	Distance from Vent Pipe (ft)	T (ft^2/day)	B (ft)	h (ft)	deltaP (ft)	AER (/day)	AF (-)
SSP2	6	1200	24	15	0.5	20	6E-03
		1200	30	15	0.5	20	4E-03
		1200	23	15	0.5	20	7E-03
		1200	26	15	0.5	20	5E-03
SSP3	12	1200	22	15	0.5	20	7E-03
		1200	26	15	0.5	20	5E-03
		1200	21	15	0.5	20	8E-03
		1200	26	15	0.5	20	5E-03
SSP4	19	1200	12	15	0.5	20	3E-02
		1200	12	15	0.5	20	2E-02
		1200	12	15	0.5	20	3E-02
		1200	15	15	0.5	20	2E-02
SSP5	14	1200	10	15	0.5	20	4E-02
		1200	11	15	0.5	20	3E-02
		1200	8.5	15	0.5	20	5E-02
		1200	9.5	15	0.5	20	4E-02
SSP6	17	1200	12	15	0.5	20	2E-02
		1200	8.7	15	0.5	20	5E-02
		1200	10	15	0.5	20	3E-02
		1200	7.4	15	0.5	20	6E-02
						min	4E-03
						max	6E-02
						mean	2E-02

The mean value for the calculated building-specific attenuation factor (0.02) was very close to the 95th percentile default recommended by the U.S EPA (0.03), which is consistent with observations that the material below the basement is highly permeable, and the SF_6 tracer test indicates the floor is relatively permeable, both of which would lead to increased susceptibility to vapor intrusion.

7.5 COST CONSIDERATIONS

With the land drain open, mass flux monitoring showed that a flow rate of 100 scfm would capture the maximum emission rate of TCE measured during building depressurization testing (0.3 g/day). The conventional system has a flow rate of 100 scfm and is therefore already optimally designed for the case with the Land Drain open. The optimization process would have been an unnecessary expense for the case with the land drain open (see Table 7-7). This is fairly common for single family dwellings, where a conventional radon-style mitigation system with one fan and one suction point is often adequate, and as a result, there are many radon mitigation contractors who perform no diagnostic testing at all, only verification testing via indoor air sampling after the system has been operating for long enough to reach stable conditions.

Table 7-7: Sun Devil Manor Cost Summary (Land Drain Open)

Cost Components	Conventional	Optimized
Initiation	$ 4,660	$ 4,660
Reconnaissance	$ 3,580	$ 4,280
Pilot Test	$ 2,300	$ 11,200
Installation	$ 9,975	$ 8,575
Operation	$ 51,032	$ 51,032
Maintenance	$ 300	$ 300
Fan Replacement	$ 4,000	$ 4,000
Training	$ 5,000	$ 6,000
TOTALS	$ 80,847	$ 90,047
Total incremental cost of optimization activities		$ 9,600
Net Savings		$ (9,200)
Return on Investment		-1.0
Ratio of Conventional Costs vs Optimized Costs		0.9

With the land drain closed, a flow rate of 60 scfm would capture the average TCE mass loading (0.0013 g/day), which is similar to the calculated upward diffusive flux and the maximum flux measured under ambient pressure condition. However, if the land drain were closed or did not exist, the mass loading to the building would be insufficient to sustain indoor air concentrations above the risk-based screening level, so no mitigation system would be required. Nevertheless, conventional practice would likely have resulted in a system installation regardless based on subsurface vapor concentrations above screening levels. The diagnostic testing would have been able to prove no system was needed and achieved a considerable savings. For the case with the land drain closed, the total net savings would be about $62,000 over a 30-year operating period, assuming the optimization testing was able to clearly demonstrate a mitigation system is not needed (Table 7.8).

Table 7-8: Sun Devil Manor Cost Summary (Land Drain Closed)

Cost Components	Conventional	Optimized
Initiation	$ 4,660	$ 4,660
Reconnaissance	$ 3,580	$ 4,280
Pilot Test	$ 2,300	$ 9,900
Installation	$ 9,975	$ -
Operation	$ 51,032	$ -
Maintenance	$ 300	$ -
Fan Replacement	$ 4,000	$ -
Training	$ 5,000	$ -
TOTALS	$ 80,847	$ 18,840
Total incremental cost of optimization activities		$ 9,600
Net Savings		$ 62,007
Return on Investment		6.5
Ratio of Conventional Costs vs Optimized Costs		4.3

8.0 BUILDING 11193 VANDENBERG AFB

8.1 SITE LOCATION AND HISTORY

Building 11193 is an inactive former drycleaner with PCE and degradation products (TCE and cDCE) in the subsurface and indoor air at consistently detectable concentrations. The structure is single story, with a concrete slab-on-grade floor, sheet metal walls and single pane windows with a footprint of about 11,000 ft^2. A photograph of the building exterior is provided in Figure 8-1 and interior photos are included in Figure 8-2.

Figure 8-1: Vandenberg Building 11193

Figure 8-2: Interior Photos of Building 11193

The floor is uncovered in the woodshop area, and covered by tile or carpet in most other areas. There are expansion joints between sections of the floor slab that have a large aperture in places and are unsealed. Where the floor is uncovered, testing was performed before and after sealing the floor joints with Duct Tape. Some joints were positioned under walls and were not accessible. Other joints were covered by floor tiles or carpet and these floor coverings would be expected to restrict cross-slab air flow to varying degrees. There is a drop ceiling at a height of about 10 feet and a roof with a peak at about 15 feet down the centerline of the long axis of the building. Several penetrations through the roof for exhaust fans that are no longer existing were sealed prior to testing using plastic garbage bags and duct tape to minimize excessive leakage of the building envelope.

The building is currently vacant and therefore, was readily accessible for research. Research has previously been performed here under the AFCEC BAA Program (Contract # FA8903-10-C-8116) to compare High Volume Sampling (HVS) to multi-incremental sampling for subslab VOC vapor characterization. Research was also performed under ESTCP Project ER2015-03 to measure mass loadings via building pressure cycling (BPC) and vertical profiling.

8.1.1 Site Geology/Hydrogeology

The data collected through historical site investigation activities indicates the shallow geology in the vicinity of Building 11193 consists of unconsolidated alluvial terrace deposits comprised primarily of moist silty sand with some interbedded silty clay layers, based on boring logs for monitoring well 24-PMW-32 and 24-MW-32B located about 22 and 50 feet, respectively, to the north of the building. The depth to the water table in the vicinity of the building is approximately 11 feet below grade based on water level data from monitoring well 24-PMW-32. Detailed soil boring logs for 4 locations within the building will be included in the final report for ESTCP Project ER2015-03.

Monitoring well 24-PMW-32 has been sampled 29 times since April 2009 (Arcadis 2016). In general, the concentrations of PCE, TCE and cis-1,2-DCE have been at parts per million levels and have declined over that period (Figure 8-3). The soil vapor concentration of PCE, TCE and cis-1,2-DCE at equilibrium with the water based on Henry's Law partitioning generally would be above 1,000,000, 400,000 and 1,400,000 micrograms per cubic meter ($\mu g/m^3$), respectively, for most of the data shown on Figure 8-3.

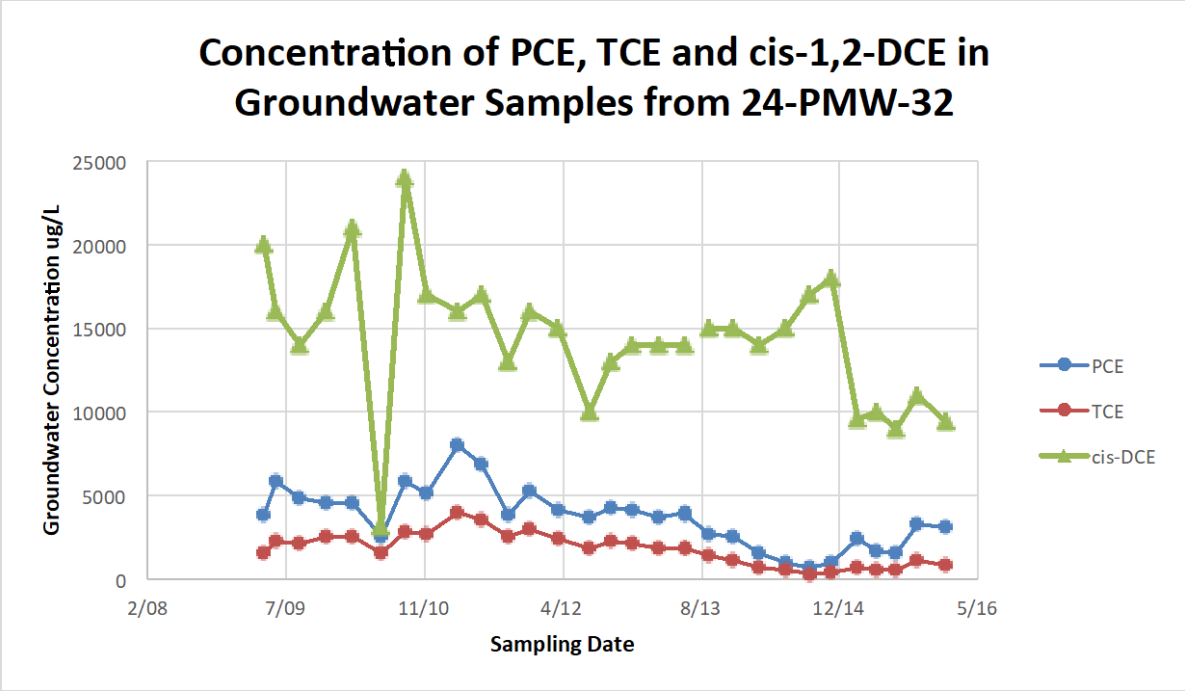


Figure 8-3: PCE, TCE and cis-1,2-DCE concentration trends, monitoring well 24-PMW-32

8.1.2 Contaminant Distribution

Indoor and Outdoor Air Monitoring, January 2012

The Air Force performed indoor air monitoring in Building 11193 on January 19 and 20, 2012, using a HAPSITE portable gas chromatograph/mass spectrometer (GC/MS) to measure vapor flux into the building and scan for background sources (USAF, 2012). The cross-building pressure differential was also monitored using a micromanometer with data-logging abilities. The cross-building differential pressure readings indicated that the building was under a slight negative pressure (~0.5 Pa) during most of the study, with periods of elevated depressurization (3 to 5 Pa) attributable to operation of an exhaust fan. The study concluded that PCE and other chlorinated alkanes were attributable to subsurface vapor intrusion and that 1,2-dichloroethane was likely due to an interior source. Confirmatory samples (4 indoor air samples and two outdoor air samples) were collected by Shaw Environmental and Infrastructure on January 30, 2012 and analyzed by Columbia Analytical Services of Simi Valley, California, using Summa canisters and EPA Method TO-15 SIM and full scan. It is not known whether exhaust fans or the HVAC system were operational during that sampling event. The measured PCE indoor air concentrations ranged from 21 to 47 µg/m^3, TCE concentrations ranged from1.4 to 6.9 µg/m^3, and cDCE concentrations ranged from 0.95 to 3.9 µg/m^3. Vinyl chloride was not detected. The indoor air monitoring data are provided in Table 8-1 and associated sampling locations are shown on Figure 8-4.

Table 8-1: Indoor air data measured in January 2012

Air Force HAPSITE Results					
Day 1 Room by Room Sampling			PCE	TCE	c-DCE
LOC	Description	Sample Date	µg/m³	µg/m³	µg/m³
	Outside air blank	1/19/12 3:30 PM	<1.36	<0.64	<0.24
ER-1	Embroidery room (3)	1/19/12 3:44 PM	8.48	<0.64	0.63
ER-2	Embroidery room - inside wall	1/19/12 4:14 PM	21.4	<0.64	1.39
CR-1	Ceramics shop (2)	1/19/12 4:23 PM	20.1	<0.64	0.99
KR-1	Ceramics kiln room (1)	1/19/12 4:31 PM	<1.36	<0.64	<0.24
FR-1	North furnace room (4)	1/19/12 4:39 PM	<1.36	<0.64	<0.24
FS-1	Frame shop (5)	1/19/12 4:47 PM	2.24	<0.64	<0.24
LR-1	Lobby (6)	1/19/12 4:56 PM	<1.36	<0.64	<0.24
EG-1	Engraving room (7)	1/19/12 5:06 PM	3.46	<0.64	<0.24
MR-1	Men's room (8)	1/19/12 5:12 PM	4.41	<0.64	<0.24
WR-	Women's room (9)	1/19/12 5:19 PM	5.42	<0.64	0.32
CS-1	Cleaning supply room (10)	1/19/12 5:26 PM	5.63	<0.64	0.28
WS-1	Woodshop (11)	1/19/12 5:36 PM	22.0	<0.64	0.87
WF-1	Wood finishing room (12)	1/19/12 5:46 PM	3.73	<0.64	0.40
ER-2	***Overnight sampling*** LTM - Embroidery Room (3)	1/19/12 7:56 PM	41.4	0.86	2.06
ER-2	LTM - Embroidery Room (3)	1/19/12 9:57 PM	31.5	0.70	1.51
ER-2	LTM - Embroidery Room (3)	1/19/12 11:58	37.7	<0.64	2.46
ER-2	LTM - Embroidery Room (3)	1/20/12 1:59 AM	39.5	0.64	2.85
ER-2	LTM - Embroidery Room (3)	1/20/12 4:01 AM	39.8	0.75	3.21
ER-2	LTM - Embroidery Room (3)	1/20/12 6:02 AM	42.2	1.07	3.49
ER-2	LTM - Embroidery Room (3)	1/20/12 8:05 AM	43.4	0.97	3.85
CR-1	Ceramics room (2)	1/20/12 9:06 AM	35.9	<0.64	2.93
			21.9	<0.64	2.30
	Day 2 room-by-room sampling				
ER-2	Embroidery Room (3)	1/20/12 8:37 AM	47.8	1.29	3.81
LR-1	Lobby (6)	1/20/12 8:48 AM	27.8	<0.64	2.82
WS-1	Woodshop (11)	1/20/12 8:57 AM	54.9	4.46	10.8
SHAW TO-15 Results					
	SV-11193-JA01	1/30/2012	32	1	1.8
	SV-11193-JA02	1/30/2012	21	1	1.6
	SV-11193-JA03	1/30/2012	20	0.95	1.4
	SV-11193-JA04	1/30/2012	47	3.9	6.9

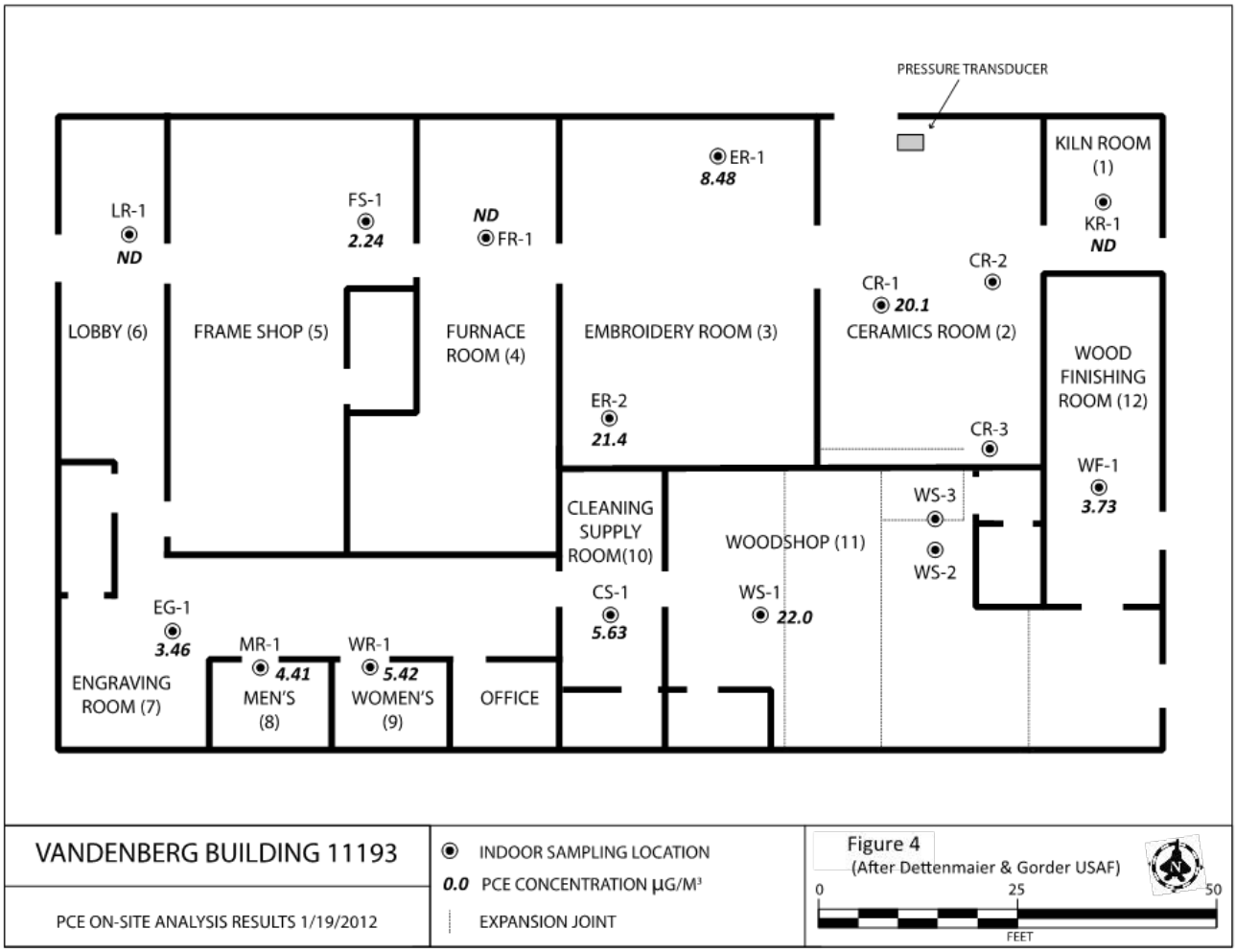


Figure 8-4: Sampling locations for Hapsite Survey (USAF, 2012)

Subslab Monitoring, June 2012

In June 2012, Geosyntec installed and sampled eleven temporary subslab vapor points as part of a comparative study of conventional, multi-interval and high volume sampling (HVS) characterization techniques for the Air Force under BAA contract #FA8903-10-C-8116 (Figure 8-5). Subslab samples were analysed using a HAPSITE and Summa canisters with TO-15 analysis (Table 8-2). The HAPSITE was operated by Dan Schenk of KD Analytical using the HAPSITE GC/MS from Inficon and an operating procedure provided by Eric Dettenmaier of the Air Force. The maximum concentrations of PCE and TCE in the subslab soil vapor samples were 1.2 million $\mu g/m^3$ and 41,000 $\mu g/m^3$, respectively. The PCE and TCE subslab concentrations varied more than two orders of magnitude with the highest concentrations measured in samples from C-1 and D-1, beneath the northeastern quadrant of the building (Figure 8-5).

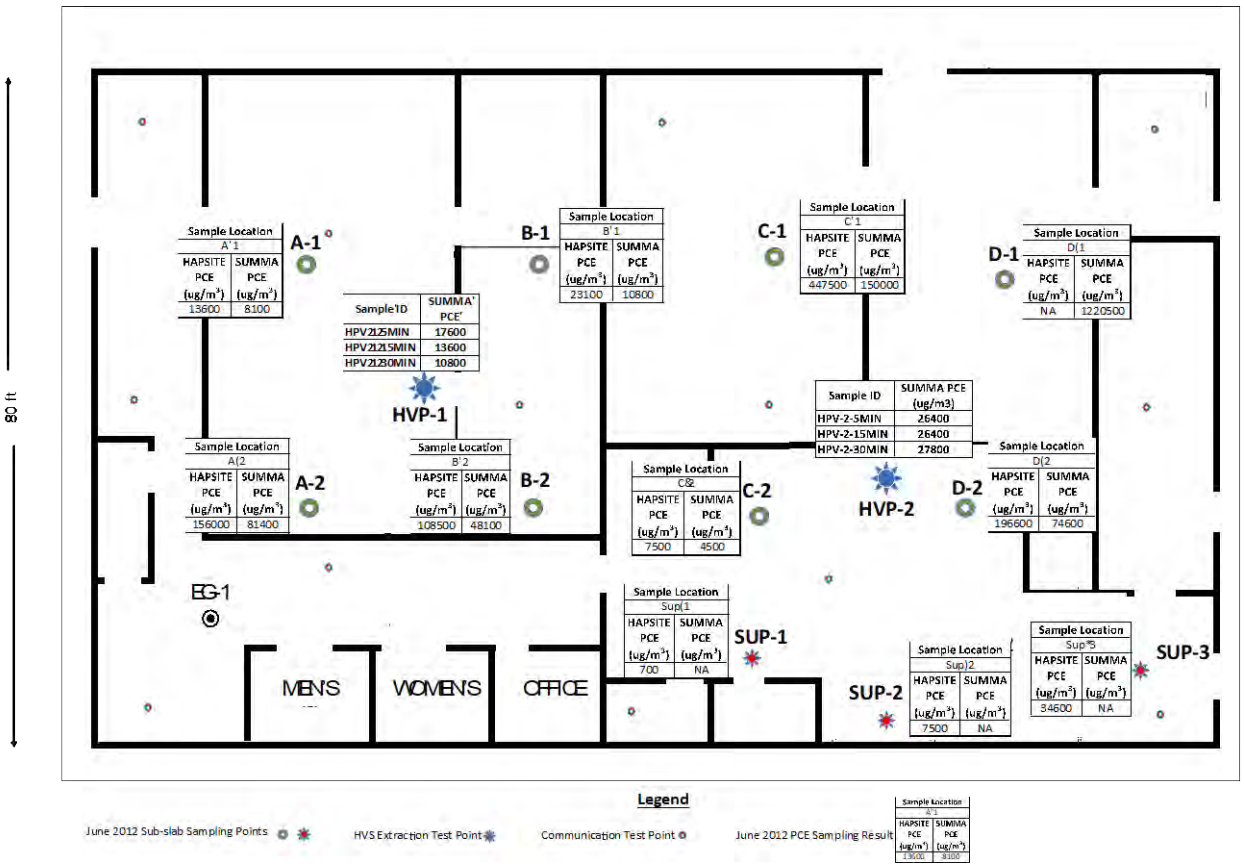


Figure 8-5: PCE measured in subslab soil vapor, June 2012

Table 8-2: Subslab HAPSITE and Summa TO-15 Sampling Results June 2012

Vandenberg Air Force Base AFCEE Building 11193 Sub-slab Sampling Results Summary							
Sample Location	**Sample Date**	**HAPSITE PCE (ug/m^3)**	**HAPSITE TCE (ug/m^3)**	**HAPSITE cis-DCE ($\mu g/m^3$)**	**SUMMA PCE (ug/m^3)**	**SUMMA TCE (ug/m^3)**	**SUMMA cis-DCE ($\mu g/m^3$)**
A-1	6/4/12	1.36E+04	5.00E+02	ND @79	8.10E+03	3.00E+02	ND @19
A-2	6/4/12	1.56E+05	ND @ 537	ND @ 396	8.14E+04	ND(260)	ND @194
B-1	6/4/12	2.31E+04	1.30E+03	87	1.08E+04	8.00E+02	ND @27
B-2	6/4/12	1.09E+05	8.00E+02	ND @ 396	4.81E+04	5.00E+02	ND @127
C-1	6/4/12	4.48E+05	1.56E+04	30923	1.50E+05	4.14E+04	1.15E+04
C-2	6/4/12	7.50E+03	1.50E+03	33	4.50E+03	1.20E+03	ND @13
D-1	6/4/12	NA	NA	NA	1.22E+06	9.10E+03	3.49E+04
D-2	6/4/12	1.97E+05	7.00E+03	515	7.46E+04	4.10E+03	1.91E+03
Sup-1	6/4/12	7.00E+02	ND @ 107	ND @79	NA	NA	NA
Sup-2	6/4/12	7.50E+03	ND @ 107	ND @79	NA	NA	NA
Sup-3	6/4/12	3.46E+04	1.00E+03	ND @79	NA	NA	NA

High Volume Subslab Sampling, June 2012

High Volume Sampling (HVS, after McAlary et al., 2010) tests were performed for durations of 30 minutes each at two locations shown on Figure 8-5 (HVP-1 and HVP-2). These tests involved extracting large volumes of subslab soil vapor (75,000 L from HPV-1 and 180,000 L from HPV-2) from temporary 2-inch diameter extraction points and measuring the VOC vapor concentrations (Table 8-3) at the beginning, middle and end of each test to infer the subsurface concentration at progressively larger distances from the extraction point. The Hantush-Jacob (1955) Leaky Aquifer Model analysis of the transient and steady-state vacuum data indicated much higher floor permeability near HVP-2, apparently attributable to a floor drain in the woodshop (Figure 8-6). Nevertheless, PCE concentrations increased slightly over 30 minutes of gas extraction at HPV-2, indicating the higher rate of indoor air leakage was more than compensated by migration of higher vapor concentrations from the northeast quadrant of the building.

Table 8-3: Concentrations of PCE and TCE measured during June 2012 HVS testing

Vandenberg Air Force Base AFCEE Building 11193 HVS Summa Sampling Results Summary							
HPV-1				HPV-2			
Sample ID	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	cis-DCE ($\mu g/m^3$)	Sample ID	PCE ($\mu g/m^3$)	TCE ($\mu g/m^3$)	cis-DCE ($\mu g/m^3$)
HPV-1-5MIN	17600	200	ND @75	HPV-2-5MIN	26400	1900	400
HPV-1-15MIN	13600	200	43	HPV-2-15MIN	26400	1600	400
HPV-1-30MIN	10800	200	59	HPV-2-30MIN	27800	1600	600

note: sample ID includes time after beginning of test when sample was collected

Figure 8-6: Floor drain in the former woodshop area (6-inch diam. concrete core for scale)

The mass removal rates achieved during the HVS tests were estimated from the product of the effluent concentrations and flow rates measured during the tests (Table 8-4). PCE mass removal rates ranged from 37 to 60 g/day at HPV-1 and 90 to 94 g/day at HVS-2. TCE mass removal rates were ~0.5 g/day at HVS-1 and ~6 g/day at HPV-2.

Table 8-4: Building 11193 Mass Loading from 2012 HVS tests

Building 11193 PCE and TCE Mass Loadings From HVS Tests

Date	Location/Time	Stack PCE (pppv)	Stack PCE (ug/m^3)	Stack TCE (pppv)	Stack TCE (ug/m^3)	Flow Velocity (ft/min)	Stack Area (ft^2)	Flow Rate (cfm)	PCE Mass Rate (ug/min)	PCE Loading (g/day)	TCE Mass Rate (ug/min)	TCE Loading (g/day)
Jun-12	HPV-1-5MIN	2.60E+03	1.76E+04	34	183	3822	0.022	83	4.2E+04	60	4.3E+02	0.6
	HPV-1-15MIN	2.00E+03	1.36E+04	31	167	3822	0.022	83	3.2E+04	46	3.9E+02	0.6
	HPV-1-30MIN	1.60E+03	1.08E+04	29	156	3822	0.022	83	2.6E+04	37	3.7E+02	0.5
	HPV-2-5MIN	3.90E+03	2.64E+04	350	1881	3822	0.022	83	6.2E+04	90	4.4E+03	6.4
	HPV-2-15MIN	3.90E+03	2.64E+04	300	1612	3822	0.022	83	6.2E+04	90	3.8E+03	5.5
	HPV-2-30MIN	4.10E+03	2.78E+04	300	1612	3822	0.022	83	6.6E+04	94	3.8E+03	5.5

conversions:

1 ug = 2.2E-09 lb
1440 min = 1 day
1 cf = 0.0283 m3
pipe diameter = 0.002 sq in
1 sq in = 0.00694444 sq ft

Building Characteristics

Length (ft)	Width (ft)	Height (ft)	Build Vol (ft^3)	Assumed AER	Q building (ft^3/day)	Q building (m^3/day)
140	80	10	1.12E+05	0.3	8.06E+05	2.28E+04
140	80	10	1.12E+05	4.1	1.10E+07	3.12E+05

8.2 BUILDING-SPECIFIC TESTING

8.2.1 Instrumentation

Building 11193 is vacant and slated for demolition, which provided an opportunity for extensive instrumentation. One suction point was installed as near as practical to the middle of the building with a 6-inch diameter cored hole through the floor and removal of one 5-gallon pail of fill from beneath the slab (i.e., a conventional suction pit). Twenty-six (26) subslab probes (SSPs) were installed to monitor subslab vapor concentrations and pressure, at locations intended to include near-field (r=3 ft from suction point), the far corners of the building, the middle of each of the far walls, and two or three locations in between the near and far locations along each of the compass directions and diagonals to provide good spatial coverage, and enable assessment of anisotropy. Nested probes (subslab, 5 and 10 ft deep soil gas probes and a shallow groundwater monitoring well) were installed central to each of the four quadrants of the building (SVP-1 to 4) by ESTCP Project 201503 and a nest of subslab, 5 ft and 10 ft probes without a well was installed a few feet beside the suction point (SSV-MP). Subslab probes were installed with Vapor Pins and deeper probes were ¼-inch Nylaflow tubing with 6-inch stainless steel screens. Both had Swagelok™ valves. A temporary SSD system was constructed using an Obar GBR 76UD fan, as shown in Figure 8-8.

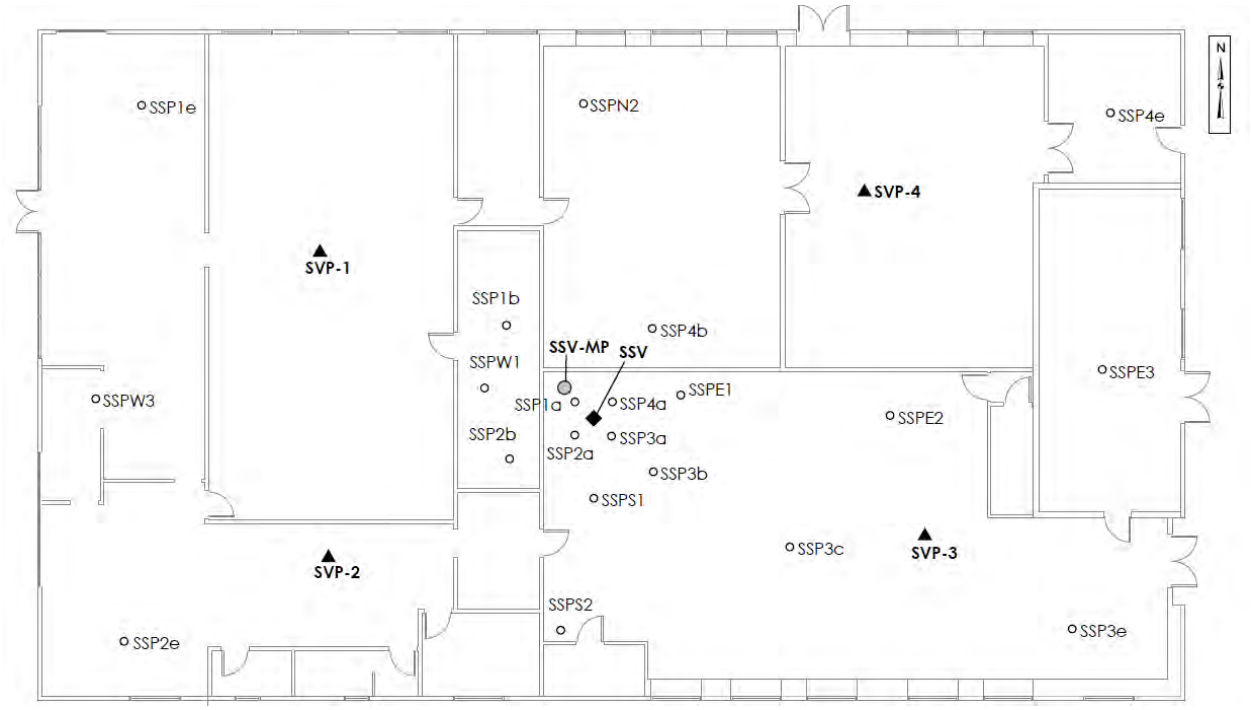


Figure 8-7: Building 11193 Layout and instrumentation (reprinted with permission from McAlary et al., 2018, copyright American Chemical Society)

Figure 8-8: Temporary subslab venting system at Building 11193

8.2.2 Differential Pressure Monitoring

The ambient cross-slab pressure differential was measured over a period of one month with a TEC DG-700 digital micromanometer in two locations (SSP-3E and SSP-W1).

8.2.3 Pneumatic Testing and Mathematical Modeling

Static vacuum was measured at all subslab probes with the OBAR fan running at full speed (~44 scfm) and half speed (~25 scfm). At 25 scfm, the static vacuum measurements were repeated after visible expansion joints in the workshop area (bare concrete floor) were sealed using duct-tape. Static vacuum was also measured in the 5 and 10 ft deep probes in the five nested locations.

Transient vacuum response to turning the fan on and off was measured using a TEC DG-700 data-logger to document the response at dozens of probes. Mathematical analysis with AQTESOLV was performed at probes selected after review of the static vacuum data to represent high (SSP-3B), low (SSP-W1) and mid-range (SSP-E1) values of the leakance parameter.

8.2.4 Subslab Tracer Testing

Inter-well tracer testing was performed at a flow rate of 44 scfm at 9 injection points: SSPs S1, S2 E1, E2, 1B, 2B, 3B, 3C and SVP4-SS. These include different distances to facilitate matching the profile of travel time versus distance calculated with Equations 5 and 6, as well as different directions to enable an assessment of anisotropy. An inter-well tracer test was attempted from the 5 ft deep soil gas probe located a radial distance of 5 feet from the suction point, but helium was never detected at the effluent of the SSV system, which indicates the active flow zone is shallow.

A helium flood test was performed at a flow rate of 8 scfm with monitoring at locations SSP-1B, 3B and 4B, which are at comparable radial distances, but different directions to assess anisotropy. The flow rate was reduced to allow the breakthrough curves to develop slowly enough to be well-characterized at each location.

8.2.5 Mass Flux Monitoring

The temporary SSV system was operated at a variety of flow rates and samples were collected to characterize the mass removal rate as a function of the system flow rate. A stress test was also conducted, where a blower door was used to impose a negative pressure inside the building to simulate conditions that might occur if a large exhaust fan was turned on. During the stress test, samples of indoor air at the face of the exhaust fan were also collected to characterize the mass removal rate of VOCs from the building. Tedlar bag samples were also collected from the temporary SSV system effluent at a variety of flow rates to assess the radon mass loading to the building.

8.2.6 Long-Term Operation

The temporary SSV system was operated for a period of about one month to assess changes in the vapor concentrations and mass removal rate over time. PID readings were recorded at the effluent and at selected subslab probes at the end of one month of operation. Two indoor air samples were also collected by Summa canister and analysed by U.S. EPA Method TO-15 SIM.

8.3 RESULTS AND DISCUSSION

Differential Pressure Monitoring

Figure 8-9 shows the ambient cross-slab differential pressure data and wind speed. The differential pressure was negligible at SSP-W1 (near the middle of the building) and slightly larger at SSP-3E (near the southeast corner), which showed a slightly negative building pressures (<0.3 Pa on average) and fluctuations generally less than 1 Pa. The wind speed generally increased each afternoon and diminished at night, which was reflected in a response less than about 0.5 Pa at SSP-3E.

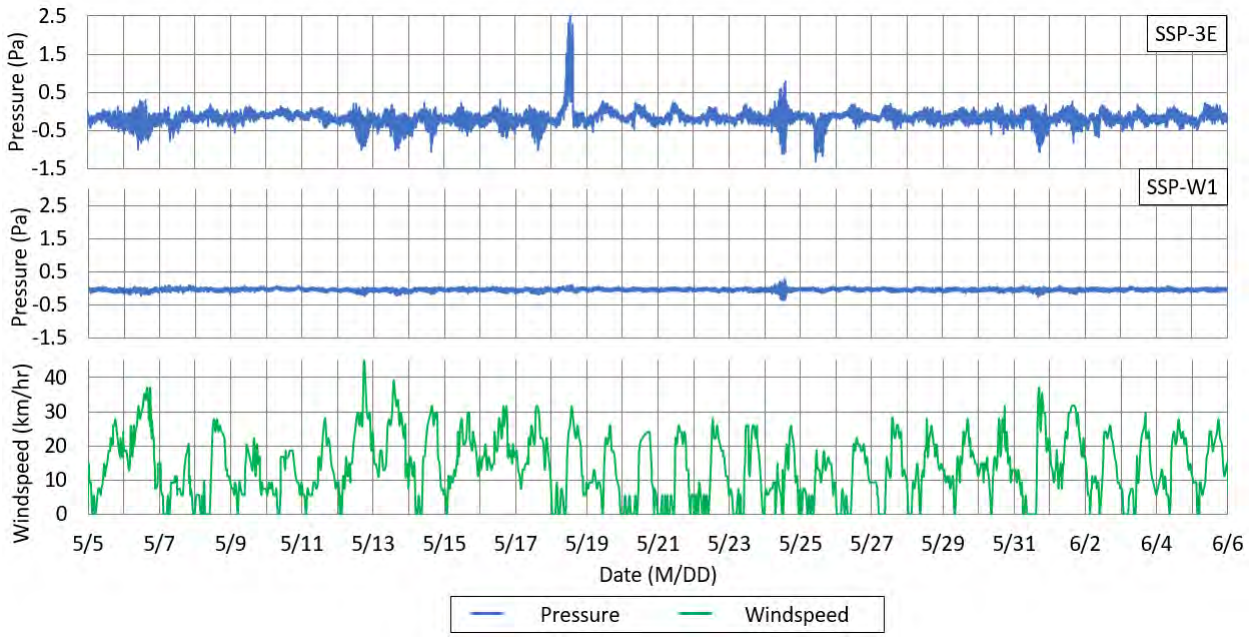


Figure 8-9: Baseline Cross-Slab Pressure Data from SSP-3E and SSP-W1 with windspeed

8.3.1 Spatial Distribution of VOC Concentrations

Subslab PID readings demonstrated that the highest vapor concentrations are located in the northeast quadrant. A contour map of the PID readings in subslab probes is shown in Figure 8-10 and a table of PID readings in the nested probes is provided in Table 8-5, including readings before (6/9/2-17) and after (6/2-/2017) one week of SSV testing. Results of Summa canister sampling and TO-15 analysis at the end of the week of SSV testing are provided in Table 8-6.

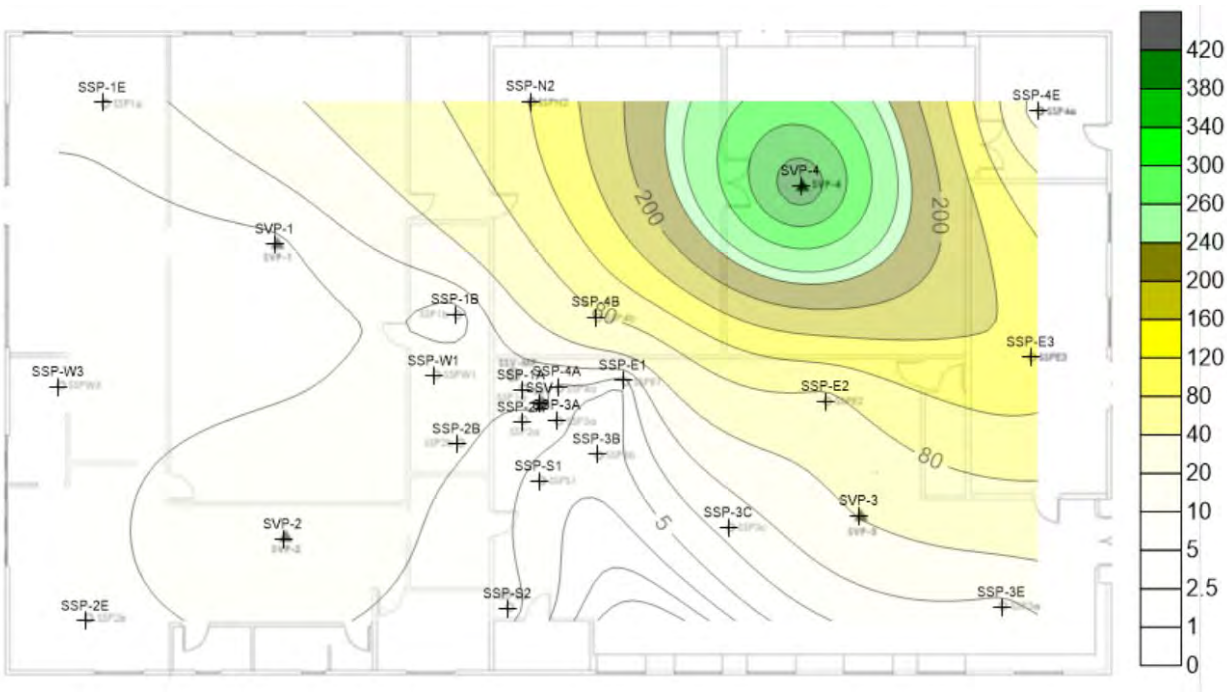


Figure 8-10: Contour map of subslab PID readings (ppmv)

Table 8-5: PID readings in nested probes before and after 1 week of SSV testing

Location	Depth (ft)	Date	PID Reading (ppm)
SVP-1	5	6/9/2017	58.8
	5	6/20/2017	10.1
	10	6/9/2017	53.4
	10	6/20/2017	34.9
SVP-2	5	6/9/2017	36.5
	5	6/20/2017	33.3
	10	6/9/2017	39.4
	10	6/20/2017	30.1
SVP-3	5	6/9/2017	168.1
	5	6/20/2017	137.9
	10	6/9/2017	174
	10	6/20/2017	137.7
SVP-4	5	6/10/2017	1360
	5	6/20/2017	83
	10	6/10/2017	1220
	10	6/20/2017	1831

SSV-MP	5	6/15/2017	103.1
	10	6/15/2017	160.5

Table 8-6: TO-15 data for subslab probes after 1 week of SSV testing

Location	Date	PCE Concentration (µg/m^3)	TCE Concentration (µg/m3)
SVP1-SS	6/22/2017	4,200	82
SVP2-SS	6/22/2017	12,000	ND
SVP3-SS	6/22/2017	190,000	3,600
	7/13/2017	50,000	790
SVP4-SS	6/22/2017	340,000	2,200

8.3.2 Steady Vacuum versus Radial Distance

Initial measurements of static vacuum indicated significant air leakage across the expansion joints in the workshop area, which had an aperture of up to about 2 cm. These were sealed with duct tape as shown in Figure 8-11.

Figure 8-11: Expansion joint (left, scissors for scale) and application of duct-tape (right)

The steady vacuum levels after floor sealing at flow rates of 25 and 44 scfm are provided in Table 8-7.

Table 8-7: Static vacuum at probes with SSV system running at 25 scfm and 44 scfm

ID	r (ft)	25 scfm Vacuum (Pa)	44 scfm Vacuum (Pa)
SSP-1A	3.0	508	747.5
SSP-2A	3.0	508	1495
SSP-3A	3.0	474	1625
SSP-4A	3.0	643	1137.5
SSV-MP-5ft	5.0	10.3	30.2
SSV-MP-10ft	5.0	11.1	21.8
SSP-1B	15.3	23	67.7
SSP-4B	12.9	53.4	147.8
SSP-E1	10.9	144	397
SSP-3B	10.0	207	574
SSP-S1	10.0	159	447
SSP-2B	11.2	41.7	113.7
SSP-W1	13.6	18.1	51.8
SSP-N2	37.7	12.7	33.9
SVP-4-SS	43.1	12.3	33.6
SVP-4-5ft	43.1	4	
SVP-4-10ft	43.1	5.9	
SSP-E2	35.5	1.4	4.3
SSP-3C	28.0	31	79.6
SVP-3-SS	43.3	2.3	6.3
SVP-3-5ft	43.3	5	
SVP-3-10ft	43.3	10	
SSP-S2	25.7	35	92.6
SVP-2-SS	36.7	12	30
SVP-2-5Ft	36.7	13	11.3
SVP-2-10Ft	36.7	4.3	5.2
SVP-1-SS	39.1	5	14.5
SVP-1-5ft	39.1	9	2.9
SVP-1-10ft	39.1	6.5	1.2
SSP-1E	65.9	2.3	4.8
SSP-4E	71.9	4.5	10.3
SSP-E3	61.2	0.2	2.1
SSP-3E	62.5	0.1	0.5
SSP-2E	62.5	4.9	7.9
SSP-W3	59.7	1.6	6.4

Figure 8-12 shows the effect of sealing the floor: red boxes encompass measurements made before and after sealing the joints. Note the flow rate was throttled back to 25 scfm, roughly half of the system maximum, and the vacuum was greater than the ambient cross-slab differential in all but one probe.

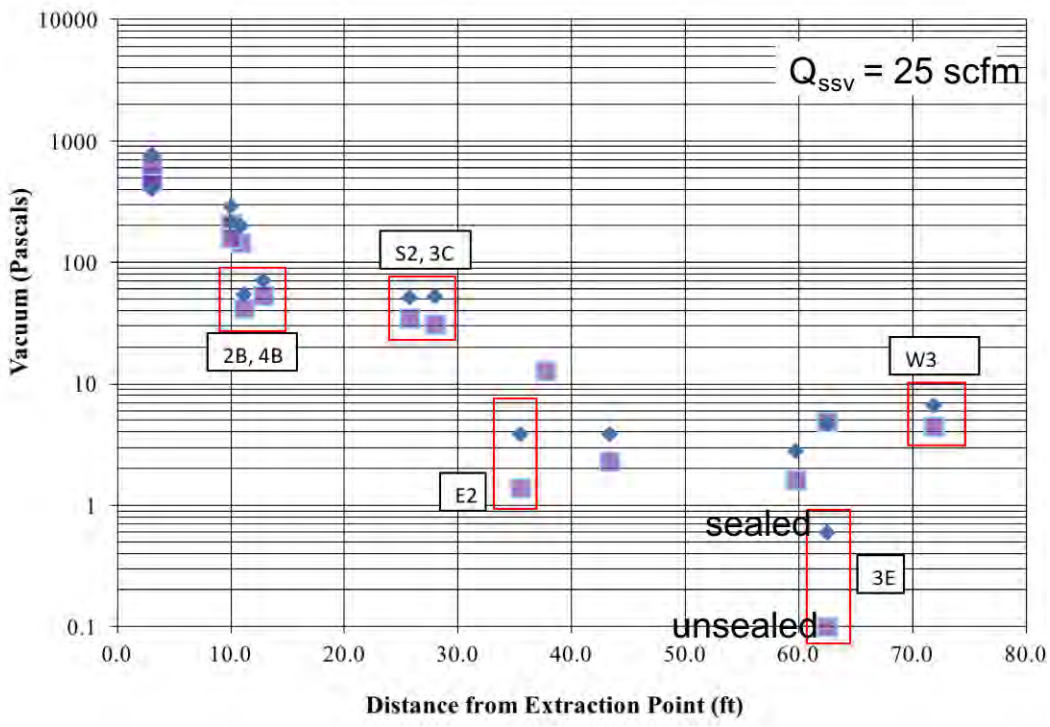


Figure 8-12: Effect of floor sealing on vacuum measurements at 25 scfm

Figure 8-13 shows the profile of steady vacuum versus radial distance from the suction point as well as three curves calculated using Equation 4 and a transmissivity value of 54 ft^2/day, with high (17.5 ft), low (5.5 ft) and mid-range (13.5 ft) values for the leakance parameter (B). From inspection of the data and model curves shown on Figure 8-13, it is evident that a single suction point running at about 44 scfm can induce a vacuum greater than the typical cross-slab differential to a radius in the range of about 40 to >80 feet. The whole building is <80 ft from the suction point.

Anisotropy was evaluated by color-coding the data along each of eight transects: along the compass directions (north, south, east and west), plus diagonals with numbers 1 (northwest), 2 (southwest), 3 (southeast), and 4 (northeast). The highest vacuum levels were along row 4, which is in the direction of the highest subslab concentrations. The model curve corresponding to the lowest vacuum levels (B=5.5 ft) matches points on three different transects at r<15 ft, but measurements at r>60 ft along all three transects show vacuum levels higher than the model curve for B = 13.5 ft. This indicates the data showing greatest leakage (lowest B value) is localized, and likely attributable to leakage of indoor air across the floor slab through an expansion joint under the wall to the west of the suction point, which could not be accesses for sealing.

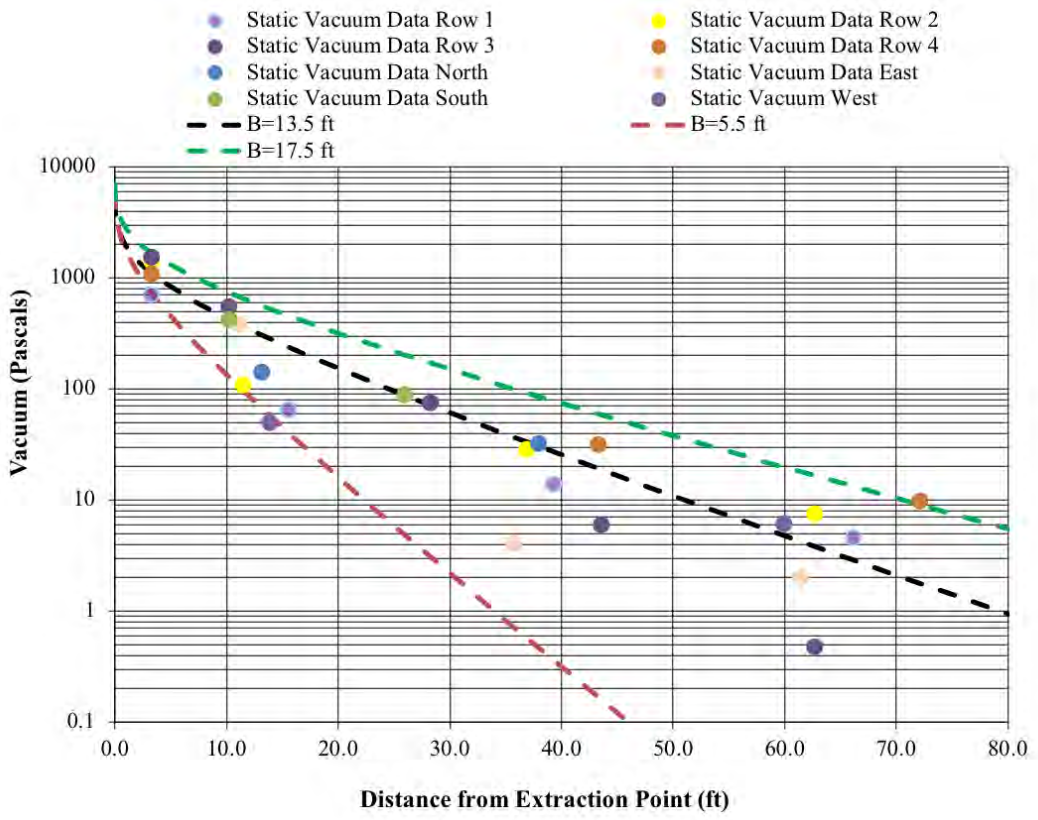


Figure 8-13: Vacuum vs radial distance and direction from the suction point at Building 11193, measured at an extraction flow rate of 44 scfm, and showing Hantush-Jacob Model curves for T = 54 ft2/day and three different B values (5.5 ft, 13.5 ft and 17.5 ft) (adapted with permission from McAlary et al., 2018, copyright American Chemical Society)

8.3.3 Transient Vacuum Response Testing

The transient vacuum response tests all showed trends consistent with expectations and relatively rapid response (roughly 20 seconds), the main difference was the magnitude of the response. To illustrate this point, Figures 8-14, 8-15 and 8-16 show the raw transient data collected at three probes, which are all at comparable radial distance from the suction point, but in different directions. The magnitude of the induced vacuum was over 150 feet of air head at SSP-3B, and as low as 16 feet of air head at SSP-W1. The floor slab is bare concrete between the suction point and SSP-3B, and was observed to be in excellent condition. There was an expansion joint between the suction point and SSP-W1, which could not be sealed with duct tape because it was located directly under an internal wall (which was evident because the expansion joint was visible at the doorway crossing the wall). The low magnitude of vacuum at SSP-W1 was attributable to leakage of air across the expansion joint.

AQTESOLV curves fit to these three data sets are shown on Figures 8-17, 8-18 and 8-19, respectively. These fits were achieved with a T of 54 ft^2/day and B values shown on Figure 8-13.

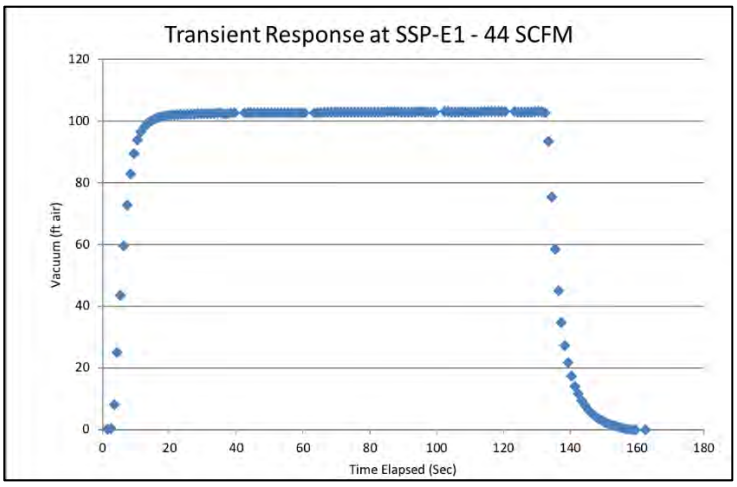


Figure 8-14: Transient vacuum response at SSP-E1 (r=10.9 ft) to gas extraction at 44 scfm

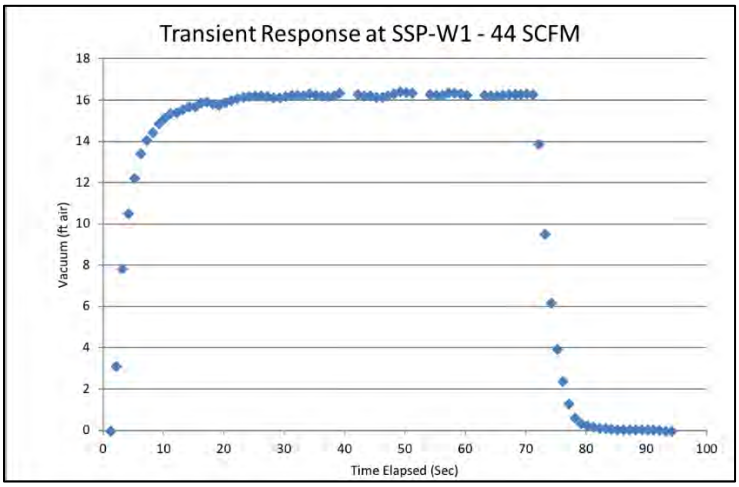


Figure 8-15: Transient vacuum response at SSP-W1 (r=13.6 ft) to gas extraction at 44 scfm

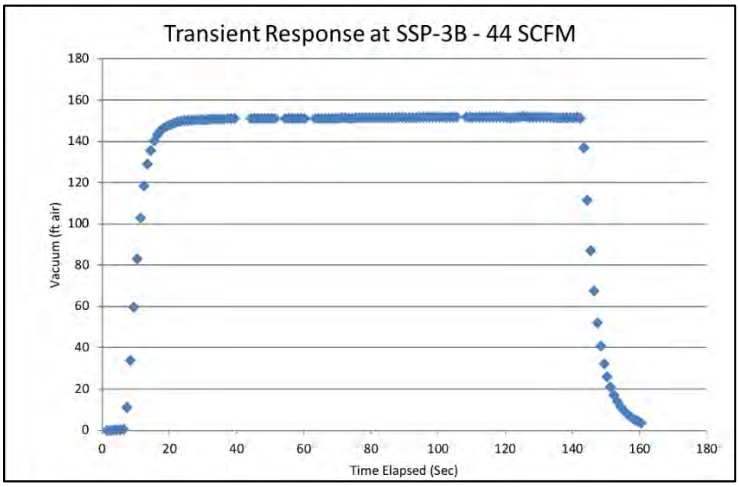


Figure 8-16: Transient vacuum response at SSP-3B (r=10 ft) to gas extraction at 44 scfm

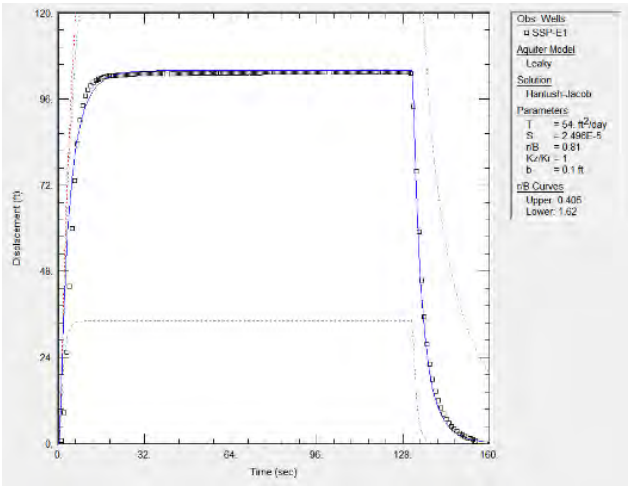


Figure 8-17: Hantush Jacob Model fit to the transient vacuum response data at SSP-E1

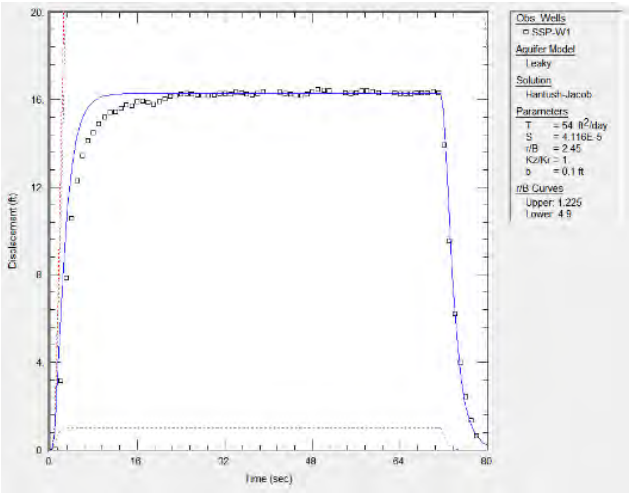


Figure 8-18: Hantush Jacob Model fit to the transient vacuum response data at SSP-W1

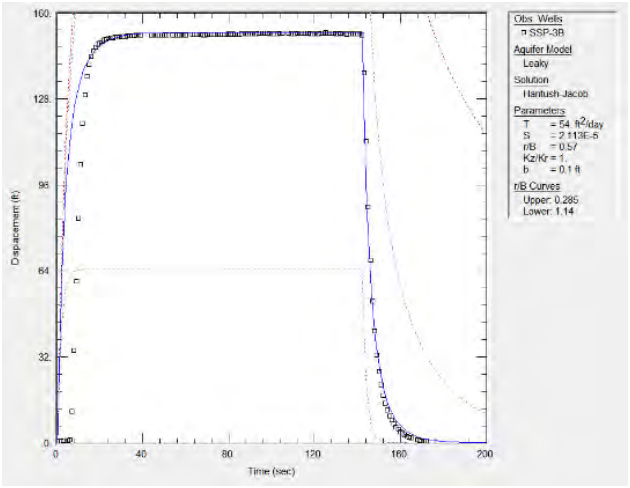


Figure 8-19: Hantush Jacob Model fit to the transient vacuum response data at SSP-3B

8.3.4 Subslab Tracer Test Results

The inter-well tests at 44 scfm are shown on Figure 8-20. The locations at a nominal 10 ft radius (SSPs S1, E1, 3B and 2B) showed average travel times of 17, 19, 19 and 29 seconds, respectively. Note that the direction (row 2) with the slowest travel time was also the direction with the lowest vacuum at that radius (Figure 8-13) and that location is on the far side of an expansion joint that could not be sealed because it is below an interior wall. The other three locations were within the workshop area where the floor is bare concrete and there were no expansion joints between the suction point and the monitored probes. The travel times were progressively longer for probes at greater radial distances (55 seconds at 15 ft, 115 seconds at 26 ft, 150 seconds at 28 ft and 820 seconds at 43 ft). Note that the shape of the breakthrough curve is sharp for the shorter tests and becomes broader for the longer tests, and as the peak becomes broader, it becomes more difficult to discern the moment when the helium concentration in the SSV effluent reaches a maximum value. This is attributable to the fact that helium has a high diffusion coefficient, and is dispersing as the test progresses. Longitudinal dispersion also occurs as a consequence of advective transport. Collectively, this imposes a limit to the range of distances or travel times that can be measured using the inter-well test method.

The helium flood test data at a flow rate of 8 scfm are shown on Figure 8-21. The arrival time was much faster for location SSP-3B (about 36 seconds) across intact concrete than at SSP-4B (about 115 seconds) or SSP-1B (about 152 seconds), which are both located on the opposite sides of different expansion joints that lie beneath walls and could not be sealed.

The travel time measured with the inter-well tracer tests at a flow rate of 44 scfm and calculated using Equation 5 and 6 with T = 54 ft^2/day and B = 13 ft is shown on Figure 8-22, assuming the thickness of the zone through which flow occurs is approximately 0.1 ft with a gas-filled porosity of about 20%. Note that one curve reasonably matches all the inter-well tracer test data and yields an estimated travel time of about 200 minutes from the far corners of the building.

The helium flood test was performed at a slower flow rate (8scfm) and the comparison between the model and the field measurements is shown in Figure 8-23. The model curve in Figure 8-23

was calculated using Equation 5 and the same inputs as used for Figure 8-22 (T= 54 ft^2/day, B = 13.5 ft, b = 0.1 ft and n = 20%). This curve also reasonably matches the helium flood tracer data. The fit between the model and the tracer data at two different flow rates is satisfactory, and this provides value because the calibrated model can be used to perform a sensitivity analysis on the flow rate, which can help with design decisions such as fan selection.

Figure 8-24 shows the velocity profile calculated using Equation 5 and the same inputs as used for Figure 8-22 (Q=44 scfm, T= 54 ft^2/day, B = 13.5 ft, b = 0.1 ft and n = 20%). Note that the velocity is very high, even at large radial distances, relative to the design criteria of 3 ft/day.

The calibrated model can also be used to calculate the proportion of gas flow originating in the sub-surface as a function of radial distance. For a B value of 13 feet, the contribution from the subsurface is 5% of the total flow to a distance of 55 feet from the extraction point, which approaches the far edges of the building, as shown on Figure 8-25.

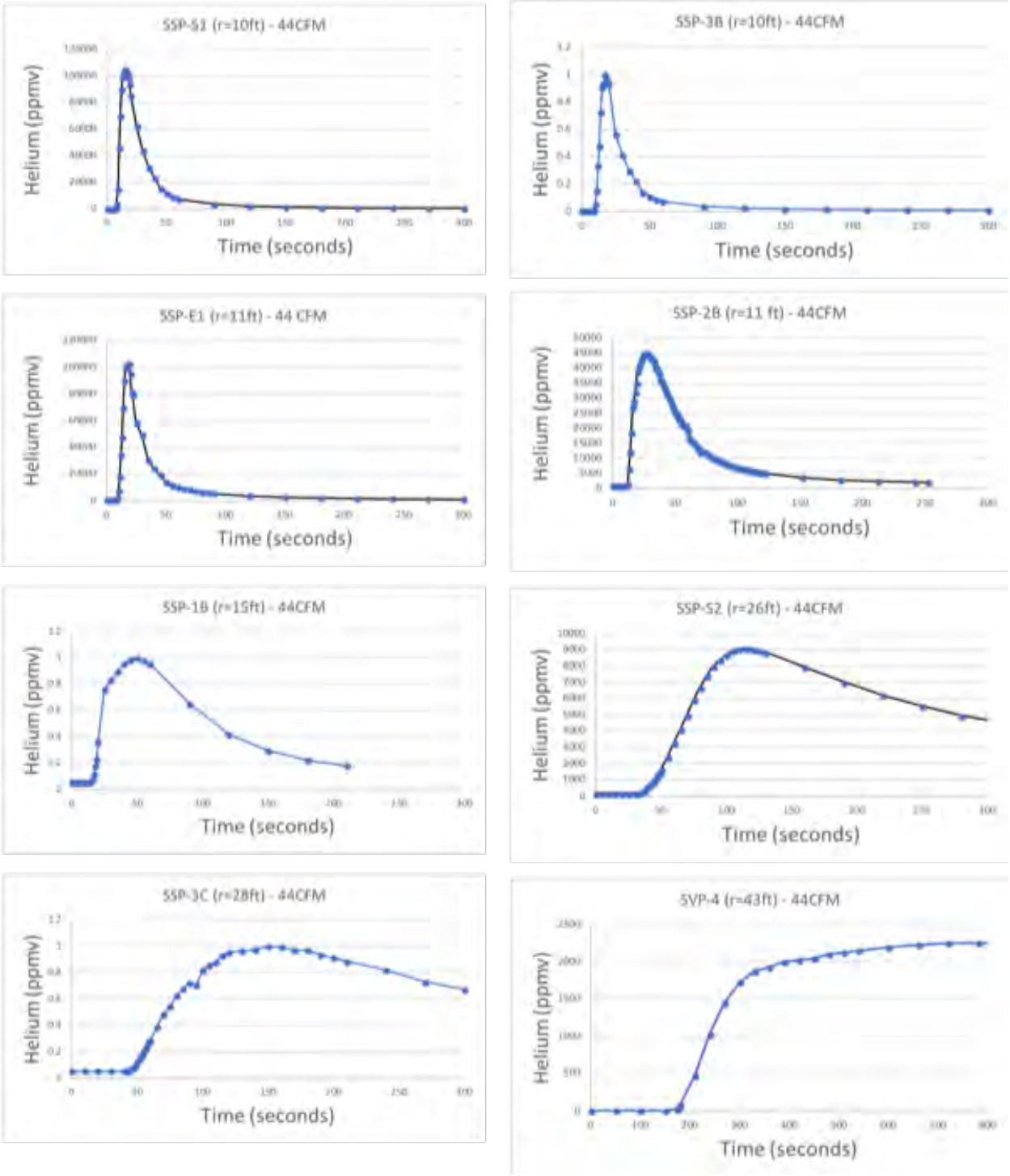


Figure 8-20: Results of helium inter-well tracer testing

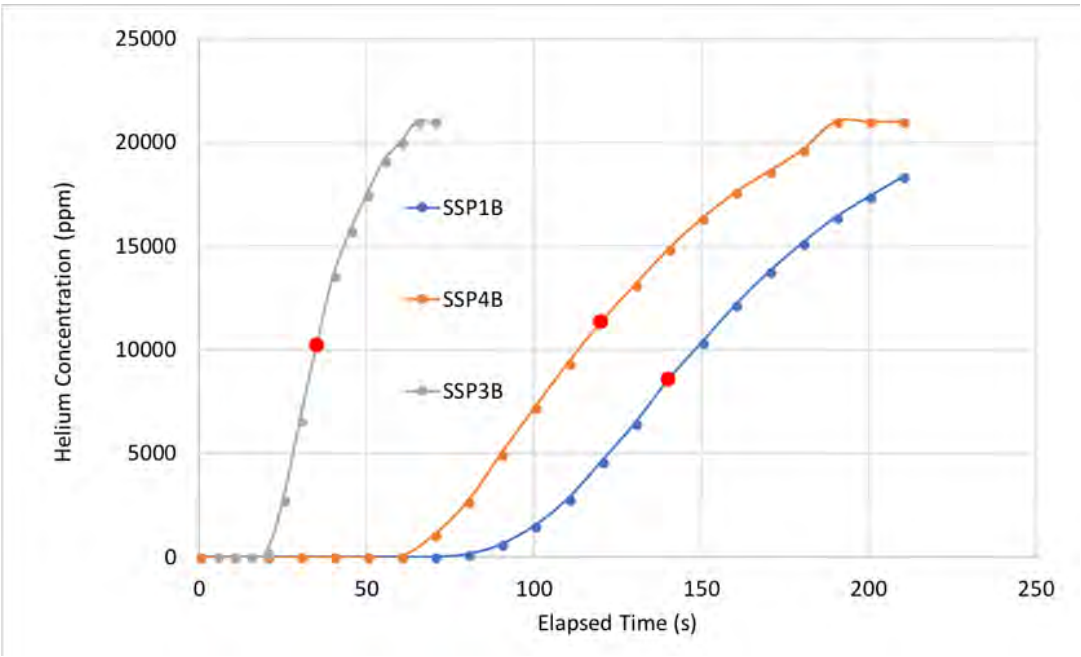


Figure 8-21: Helium Flood data at 8 scfm for SSP1B (r=15.3 ft), SSP4B (r =12.9 ft) and SSP3B (r=10 ft)

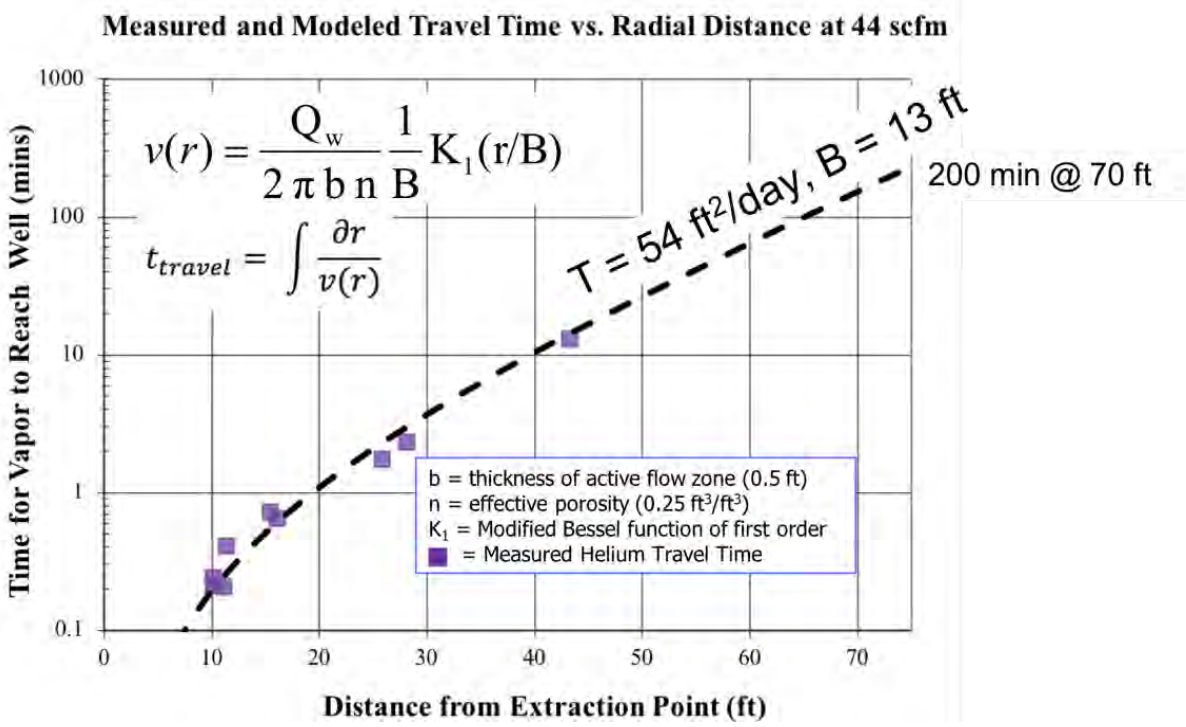


Figure 8-22: Travel time vs distance at 44 scfm with inter-well tracer test data

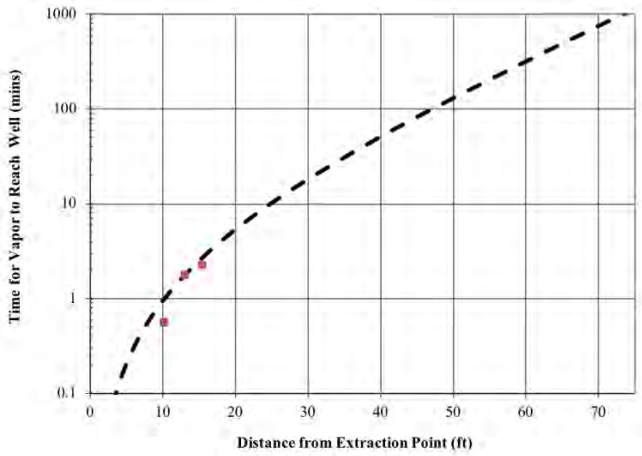


Figure 8-23: Travel time vs distance at 8 scfm with flood tracer test data

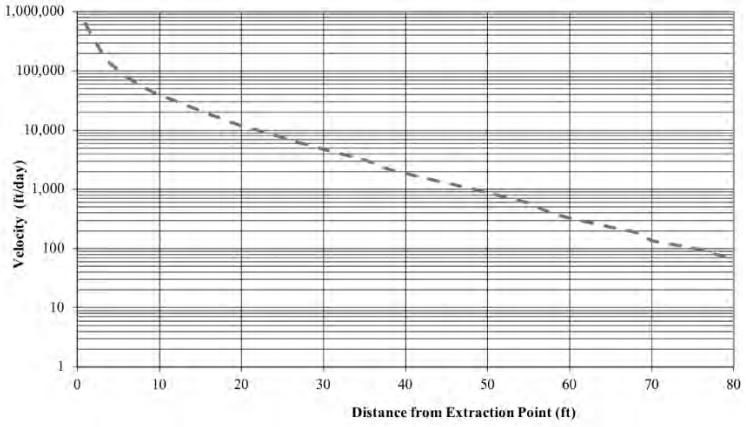


Figure 8-24: Velocity vs radial distance for a flow rate of 44 scfm

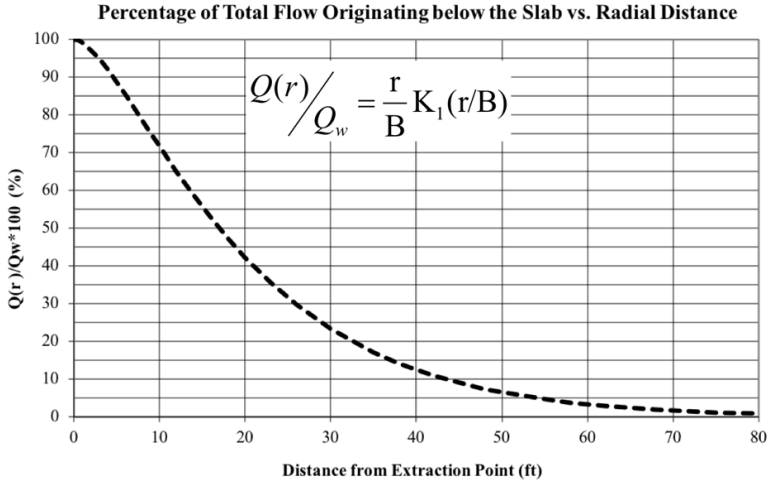


Figure 8-25: Proportion of flow originating from below the floor slab vs radial distance from the point of suction

Equation 7 can also be used to calculated the downward flow across the slab at various radial distances, and these can be used to calculate the flow per unit area for concentric rings around the suction point. Figure 8-26 shows the chart for the same parameters as Figure 8-26, and the default recommended by EPA (5 L/min for a 1000 ft^2 building) would be equalled or exceeded to a radius of 70 ft.

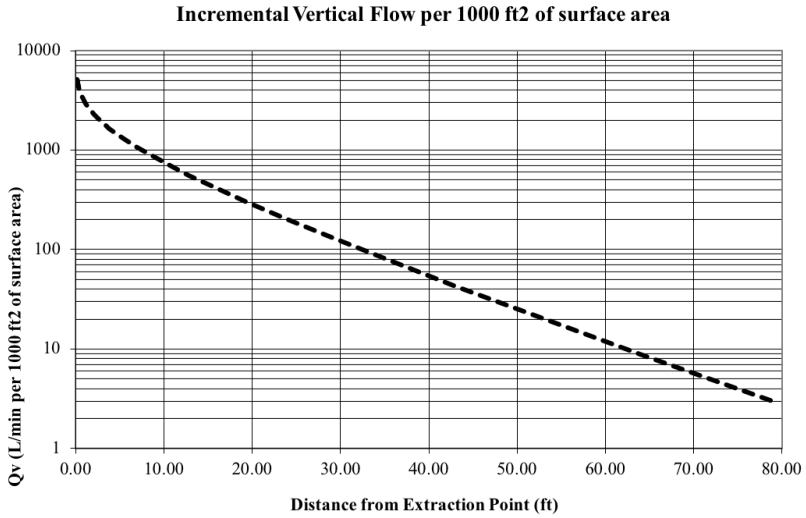


Figure 8-26: Vertical flow 1000 ft^2 of floor area for Q = 44 scfm

8.3.5 Mass Flux Analysis

The mass removal rate from the subsurface from the temporary SSV system and the mass removal rate from the blower door during the stress test components are presented in Table 8-8. For reference, Building Pressure Cycling (BPC) tests conducted as part of ESTCP Project ER-2015-03 showed mass loadings to the building under negative pressure similar to the SSV system performance at 25 scfm. The BPC tests conducted as part of ESTCP Project ER-2015-03 included testing under positive building pressure and showed mass loadings similar to the building mass loadings during the stress test (Table 8-8), which appears to be attributable to causes other than subslab advection into the building, which may include diffusion across the concrete floor, desorption from sorptive building surfaces, or possibly sources inside the building. The mass loading through the building under negative pressure during the stress test were all similar to the BPC loadings under positive building pressure, which would appear to be both caused by the same mechanism, which is not subsurface vapor advection to indoor air.

Table 8-8: Mass loading calculations for various combinations of flow from door fan and SSV system

SSV Flow Rate (scfm)	Blower Door Flow (scfm)	Building Pressure (Pa)	Duration (hr)	PCE		TCE	
				SSV Mass Loading (g/day)	Building Mass Loading (g/day)	SSV Mass Loading (g/day)	Building Mass Loading (g/day)
50		neutral	1	45		1	
		neutral	5	50		0.79	
25		neutral	1	24		0.38	
		neutral	16	22		0.3	
25	5100	-10	1	27	2	0.3	0.15
60	5100	-10	1	67	1.9	0.74	0.18
		-10	17	50	1.3	0.52	0.1
65	5100	-10	3	55	4.2	0.55	0.14
65	3800	-5	1.5	52	5.7	0.55	0.13
60	3800	-5	4.5	37	3.6	0.42	0.085
60		neutral	22 days	10		0.26	

The PCE mass removal rates were 40 to 100 times higher than the TCE mass removal rates, so the discussion will focus on PCE. The initial rate of mass removal with the SSV flow at 50 scfm was 45 g/day for PCE, and slightly higher (50) after 5 hours, indicating vapor migration from the northeast quadrant where concentrations were highest. Reducing the flow rate by half reduced the mass removal rate by half, and still maintained a level of mass removal comparable to the mass loading to the building during building depressurization and this was sustained overnight.

The first step in the stress test (-10Pa applied to the building) actually increased the rate of PCE mass removal from the sub-surface from 22 to 27 g/day, apparently because of less dilution from downward flow across the floor. The rate of PCE mass removal from the building (2 g/day) was much smaller than the rate of mass removal from the subsurface, indicating that SSV extraction at 25 scfm was capturing more than 90% of the available flux to the building. The SSV flow was progressively increased to 60 scfm, which yielded a slight decrease in the loading to the building (1.3 g/day). However, at an even higher SSV flow of 65 scfm, the mass loading to the building actually increased to 4.2 g/day, which is inconsistent with expectations from the conceptualization of advective vapor intrusion. Furthermore, decreasing the building depressurization to -5Pa further increased the PCE mass loading to the building to 5.7 g/day, also inconsistent with expectations.

A possible explanation for the mass loading of VOCs to the inside of the building during the stress-test is vertical diffusion through the floor slab. Using an effective diffusion coefficient (D_{eff}) of $2x10^{-4}$ cm^2/s, a weighted average upward diffusive flux of 4 g/day PCE and 0.1 g/day TCE was calculated (see Table 8-9), which matches very closely to the mass loading to the building during the stress test and positive pressure component of the BPC testing. Virtually identical results were obtained using June 2017 subslab concentrations measured as part of ESTCP project ER2015-03. This D_{eff} value is within the range of published values for diffusion coefficient in concrete of VOCs (Patterson and Davis, 2009, De Biase et al., 2014), radon (Daoud and Renken, 1999, Gadd

and Borak, 1995, Klink et al., 1999 and McCarter et al., 2000) and water (Yi et al., 2016). Therefore, this appears to be a likely explanation. Other possibilities include counter-diffusion from sorptive building surfaces, such as rubber-backed carpet. This has implications for mitigation system design, because diffusion can apparently contribute sufficient mass loading to the building to sustain indoor air concentrations of potential concern even with an effective subslab venting system if the subslab concentrations are high enough, and it may be necessary to employ supplemental technologies such as increased building ventilation or indoor air filtration as interim measures until the subslab concentrations are reduced and the mass stored in the concrete diminishes.

Table 8-9: Calculated diffusive flux across the concrete floor slab

Sample Location	Sample Date	PCE (ug/m^3)	TCE (ug/m^3)	Area (m2)	Slab thickness (m)	Deff (m2/s)	PCE Mass Loading (g/day)	TCE Mass Loading (g/day)
A-1	2012-06-04	8,100	300	128	0.1	2E-08	2E-02	7E-04
A-2	2012-06-04	81,400	130	128	0.1	2E-08	2E-01	3E-04
B-1	2012-06-04	10,800	800	128	0.1	2E-08	2E-02	2E-03
B-2	2012-06-04	48,100	500	128	0.1	2E-08	1E-01	1E-03
C-1	2012-06-04	150,000	41,400	128	0.1	2E-08	3E-01	9E-02
C-2	2012-06-04	4,500	1,200	128	0.1	2E-08	1E-02	3E-03
D-1	2012-06-04	1,220,500	9,100	128	0.1	2E-08	3E+00	2E-02
D-2	2012-06-04	74,600	4,100	128	0.1	2E-08	2E-01	9E-03
						Total	4E+00	1E-01

Note that Table 8-8 clearly shows that increasing the SSV system flow rate was not effective at reducing the mass loading through the building during the stress test. This is an important finding because increasing the fan size or number of suction points would commonly be the first choice in modifications to the system if verification testing indicated unacceptable indoor air concentrations persisted after the commissioning of a mitigation system.

8.3.6 Long-Term SSV Operation

Figure 8-26 shows subslab PID readings over a period of a few weeks of operation of the subslab venting system at a range of flow rates and again after one month of operation at a flow rate of 29 scfm. The SSV system effluent and six subslab probes are shown. PID readings were reduced from 400 ppm to 2 ppm in the area of highest initial PID readings. The slope of the semi-log plot is very similar for five of the seven data sets and much steeper for subslab probe SSP-N2, which is located nearest a wall of the building, indicating that outdoor air is being drawn into the region below the building, and that the system influence extends to the outer wall of the building. SVP-3-SS shows slightly less reduction in the PID reading, and also shows less vacuum than other probes at a similar radius from the suction point.

SVP-3SS had soil vapor concentration in 2012 of 120,000 and 9,000 μg/m^3 of PCE and TCE, respectively. After a month of SSV operation, the soil vapor concentration dropped to 50,000 and 790 μg/m^3 of PCE and TCE, respectively.

Indoor air concentrations measured in two Summa canister samples analyzed by EPA Method TO-15 at end of 1 month of SSV operations had 6.8 and 7.5 μg/m^3 PCE and 0.21 and 0.15 μg/m^3 TCE. These are lower by almost an order of magnitude than concentrations measured in indoor air before the SSV operations (Table 8-1), which averaged 30 μg/m^3 for PCE and 1.7 μg/m^3 for TCE. This is similar to the magnitude of the reduction in concentrations in the SSV effluent during that time (Table 8-9). For an ambient building air exchange rate of about 0.8/hr (U.S. EPA, 2011), the indoor air PCE concentration could be sustained by a mass loading of 0.64 g/day, which is almost an order of magnitude lower than the diffusive flux calculated in Table 8-8. Therefore, it is reasonable to suspect that there is a lingering contribution to PCE in indoor air from either diffusion through the concrete floor or perhaps counter-diffusion from sorptive building materials.

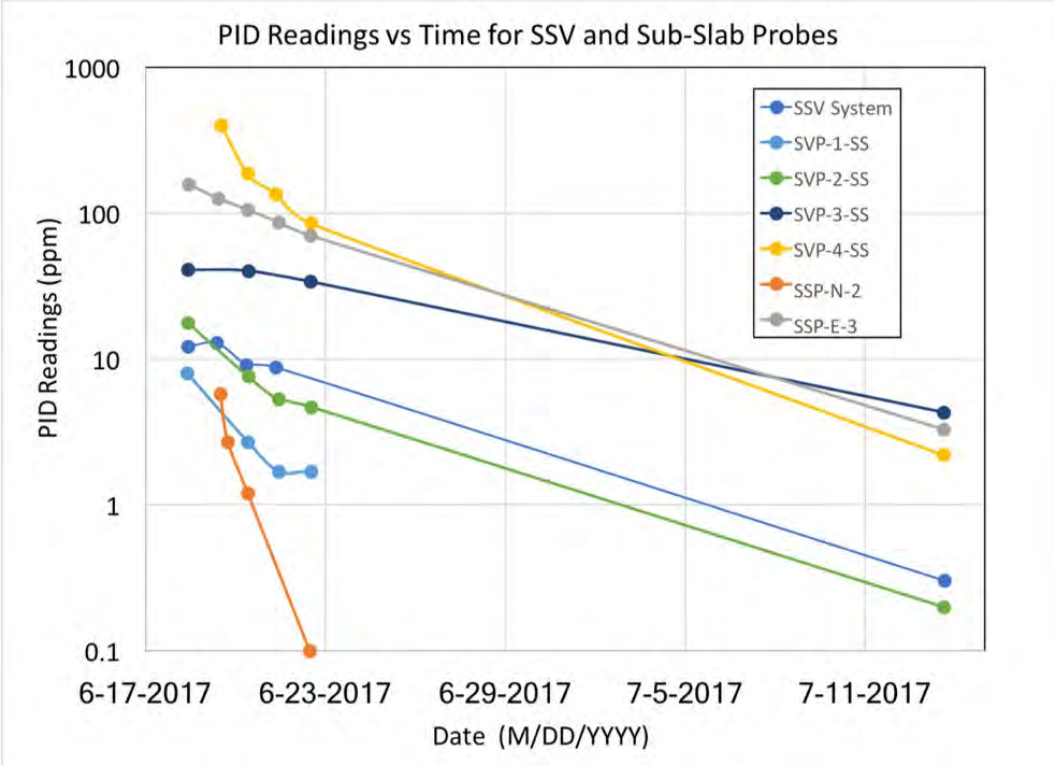


Figure 8-27: PID reading vs time during operation of the SSV system at Q = 29 scfm

Table 8-10: PCE and TCE Concentrations by Method TO-15 in SSV Effluent

Date	Sample ID	PCE Conc (µg/m3)	TCE Conc (µg/m3)
SSV System			
6/19/2017	B11193-061917-SSV-COMB-1	23,000	520
6/19/2017	B11193-061917-SSV-2-22	25,000	390
6/20/2017	B11193-062017-SSV-1-44	26,000	410
6/20/2017	B11193-062017-SSV-3-22	22,000	300
6/20/2017	B11193-062017-SSV-4-22	27,000	310
6/20/2017	B11193-062017-SSV-4-22-DUP	27,000	310
6/20/2017	B11193-062017-SSV-5-59	28,000	310
6/21/2017	B11193-062117-SSV-6-59	21,000	220
6/21/2017	B11193-062117-SSV-7-65	21,000	210
6/21/2017	B11193-062117-SSV-8-65	20,000	210
6/21/2017	B11193-062117-SSV-9-58	16,000	180
7/13/2017	1707242B-03A	4,400	110

8.3.7 Radon

The results of analysis of radon samples collected from the effluent of the temporary SSV system are shown in Table 8-10. The source strength is moderate beneath building 11193, and as a result the radon activity in the extracted gas was 31 pCi/L or less. The product of the radon activity and the system flow rate (MF-Rn) dividied by the ambient building ventilation rate (Qbuild) yields an estimate of the radon concentrations that might be expected in indoor air if the SSV system was not operating (RN-ia), all of which are within a factor of about 2 which shows internal consistency and all of which are far below the indoor air target level of 4 pCi/L.

Table 8-11: Radon activity and flux data for Building 11193

Qssv (scfm)	Qssv (L/day)	Rn-ssv (pCi/L)	MFRN (pCi/day)	Qbuild (L/day)	Rn-ia (pCi/L)
44	1793088	31.1	5.6E+07	9.0E+07	0.62
22	896544	30.2	2.7E+07	9.0E+07	0.30
54	2200608	18.3	4.0E+07	9.0E+07	0.45
54	2200608	18.3	4.0E+07	9.0E+07	0.45
65	2648880	18.4	4.9E+07	9.0E+07	0.54
65	2648880	18.5	4.9E+07	9.0E+07	0.55
60	2445120	16.5	4.0E+07	9.0E+07	0.45

8.3.8 Building-Specific Attenuation Factor

Material in this section is also the subject of a journal article (McAlary et al., 2018) and is reproduced here with the expressed written consent of ACS Publishers. Attenuation factors for Building 11193 calculated using Equation 17 are shown in Table 8-11. Upper and lower estimates were calculated using the range of parameter values listed in Table 8-11 and a best estimate was calculated using approximate midpoint parameter values. The mean air exchange rate of 0.8 /hr for a naturally-ventilated commercial building (U.S. EPA, 2011) was used. The data indicate average differential pressures of 0.2 pascals (0.05 ft-air or 0.0008 inch-H_2O) or less and maximum differential pressures of 2 pascals (0.5 ft-air or 0.008 inch-H_2O) or less. The calculated AF values are at least 10 and up to 1,000 times lower than the default AF of 0.03 recommended in regulatory guidance (U.S.EPA, 2012). The uncertainty of +/- one order of magnitude is comparable to the uncertainty in the empirical AFs in Table 8-12.

Table 8-12: AFs calculated from flow and vacuum analysis at Building 11193 (reprinted with permission from McAlary et al., 2018, copyright American Chemical Society)

Basis for Input Selection	T (ft^2/day)	ΔP		B (ft)	h (ft)	AER (/hr)	Building-Specific AF
		Pa	(ft-air)				
Low estimate of AF	54	0.17	0.05	18	15	0.8	2.9E-5
Best estimate of AF	54	0.85	0.25	13	15	0.8	2.8E-4
High estimate of AF	54	1.7	0.5	5.5	15	0.8	3.1E-3

Empirical AFs were calculated as the ratio of the average indoor air concentration divided by the average subslab concentration for PCE and degradation products trichloroethene (TCE) and cis-1,2-dichloroethene (cDCE), as shown in Table 8-12.

Table 8-13: Empirical AFs calculated from indoor air and subslab concentrations (reprinted with permission from McAlary et al., 2018, copyright American Chemical Society)

Media	PCE	TCE	cDCE
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
indoor air	32	1	1.8
	21	1	1.6
	20	0.95	1.4
	47	3.9	6.9
Minimum	20	0.95	1.4
Maximum	47	3.9	6.9
Average	30	1.7	2.9
subslab	8,100	300	***19***
	81,400	***260***	***194***
	10,800	800	***27***
	48,100	500	***127***
	150,000	41,400	11,500
	4,500	1,200	***13***
	1,220,000	9,100	34,900
	74,600	4,100	1,910
Minimum	8,100	***260***	***13***
Maximum	1,220,000	41,400	34,900
Average	199,700	7,208	6,086
Minimum AF	1.6E-05	2.3E-05	4.0E-05
Maximum AF	5.8E-03	<1.5E-2	<0.53
Average AF	1.5E-04	2.4E-04	4.8E-04

Note: values in ***bold italics*** are reporting limits and represent upper estimates of concentrations where results were less than the reporting limit.

Minimum and maximum AFs are also included in Table 8-12, which were calculated using the high and low ends of the ranges of measured concentrations. The average empirical AFs in Table 8-12 were all within a factor of 2 of the best estimate AF in Table 8-11, which provides further support for the validity of Equation 17 for calculating AFs from flow and vacuum data. The range of AF values in Table 8-11 and Table 8-12 are also similar, roughly one order of magnitude in either direction from the mean value. The subslab samples show considerably more spatial variability than the indoor air data, and the average subslab concentration would therefore be potentially highly sensitive to the selection of subslab sample locations, so the agreement between AFs in Tables 8-11 and 8-12 may be somewhat fortuitous, but the close comparison between the empirical AFs and those calculated using Equation 17 is nevertheless encouraging. Table 8-11 and Table 8-12 both indicate that the U.S. EPA default AF of 0.03 is about 100-fold greater (overly protective) than the building-specific (empirical and calculated from pneumatic testing) AFs for Building 11193.

8.4 COST CONSIDERATIONS

The optimal system design for Building 11193 consists of a single suction point and a single fan operating at approximately 25 scfm with an interim supplement of either enhanced building ventilation or indoor air filtration for the period of time required for diffusive emissions through the concrete or counter-diffusion from sorptive building surfaces to diminish to acceptable levels. Conventional analysis of the radius of influence based only on static vacuum measurements could have had a wide range of results, depending on whether the communication test points were on the opposite side of an unsealed expansion joint or not, as shown dramatically in Figures 8-15 and 8-16, where there was almost a 10-fold difference in the static vacuum for two probes at almost the same radial distance from the suction point. A conventional analysis could have resulted in a radius of influence as small as 20 feet, in which case the number of suction points would likely be about 8. If the radius of influence used to design the system at Building 205 had been adopted instead (Building 205 had 27 suction points to cover 64,000 ft^2, or 2,370 ft^2 per suction point), then 5 suction points would have been specified. Comparisons to both possible conventional systems are made here.

Tables 8-14 and 8-15 provide a summary of the cost comparison for the conventional vs optimized mitigation system for Building 11193. The incremental cost of the optimization testing and analysis service (assuming a production level of detail and not a research level of detail) would be about $9,800, but would result in a net savings of $84,000 to $170,000 over a 30 year lifecycle, which is a return on investment of 8.5 to 18 times. The cost differential between the conventional and optimized system is shown as a factor of 1.9 to 2.9.

Table 8-14: Building 11193 Cost Summary (5 fan conventional system)

Cost Components	Conventional	Optimized
Initiation	$ 6,175	$ 6,175
Reconnaissance	$ 5,600	$ 6,300
Pilot Test	$ 3,575	$ 11,490
Installation	$ 49,875	$ 8,575
Operation	$ 84,951	$ 50,261
Maintenance	$ 1,500	$ 300
Fan Replacement	$ 20,000	$ 4,000
Training	$ 5,000	$ 6,000
TOTALS	$ 176,676	$ 93,101
Total incremental cost of optimization activities		$ 9,815
Net Savings		$ 83,575
Return on Investment		8.5
Ratio of Conventional Costs vs Optimized Costs		1.9

Table 8-15: Building 11193 Cost Summary (8 fan conventional system)

Cost Components	Conventional	Optimized
Initiation	$ 6,175	$ 6,175
Reconnaissance	$ 5,600	$ 6,300
Pilot Test	$ 4,475	$ 11,490
Installation	$ 79,800	$ 8,575
Operation	$ 131,861	$ 50,261
Maintenance	$ 2,400	$ 300
Fan Replacement	$ 32,000	$ 4,000
Training	$ 5,000	$ 6,000
TOTALS	$ 267,311	$ 93,101
Total incremental cost of optimization activities		$ 9,815
Net Savings		$ 174,209
Return on Investment		17.7
Ratio of Conventional Costs vs Optimized Costs		2.9

9.0 PERFORMANCE ASSESSMENT

9.1 REDUCE LIFECYCLE COST

At Building 205, the existing system was designed with 27 suction points and 9 high suction fans. The data collected in this study demonstrated that the mass loading to the building under depressurized conditions was insufficient to pose a potential health risk, and the mass loading from the combined flow of 500 scfm from 9 fans was also too low to pose a potential health risk, so a strong argument could be made to decommission the system altogether. Fan 3 alone was able to remove a similar TCE mass as all 9 fans together, and was considered an appropriate action while maintaining a protective system. Fan 8 was added to provide additional reduction of indoor air radon concentrations, even though they did not exceed the criteria of 4 pCi/L. A reduction in the system from 9 fans to 2 fans exceeds the success criteria of a 4x reduction in cost.

At Building 200, the initial system (two vent pipes: V-1 and V-2) was inadequate because V-2 was drawing gas from somewhere other than the typical radial flow pattern. If the methods developed in this research were available and employed by the contractor, that fact would have been obvious during the initial diagnostics testing with minimal effort, and an additional vent pipe like V-3 would have been installed at that time, which would have resulted in an effective system in the first attempt. This would have reduced the burden of indoor and subslab monitoring over time, eliminated the cost of an expensive blower and variable frequency drive, eliminated the cost of a second mobilization for the installation of V-3, reduced the cost of electricity to drive the blower and reduce the energy penalty of conditioned air being drawn across the slab. Not all of the costs incurred are available to the study team, so it is difficult to quantify, but it seems likely that the savings would have been substantial.

At Sun Devil Manor, no system would be needed if the land drain had not been present and with the land drain present, the system as installed was appropriately sized. This is encouraging because the AF was calculated to be 0.02, so the building appears to be very susceptible to vapor intrusion, and yet is still easily mitigated.

At Building 11193, the data collected in this study demonstrated that a single suction point was sufficient to achieve performance objectives for vacuum, velocity, travel time and mass removal rates with a flow rate as low as about 25 scfm with interim supplements such as enhanced ventilation and/or carbon filtration. A conventional design process may have resulted in an estimated radius of influence as small as about 15 ft, which could have resulted in as many as 15 suction points, depending on the locations of the pilot test installations relative to the unsealed expansion joints below the floor. If a system was built using the same number of suction point per unit area as Building 205 (one suction point per 2,370 ft^2 of building footprint), it would have employed 5 suction points. Therefore, the success criteria of a 4x reduction in cost appears to have been achieved.

A summary of the comparison between the typical costs of conventional systems and the optimal systems for all four test buildings is presented in Table 9-1. Details of how the costs in Table 9-1 were derived are presented in Sections 5.4, 6.4, 7.4, and 8.4 and Appendix E. The potential savings are appreciable compared to the costs for all buildings except SDM for the case with the Land Drain open, which was already optimally designed. The performance goal (reduction in net

present value of lifecycle cost) was less than the goal of 4X in most cases, but the return on investment (savings divided by incremental cost of optimization) was in the range of 5X to 10X, which is encouraging.

Table 9-1: Summary of Potential Savings Compared to Optimization Costs

		Mitigation System Capital and OM&M Costs ($000s)			
		Building 205	**Building 200**	**Sun Devil Manor (land drain closed)**	**Building 11193 (5 vent pipe system)**
Conventional	Capital/Startup	$232	$32	$21	$66
	30 yr OM&M	$175	$125	$61	$112
	Total [A]	$407	$157	$82	$178
Optimal	Capital/Startup	$76	$38	$19	$33
	30 yr OM&M	$84	$66	$0	$61
	Total [B]	$160	$104	$19	$94
Ratio of Costs	[A/B]	2.5	1.5	4.3	1.9
Incremental Optimization Costs	[C]	$22	$10	$10	$10
Net Savings	[A-B-C]	$225	$43	$53	$74
Return on Investment	[(A-B-C)/C]	10.2	4.5	5.3	7.4

9.2 MAINTAIN PROTECTIVENESS OF INDOOR AIR QUALITY

At Building 205, indoor air quality did not exceed screening levels for TCE even under building depressurization and radon concentrations did not exceed 4 pCi/L in any indoor air samples. Therefore, protectiveness could likely have been maintained with no system at all, however, two of the fans were maintained in service in the abundance of caution. TCE indoor air concentrations are consistently below the limit of detection which is more than an order of magnitude lower than the health-based screening level, and radon concentrations are consistently below 4 pCi/L so the system is more than protective of indoor air quality.

At Building 200, indoor air quality data collected after vent-pipe V-3 was installed has been protective for TCE and the optimized system meets or exceed the performance of the previous system in terms of applied vacuum, flow rates, mass removal rates and induced subslab velocity and travel times. Routine monitoring by Avatar also demonstrates that indoor air concentrations are below screening levels, so the system is protective of indoor air quality.

At Sun Devil Manor, the system was not modified because it was already optimally designed in the case with the land-drain open. With the land drain closed, no system would be needed.

At Building 11193, the indoor air concentrations after a month of SSV system operation at 29 scfm were about 7 $\mu g/m^3$ for PCE, which is marginally above the screening level in California (2 $\mu g/m^3$),

but below the U.S. EPA residential indoor air screening level of 11 $\mu g/m^3$. At an ambient building ventilation rate of about 90,000 m^3/day, 7 $\mu g/m^3$ represents a mass loading of only 0.6 g/day. Mass loadings of up to about 5 g/day were observed under positive building pressure (ESTCP ER-201503) and this is reasonably likely to be attributable to upward diffusion through the concrete floor slab (see Table 8-9), or desorption from sorptive building surface, as described in Chapter 8. The SSV system reduced subslab concentrations during the month of operation, and maintained a mass removal of 10 g/day or more, which is comparable to or greater than the mass loading to the building under modestly depressurized conditions (see ESTCP ER201503), so the indoor air concentrations measured after a month of SSV operation may still be attributable to either a diffusive flux through the concrete or potentially counter-diffusion from sorptive surfaces (such as the rubber-backed carpet) inside the building. This criteria cannot be determined unambiguously for this building as a result, but the mass removal rate was maintained at a protective level.

This yields an important lesson: where subslab concentrations are very high (hundreds of ppmv or above for VOCs), indoor air quality may not meet targets until the system has been operating for long enough to reduce the subslab concentrations to lower levels and long enough for VOC mass stored in the concrete and other building materials to permeate out and be flushed from the building. During this period, supplemental systems such as increased building ventilation or carbon filtration could be necessary or appropriate as an interim supplemental measure for either conventionally designed or optimized systems. This is an important finding because many practitioners would interpret elevated indoor air concentrations in confirmatory samples collected after a system is commissioned as an indication that additional suction points and fans or larger fans are needed, and if diffusion through the floor slab or counter-diffusion from building materials is the root cause, this will be inefficient and likely ineffective, at least in the short-term, and add to OM&M costs in the long-term.

9.3 MAINTAIN PROTECTIVE MASS REMOVAL RATE

For Building 205, the TCE mass removal rate with 9 fans running was 0.45 g/day, and it was maintained at 0.42 g/day with one fan running, which meets the criteria (especially considering that about 2.7 g/day of TCE would be required to pose a LICR risk of 1E-6). Radon was assessed each time after modifications to the system were made. With only Fan 3 running indoor air radon levels increased, although they never exceeded the criteria of 4 pCI/L. With both Fan 3 and Fan 8 running, indoor air radon concentrations decreased to similar levels as when all 9 fans operating.

At Building 200, the Rotron blower was significantly oversized for the needs, and the replacement fan was able to achieve the same or higher levels of flow (15 to 20 scfm) and vacuum (4 to 5 in-H_2O in the vent-pipes) and mass removal (~0.2 g/day), which were protective. Radon was removed at a rate of about $6x10^6$ pCi/day, which was protective.

At Sun Devil Manor, the system was not modified. This study did demonstrate that the system as designed achieved a flow rate of 100 scfm and was sufficient to remove 0.3 g/day of TCE, which was the upper range value for the building depressurization testing (Holton et al, 2015, Guo et al., 2015). Radon concentrations under ambient conditions (Holton, 2015) showed an average of 0.45 pCi/L of radon under ambient conditions, which is about an order of magnitude lower than the target level of 4 pCi/L, so despite some uncertainties in the mass loading measurements for radon, it does not appear that radon mitigation is needed for SDM.

For Building 11193, the BPC testing (ESTCP 201503) showed a potential mass loading to the building under moderate depressurization of about 10 to 20 g/day for PCE. The SSV system was able to achieve a comparable or higher mass removal rate at a flow rate of 25 scfm. In the short term (at least 30 days from SSV system commissioning), this level of mass removal would have also needed to be supplemented with an enhanced indoor air ventilation rate or purifying filters or similar options to reduce indoor air concentrations attributable to diffusion through the concrete floor and/or desorption from interior surfaces. Indoor air concentrations of radon were not of concern without a SSV system, so any removal at all would be protective.

9.4 DATA ADEQUACY FOR PEER REVIEW

For all four buildings, the data collected include multiple lines of evidence, which facilitates peer-review because any one line of evidence may have limitations, but independent lines of evidence seldom have the same limitations, so where multiple lines of evidence are mutually supportive, the limitations of any particular line of evidence as offset by the capabilities of the others. For all four buildings, the vacuum versus time and vacuum versus distance data resulted in an internally consistent calibration to a unique pair of T and B values, except at vent pipe V-2 at Building 200, which is clearly drawing gas from some subsurface pathway that is not a conventional granular fill layer below the slab. The helium inter-well and flood tracer tests resulted in calibration of the values for the thickness and effective porosity of the active flow layer that were within reasonable ranges. The mass loading data are consistent with mass loadings measured by building depressurization. The lines of evidence and suggested performance metrics are summarized in Table 9-2, and collectively, these provide a considerable breadth of information for peer review.

The results of this research have been shared with several hundred audience members in presentations listed in the abstract of this report, a team of experts listed in Appendix A, twenty-six members of the American Association of Radon Scientists and Technologists (AARST) Consortium on National Radon Standards Mitigation Committee, and the ESTCP review panel for the final report, and all comments have been addressed. One journal article was published and a proceedings paper in the 2018 AWMA specialty conference on vapor intrusion is forthcoming. Therefore, the criteria for success on this topic were met.

Table 9-2: Summary of lines of evidence and performance metrics for all four buildings

Performance Metrics	Building 205	Building 200	Sun Devil Manor	Building 11193
Vacuum > Ambient ΔP	>100 ft	>>16 ft	>20 ft	>60 ft
Velocity >3 ft/day	~150 ft	>>16 ft	>>>20 ft	>80 ft
Travel Time <3 to 4 hours	~60 ft	>16 ft	>>20 ft	~70 ft
Q/Qw >5L/min/1000ft^2	~90 ft	>16 ft	>>20 ft	~50 ft
MFssv>MFbpc	yes, with Fan 3	yes with Obar fan	yes, at 100scfm	yes, at ~25 scfm
Additional Comments	May not need a system at all, but 2 fans are more than sufficient	Vent-pipe V-2 draws similar flow as the other vent pipes, but not much mass. A small fan is sufficiently protective and less costly than a blower	System design was already optimal for TCE. Radon mass removal rates are potentially biased	It appears that diffusion through the floor or counter-diffusion from sorptive surfaces may require additional interm actions

One journal article was produced through this study (McAlary et al., 2018).

9.5 TECHNOLOGY TRANSFER

The study methods are described in detail in chapters 4 through 8 of this document. The technology has been widely disseminated to the industry through a series of presentations listed in the Abstract of this document. A training video was planned but was not completed; however, the number of conference presentations was considerably more than planned, so the success criteria for this objective is considered met.

9.6 REGULATORY APPROVAL

For Building 205, the U.S. EPA reviewed the data collection, analysis and interpretation and accepted the modification to the system. Design modifications at Building 200 were documented in letters and reports submitted to the New Jersey Department of Environmental Protection. For Building 11193, the workplan was distributed to the Department of Toxic Substances Control and the Regional Water Quality Control Board for review and comment and a group of regulators made a visit to the building during the field program for a tour and demonstration. Comments have been positive to date; therefore, the success criteria for this objective was met..

While not strictly a regulatory agency, the AARST mitigation committee feedback was supportive.

10.0 COST ASSESSMENT

The cost of this technology includes costs that would commonly be incurred during conventional diagnostic testing, so the focus of this section is on the incremental costs. In conventional diagnostics, it is common to use a Shop-Vac or similar fan to draw gas from below the floor slab and to drill a few communication test points at selected locations nearby to monitor the static vacuum that develops in response. For this technology, the additional efforts include:

1. measuring vacuum versus time in response to cycling the fan on and off. For 3 of the 4 sites tested, the transient response was less than 1 minute in duration and the datalogger can be purchased for <$1,000, so the costs are minimal;
2. Iteratively calibrating the T and B values to Equations 1 and 4, using ATESOLV and a spreadsheet, which can be done in about 15 minutes or less per tests after familiarization;
3. Injecting helium in at least one nearby probe to measure the travel time for a given radial distance to calibrate the model to the thickness and effective porosity of the active flow zone using Equations 5 and 6. The recommended duration of these tests is no more than 2 minutes to maintain an appropriately sharp peak in the breakthrough curve, so the professional time costs are minimal. A helium cylinder can be purchased from a party supply store that will be sufficient for dozens of tests (one balloon per test), and a helium meter can be rented for less than $100 per day.
4. Measuring flow and concentration in the effluent of the system. Flow measurements can be performed in a minute or less with a thermal anemometer that can be purchased for <$1000. Sampling and analysis of the vent pipe for VOCs adds about $150 to $200 and radon adds about $50. Fitting the data to the model equations can be done within a few minutes once Equations 5 and 6 have been programmed into a spreadsheet.

10.1 COST MODEL

Components of the cost of this technology are summarized in detail for each building in Appendix E and in summary level in the tables at the end of Sections 5 through 8, plus the roll-up in Table 9-1. Capital costs include equipment, installation, electrical wiring, commissioning, performance verification monitoring and regulatory reporting. Operation, maintenance and monitoring (OM&M) costs include regulatory reporting, periodic inspection, periodic indoor air quality sampling and analysis, energy loss due to exhausting conditioned air that leaks downward across the floor, electrical cost to run the system and maintenance costs to replace worn out fans. In this report, fan replacement has been assumed to be required every 10 years and mitigation system lifespan has been assumed to be 30 years. Costs vary according to a number of factors too numerous to list so, these values should be considered to be within a range of about -20% to +50% of the most probable values. Cost values are generally rounded to 2 significant digits. The costs of the optimization testing and analysis are estimated for a level of effort that would likely occur in standard practice moving forward, not in the research level of detail conducted during this study. Assumptions for the costing are listed in the comments column of the tables in Appendix E. Estimates are based on current market pricing (neglecting inflation and discounting). If future expenditures are discounted for inflation, the costs beyond 30 years are typically small compared

to the total for the first 30 years, so a lifecycle of 30-years was assumed in the cost model. Laboratory and rental prices were cross-referenced against typical suppliers in the U.S.

For all of these comparisons, the following general approach applies. Capital costs include equipment, installation, electrical wiring, commissioning, performance verification monitoring and regulatory reporting. Operation, maintenance and monitoring (OM&M) costs include regulatory reporting, periodic inspection, periodic indoor air quality sampling and analysis, energy loss due to exhausting conditioned air that leaks downward across the floor, electrical cost to run the system and maintenance costs to replace worn out fans. In this report, fan replacement has been assumed to be required every 10 years and mitigation system lifespan has been assumed to be 30 years. Costs vary according to a number of factors too numerous to list so, these values should be considered to be within a range of about -20% to +50% of the most probable values. Cost values are generally rounded to 2 significant digits. The costs of the optimization testing and analysis are estimated for a level of effort that would likely occur in standard practice moving forward, not in the research level of detail conducted during this study.

The electrical cost to run the fans was calculated using the average U.S. electrical cost of $0.13/kWhr in June 2018 (https://www.eia.gov/electricity/). The HS-2000 fans costs approximately $2,500 to purchase and install. Heating, ventilation and air conditioning costs for Building 205 are approximately $60,000 per year according to the Facilities Engineer. The air exchange rate is about 1.8 per hour, so the typical air flow rate through the building is about 1,200,000 m^3/day (30,000 scfm), therefore the cost of HVAC is about $0.08/10,000$ft^3$. The original SSD system flow rate was 20,000 m^3/day (500 scfm), which is about 2% of the total flow through the building, so the energy cost associated with conditioned indoor air drawn across the floor slab was about $1,000 per year, or about $32,000 over a 30-year operation. Reducing the system to 2 fans would reduce the loss to $6,300 over a 30-year operation for a savings of $25,000.

10.2 COST DRIVERS

Costs for vapor intrusion mitigation systems include capital and annual operating, maintenance and monitoring (OM&M) activities. The capital costs include fees for labor in the design, installation, testing and reporting activities and disbursements for equipment, travel expenses, shipping, laboratory analysis, and associated items. The primary driver of the capital cost is the number of suction points and fans included in the mitigation system design. This depends on the radius of influence of each suction point and the area of the building. The radius of influence has traditionally been established as the distance to which the induced vacuum below the floor slab exceeds some target value (e.g. 6 to 9 pascals in ASTM E2121), but this research has shown that where highly permeable materials are present below the floor slab, vacuum levels too low to reliably measure can result in a protective system as indicated by the subslab velocity, travel times, proportion of flow from below the floor (see Equations 5, 6 and 7 and Appendix B) and mass loadings. Capital costs can also be affected by subsurface features such as footers, old pits, or tunnels that can impact the flow of vapors in the subsurface. This would require some focused investigation to evaluate the best way to mitigate that area effectively. In a large building this could be a significant cost.

The costs of OM&M includes fees for labor in the monitoring, maintenance and reporting activities and disbursements for electricity to run the fans, equipment replacement, laboratory analyses,

travel, shipping, etc. The primary cost driver is likely to be the duration of operation. Virtually all radon mitigation systems are designed for perpetual operation. VOCs may eventually be removed to a degree where the remaining mass and flux in the vadose zone toward the building is insufficient to pose a potential VI concern, but the systems are generally designed for containment, not mass removal, so a 30-year life-cycle or more is typically expected. Some accounting practices allow for a discounting of future expenses in a net present value (NPV) calculation, but interest and inflation rates are currently low, so this report has used a 30 year lifecycle with no discounting as a rangefinder for OM&M total costs. The OM&M cost driver will also depend on the size of the system. For a small system (e.g., one fan attached to one suction point, like the system at Sun Devil Manor), the average cost of electricity is only about $100/yr, and labor costs to simply verify the system remains operating are likely to be the dominant cost. For a larger system like Building 205, where 9 high suction fans were initially installed, the annual cost of electricity was about $4,000 per year prior to optimization, which would be a much more significant proportion of the total.

10.3 COST ANALYSIS

The cost analysis is based on the detailed spreadsheets in Appendix E, the narratives in Sections 5.4, 6.4, 7.4 and 8.4 and the reduction in lifecycle cost and return on investment for the incremental cost of the optimization activities. In general, the analysis shows that the potential benefit increases with building size. For a single family residence, a single suction point and a single fan is often more than adequate, especially where there is a reasonably competent floor slab and a capillary break (granular fill) below the floor slab, as typically specified in building codes. In this case, additional effort beyond conventional practice is unlikely to be needed or cost effective. However, in the case of very highly permeable granular fill, reliance on static vacuum measurements alone can be misleading because there can be a high rate of gas flow below the slab even at vacuum levels too low to reliably measure (see Appendix B for details). In this case, an inter-well tracer test can be added with minimal extra cost, and this may demonstrate that no additional fans or vent-pipes are required, with a considerable savings.

For larger buildings, the potential savings increase because the area treated by each suction point is proportional to the square of the radius of influence. For example, if a building has a footprint of 100,000 ft^2, it would require 80 suction points if the radius of influence is estimated at 20 ft, but only 6 suction points if the radius of influence is actually 75 ft. The additional lines of evidence developed in this research provide a more comprehensive way to assess the radius of influence compared to the conventional method of a linear interpolation of static vacuum measurements plotted on a chart of linear vacuum versus logarithmic radial distance. For Building 205 and Building 11193, the optimization testing demonstrated radii of influence greater than 75 ft. For smaller buildings like Building 200 and SDM, this is not necessary.

Practical experience has shown that there are certain buildings where mitigation system performance testing yields results that are difficult to explain because of complexities in the subsurface. The additional lines of evidence developed in this research can provide clues regarding the presence and general location of preferential pathways, which have been shown in certain circumstances to have an important influence on the potential for vapor intrusion, but have limited techniques currently available for assessment and characterization.

For all the buildings tested in this study (except SDM with the land drain open), the incremental cost of optimization testing was small compared to the potential saving, so the cost analysis indicates this technology is potentially valuable in most cases.

11.0 IMPLEMENTATION ISSUES

Implementation issues will be minimal for most DoD buildings. For rare cases where the floor slab rests on very low permeability native soil, subslab venting systems may not achieve sufficient flow or mass removal to be protective of indoor air and alternatives such as aerated floor, increased building ventilation and/or barriers may be needed. For new construction, it may be preferable to use aerated floors or other options, in which case the analysis developed here would not be needed. The conventional mitigation methods are written in standards that may be slow to change. In addition:

- No environmental regulations or permits are required to implement the technology.
- End-users may initially find the use of unfamiliar equations to be intimidating, but the equations are easily programmed into a spreadsheet and once verified, the application is relatively simple.
- All of the equipment required for implementation is standard commercial off-the-shelf [COTS], and much of it can also be rented to reduce capital outlays.

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APPENDIX A. POINTS OF CONTACT

Point of Contact Name	Organization Name Address	Phone Fax Email	Role in Project
Todd McAlary	Geosyntec Consultants, Inc. 3250 Bloor street west, Suite 600 Toronto, ON M8X 2X9, Canada	(416) 637.8747 tmcalary@geosyntec.com	Lead Principal Investigator
Paul Johnson	Colorado School of Mines 1500 Illinois Street, Golden, CO 80401	(303) 273.3280 pcjohnson@mines.edu	Technical Reviewer
Bill Brodhead	WPB Enterprises 2844 Slifer Valley Road Riegelsville, PA 18077	(610) 346.8004 bill@wpb-radon.com	Technical Reviewer
Henry Schuver	US Environmental Protection Agency 1200 Pennsylvania Avenue, N.W. Washington, DC 20460	(703) 308.8656 schuver.henry@epa.gov	Technical Reviewer
William Angell	University of Minnesota 1985 Buford Ave, St Paul MN	(612) 624.6786 wangell@umn.edu	Technical Reviewer
Bruce Snead	Kansas State University 133 Ward Hall 1200 N 17th St, Manhattan, KS 66506	(785) 532.6705 bsnead@ksu.edu	Technical Reviewer
Andrea Leeson	Deputy Director & Environmental Restoration Program Manager SERDP & ESTCP	(571) 372.6398 Andrea.leeson.civ@mail.mil	COR
Robert Ettinger	Geosyntec Consultants, Inc. 924 Anacapa Street, Suite 4A Santa Barbara, CA	(805) 979.9138 rettinger@geosyntec.com	Technical Reviewer
William Wertz	Geosyntec Consultants, Inc. 130 Stone road west Guelph, ON N1G 3Z2, Canada	(518) 779.3582 wwertz@geosyntec.com	Project Manager
Paul Nicholson	Geosyntec Consultants, Inc. 130 Stone road west Guelph, ON N1G 3Z2, Canada	(61) 399.352988 pnicholson@geosyntec.com	Field Study Leader

APPENDIX B. WORKED EXAMPLE OF HIGH AND LOW T AND B VALUES

Consider two cases: one with coarse sand below a concrete slab (T = 10 ft^2/day, hereafter referred to as LowT) and one with gravel (T = 1,000 ft^2/day, hereafter HighT). For both cases, assume the leakance factor (B) is the same at 15 ft (the influence of high and low leakance is described further below). In both cases, assume a fan with a power of about 100 watts is used to draw gas from the subsurface. The flow from the gravel would be higher than the flow from the sand, for the sake of this example, assume 100 standard cubic feet per minute (scfm) from the gravel and 10 scfm from the sand. These values are all consistent with observations made by Geosyntec at over 120 pneumatic tests of subslab gas extraction (McAlary et al., 2018). The profile of vacuum vs radial distance calculated using Equation 4 would be as shown in Figure B-1. If the radius of influence (ROI) was based on the minimum vacuum recommended by ASTM E2121 (6 Pa), the ROI would be about 67 ft for the LowT case and about 36 ft for the HighT case. This corresponds to an area of influence (3.14 x ROI^2) of 4,100 ft^2 for the HighT case and 14,000 ft^2 for the LowT case. If the building of interest had a footprint of 100,000 ft^2, the LowT case would likely employ about 7 suction point, whereas the HighT case would likely employ about 25 suction points. The total flow from the LowT system would be about 70 scfm, and the total flow from the HighT system would be about 2,500 scfm to achieve a vacuum below the floor greater than or equal to 6 pascals everywhere.

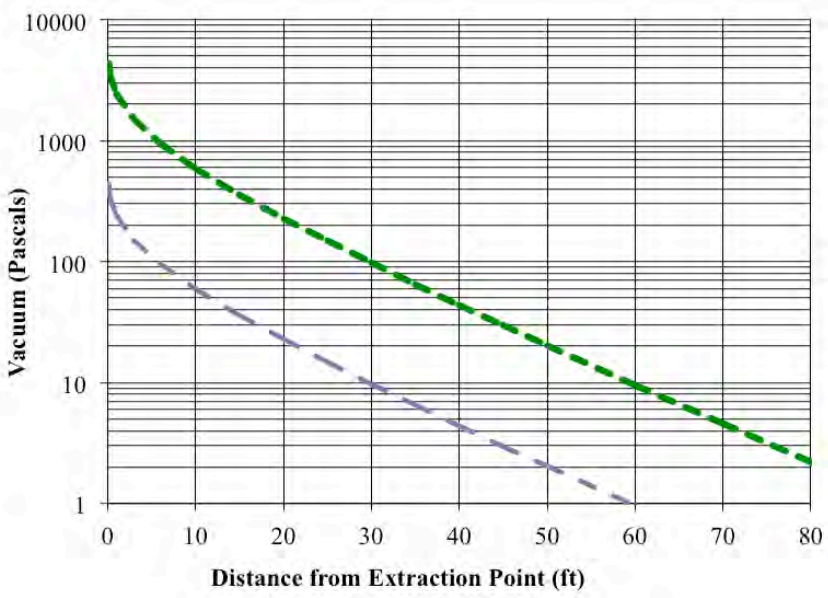


Figure B- 1: Vacuum vs distance calculated using Equation 4 and a B value of 15 ft for the LowT (green) and HighT (purple) cases described in the text above

The subslab velocities for the same two cases described above can be calculated with Equation 5, and are shown in Figure B-2. The HighT case has velocities about an order of magnitude higher than the LowT case because of the difference in the gas extraction rates (100 scfm vs 10 scfm).

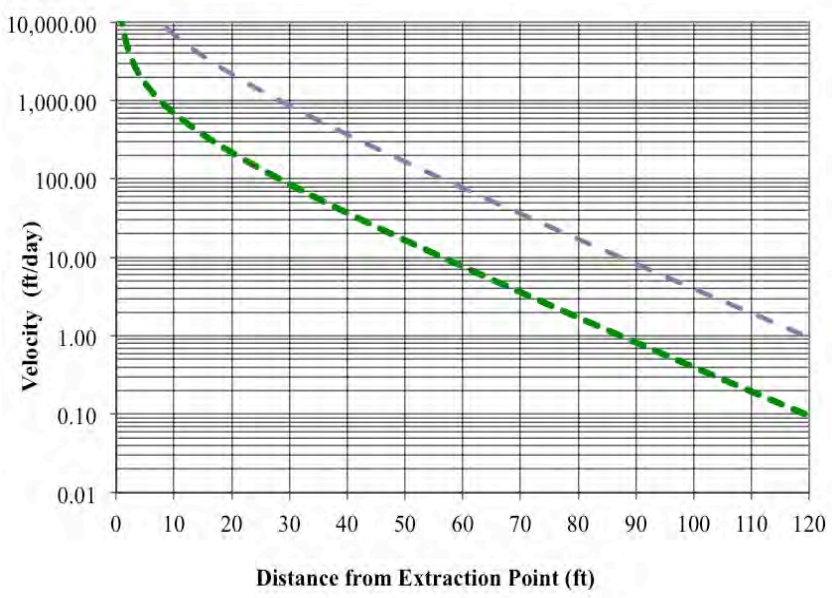


Figure B- 2: Velocity vs distance calculated using Equation 3 and a B value of 15 ft for the LowT (green) and HighT (purple) cases described in the text above

Figure B-2 shows that at the radii corresponding to 6 pascals vacuum, the induced flow velocities are about 6 ft/day for the LowK case and about 600 ft/day for the HighK case. If a goal of 3 ft/day induced velocity was used for a performance criteria, the radius of influence would be about 70 ft for the LowK case (very similar to the radius where vacuum = 6 Pa). But for the high T case, the ROI would be over 100 ft and at that radius, the applied vacuum would be much less than 0.1 pascal (inferred from extrapolation of the trend on Figure B-1), which is below the lower limit of sensitivity of most micromanometers and usually not distinguishable from fluctuations in the baseline pressure differential (and is more than 100 times lower than the target vacuum specified in ASTM E2121). This demonstrates the reason that vacuum alone is not an ideal performance metric and the permeability of the material below the floor is very important.

The travel times from different radial distances can be calculated using Equation 6, as shown in Figure B-3.

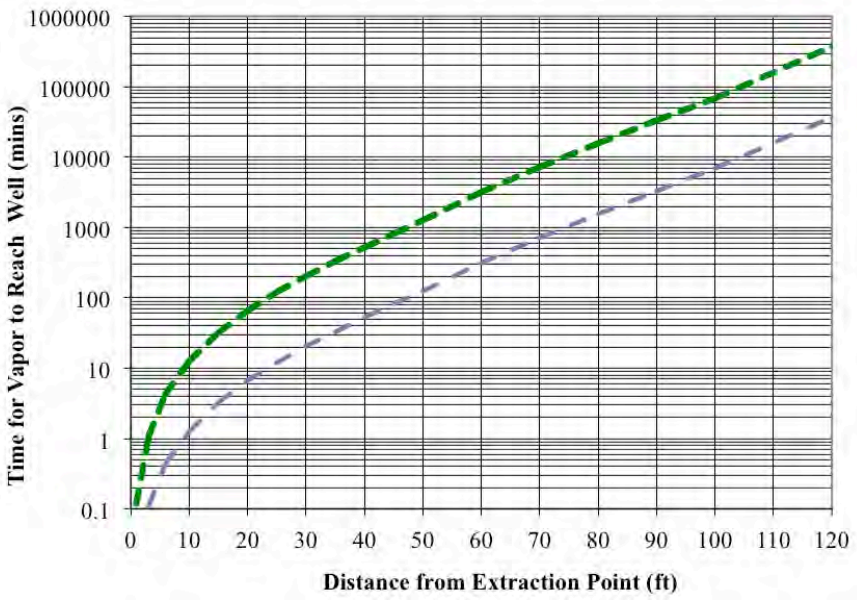


Figure B- 3: Travel time vs distance calculated using Equation 4 and a B value of 15 ft for the LowT (green) and HighT (purple) cases described in the text above

For the LowT case, where ROI based on 6 pascals of vacuum was 67 ft, the corresponding travel time is about 3.5 days. For the HighT case, where the ROI based on 6 Pa of vacuum was 37 ft, the corresponding travel times is about 30 minutes (170 times faster). This provides an insight into the rate of subslab ventilation (not just depressurization). For the hypothetical building of 100,000 ft^2 described above, the HighK system of 25 suction points and a total flow rate of 2,500 scfm would ventilate the region below the floor with an air exchange rate 170 times higher than the LowT system with 7 suction points and a total flow of 70 scfm. Note that this is not intuitive because the ratio of the system flow rates (2500/70) is 35x, not 170x. The reason for the difference is the system with larger suction-point spacing draws more air from leakage across the floor slab, and less from the subsurface, as described further below.

If the venting system was designed to remove gas from the granular fill at least once every 0.1 day, Figure B-3 shows the LowT case would be effective to a radius of about 25 ft and the HighT case would be effective to a radius of about 50 ft. For the hypothetical 100,000 ft^2 building, this would result in a system in the HighT case of 13 suction points and a total flow of 1300 scfm, and a system for the LowT case with 51 suction points and a total flow of 510 scfm. Not all cases are as bad as the 95^{th} percentile of the AF distribution, so these designs may be excessive in many cases, in which case, the building-specific attenuation factor may be useful to consider. Monitoring subslab concentrations and mass removal rates could be used to optimize the total extraction flow rate over time to maintain subslab vapor and radon concentrations at a level that poses no unacceptable risk.

The proportion of flow originating below the floor as a function of the radial distance from the point of suction can be calculated using Equation 7 and is shown on Figure B-4 for the HighT and LowT cases. Note that Equation 7 depends only on the leakage factor (B), and not on T, so the two cases result in the same relation. This chart provides information regarding the distance to which the venting system draws a significant flow from the subsurface. For the HighT case, the

radius corresponding to 6 pascals vacuum is about 36 feet, and at that radius about 20% of the flow from that distance originates in the subsurface vs 80% from leakage across the floor slab. The flow in the high T case is 100 scfm, and 20% of 100 scfm is 20 scfm. For the LowT case, the radius corresponding to 6 pascals vacuum is about 67 feet, where about 3% of the flow originates from the subsurface. The flow in the LowT case is 10 scfm and 3% of 10 scfm is 0.3 scfm (67x lower than the HighT case). For reference, EQM (2004) recommended a value of 5 L/min (0.18 scfm) as a conservative default Qsoil value for use in the U.S EPA spreadsheet implementation of the Johnson and Ettinger (1991) Model (this is for a residence with an assumed 10m x 10 m footprint).

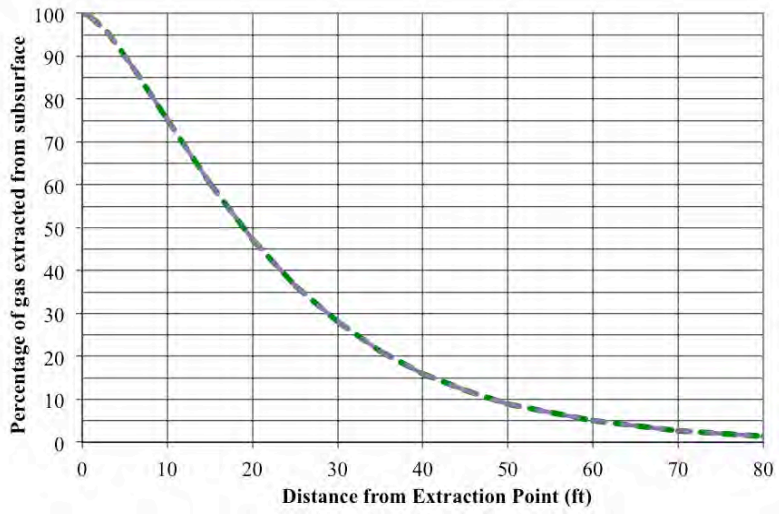


Figure B- 4: Proportion of flow originating below the floor vs distance using Equation 5 and a B value of 15 ft for the LowT (green) and HighT (purple) cases described in the text above

Figure B-5 shows the downward vertical flow across the floor for the two cases, expressed in units of L/min per 1000 ft^2 of floorspace. For the 10 scfm flow rate in the LowT case, the threshold of 5 L/min per 1000 ft^2 corresponds to a radius of about 53 ft. For the 100 scfm flow rate of the HighT case, the radius corresponding to 5 L/min per 1000 ft^2 of floor space would extend to approximately 90 ft.

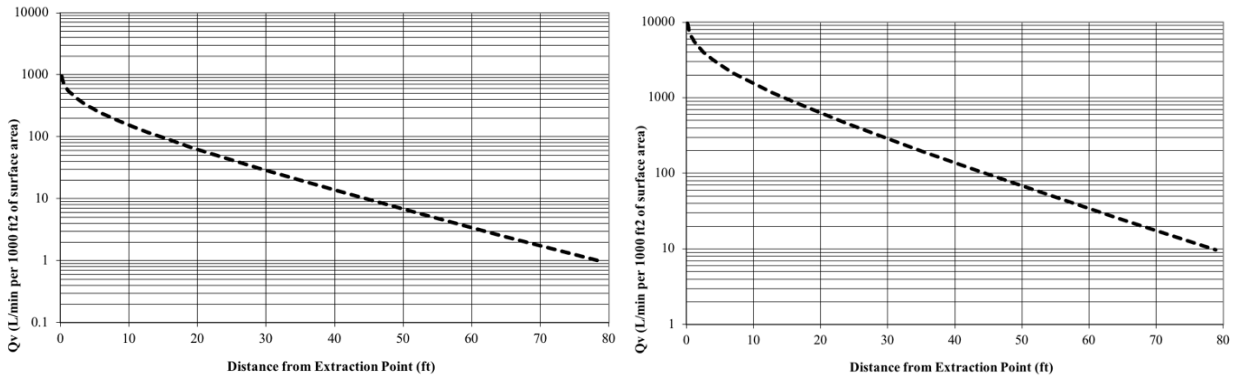


Figure B- 5: Vertical flow per 1000 ft2 of floor area for 10 scfm (left) and 100 scfm (right)

Equation 7 can also be used to estimate the energy cost of loss of conditioned air. For the HighT case, at the ROI corresponding to a vacuum of 6 Pa (36 ft), 80% of the extracted gas originates from leakage of indoor air (or 80 scfm). For the LowT case, at the ROI of 67 ft corresponding to a vacuum of 6 Pa (67 ft), the loss of conditioned air would only be 9.7 scfm. This yields almost an order of magnitude difference in the energy costs between the two cases.

The HighT and LowT cases used the same B value for simplicity. The sensitivity of the B value for these relations can also be explored. Consider a scenario with an intermediate transmissivity of 100 ft^2/day and flow rate of 50 scfm from a suction point. A HighB case might have a B value of 25 ft (this corresponds to a relatively competent floor slab) and a LowB case might have a B value of 7 ft (corresponding to a relatively leaky slab). Figure B-6 shows the four plots from Equations 4, 5, 6, and 7. The vacuum vs distance chart shows that the profile of vacuum extends much farther when the floor is less leaky. Many mitigation practitioners already measure applied vacuum at more than one radial distance as part of performance testing, and these data can be used to calibrate the vacuum vs distance profile to the B value using the model, which can be done in real time using a spreadsheet very quickly and at low cost. Note that the two curves converge at radius = 0, this is because the vacuum at the point of suction depends primarily on T and not B. Therefore, if vacuum is also measured at a small radial distance, the T value can also be calibrated by fitting the vacuum versus distance data to Equation 4.

Once the T and B values are calibrated to the vacuum vs time and vacuum vs distance data, the plot of travel time versus distance is easily generated using Equations 5 and 6. The travel time versus distance plot can be used to select a radial distance for an inter-well tracer test (for this plot, a travel time of a few minutes would correspond to a radial distance of about 10 feet for either leakage value). The tracer test can be used to verify the thickness of the zone through which the majority of gas flow occurs (b), which is a parameter in Equation 5 (but not in Equation 1 or 4, so the b value does not influence the profiles of vacuum vs time or vacuum vs distance). Once the T, B and b values have been calibrated, the model can be used to calculate the relative proportion of flow from below the floor vs distance using Equation 7.

For the leaky case (B = 7 ft, shown as the blue dashed line), the ROI corresponding to 6 pascals of vacuum is about 26 ft, but if the performance criteria included <0.1-day travel time, >3 ft/day velocity or >5L/min flow from the subsurface per 1000 ft^2 of area, the radius of influence would be 30 feet or more. For the competent slab (B = 25 ft, shown as the red dashed line), the radius of influence would be 60 feet for a travel time of 0.1 day and greater for all the other lines of evidence. The radius of influence has a direct impact on the number of suction points required to provide protection for a given footprint of building. The area of influence is simply π multiplied by the square of the radius of influence. The target treatment area divided by the area of influence provides a minimum number of suction points. Additional suction points may be appropriate if there are subsurface barriers such as bearing wall footers or preferential pathways such as subfloor utilities.

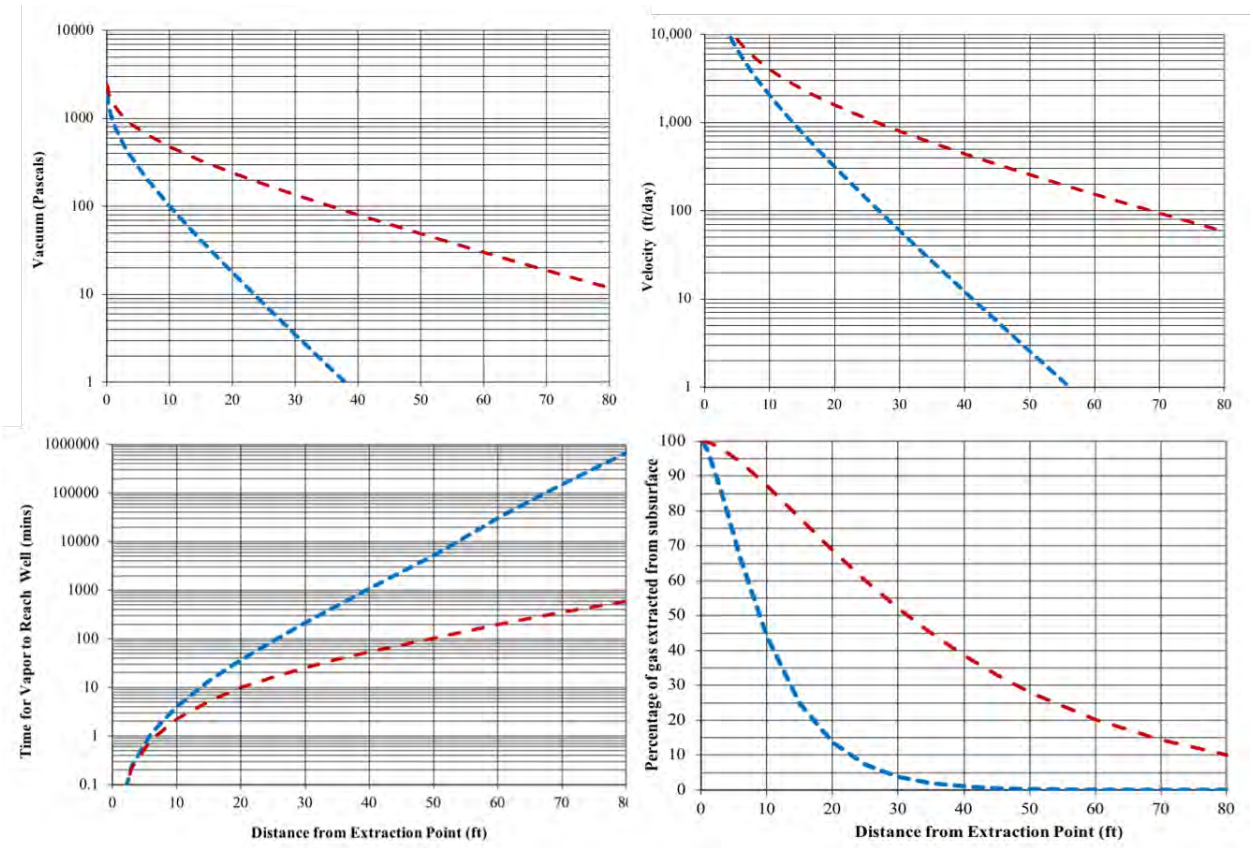


Figure B- 6: Plots of vacuum, velocity, travel time and proportion of flow from beneath the floor slab vs distance for the HighB (red) and LowB (blue) cases described in the text above

APPENDIX C. FIELD FORMS

C1.0

Site #1: Building 205

C1.1

Site #1: Building 205

Former Raritan Arsenal

DAILY FIELD REPORT	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants engineers | scientists | innovators

Project Name: ESTCP
Project Number: TR0479-02-01
Field Personnel: M. Maw (MM)

Recorded By: MM
Weather: Sunny 70's

Date: 9/10/14 **Page** 1 **of** 1
Primary Activities: Deploy Passive Reader Samplers & WMS

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0755	MM arrive onsite check in with Security and gather supplies
0810	Deploy Reader IA-01 C-175, SGT397
0815	Deploy Reader IA-02 C-124, SGT348
0820	IA-03 C-29, SGV857
0825	IA-04 C-189, SGV543 ; DUP-01 IA C-110, SGI896
0830	IA-05 C-37, SGI903
0833	IA-06 C-25, SGT337
0838	IA-07 C-220, SGT335
0841	IA-08 C-58, SGI710
0850	IA-09 C-205, SGI764
0900	VP-1 1411-AN-R-021
0915	VP-3 + DUP-02 VP
	VP-3 1411-AN-R-018
	DUP-02 1411-AW-R-001
0925	VP-6 1411-AN-R-19
0940	OA-01 C47, SFN832
0950	OA-02 / OA DUP-03 OA
	OA-02 C-198, SGI690
	DUP C-72 SGT430
1005	OA-03 C-132 SGQ641
1015	HVAC-01 1411-AN-R-020
1020	HVAC-02 C-177 SGQ579

10:27 OA-2 / HVAC-02

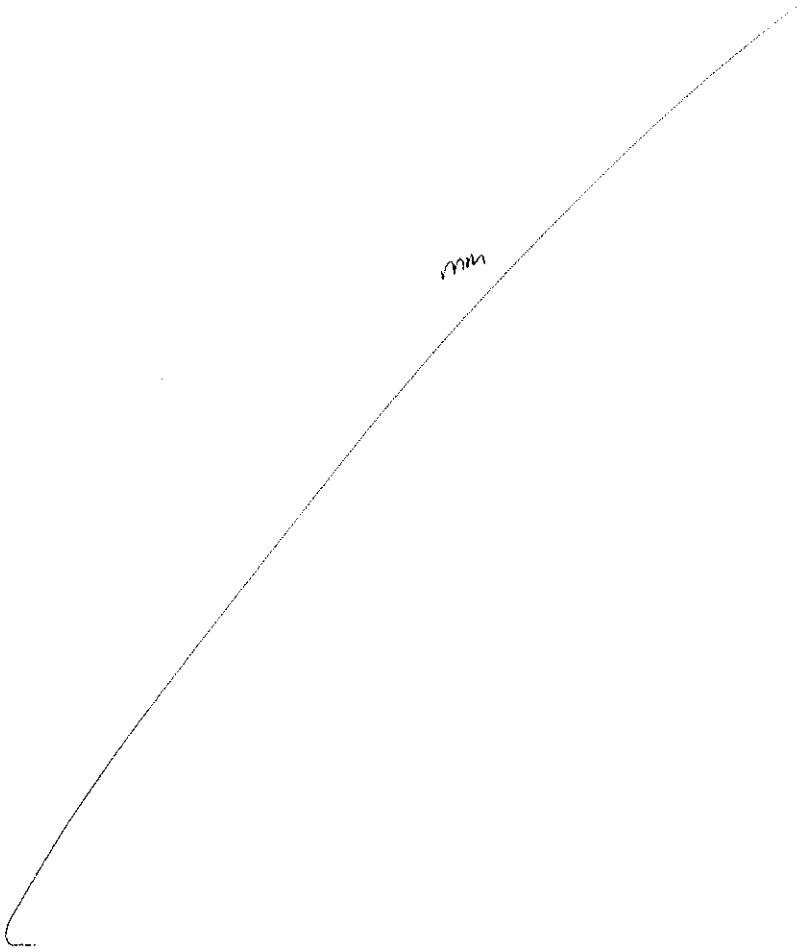
1411-AN-R-022

1035 HVAC-03
C-106 SGQ636

1040 OA-03 / HVAC-03

1411-AN-R-002

1100 MMm offsite check out with Kwong



DAILY FIELD REPORT

Geosyntec Consultants
7 Graphics Drive, Suite 106
Ewing, NJ 08628
(609) 895-1400 Fax (609) 895-1401

Geosyntec consultants
engineers | scientists | innovators

Project Name: ESTCP
Project Number: M. Mraw (MM) TR0479
Field Personnel: MM
Recorded By: MM
Weather: Sunny

Date: 10/14/14 **Page** 1 **of** 2
Primary Activities: Collect Radon & WIMS Samplers

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0800	MM onsite check in with site security
0805	Check in with Kwong
0810	Collect IA-205-01 SGT397
0814	Collect IA-205-02 SGT348
0815	Collect IA-205-03 SGY543
0821	Collect Dup-01 SGI896
0820	Collect IA-205-04 SGV543
0823	Collect IA-205-05 SGI903
0825	Collect IA-205-06 SGT337
0827	Collect IA-205-07 SGT335
0830	Collect IA-205-08 SGI710
0834	Collect IA-205-01 SGI764
0846	Collect OA-205-01 SFN832
0845	Collect OA-205-02 SGI690
	Collect Dup-02 SGT430
0850	Collect HVAC-205-01 SGQ641
0900	Collect VP-1 1411-AN-R-021
0905	Collect VP-3 1411-AN-R-018
~~0910~~	Collect ~~VP-~~ Dup-02 1411-AN-R-001
0910	Collect VP-6 1411-AN-R-019
0915	Collect HVAC-205-02 SGQ579
	Collect HVAC-02 1411-AN-R-022

DAILY FIELD REPORT	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants engineers | scientists | innovators

Project Name: ESTCP
Project Number: Millsaw (mm)
Field Personnel: MM
Recorded By: MM
Weather: Sunny
Date: 6/14/14
Page 2 **of** 2
Primary Activities: Collect Resan & wipe

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0925	Collect HVAC - 205 - 03 SGQ36
0950	Collect IA - 6 - 03 1411 AN-R- 029
0955	collect IA - 6-01 1411 - AN-R-025
1000	collect IA - 6-02 1411-AN-R-030
1010	Collect ASDS - 6-03 1411-AN-R-031
	DUP at this location shattered while trying to
	Collect sample from vent pipe
1025	Collect ASDS - 6-02 1411-AN-R-027
1035	collect ASDS - 6-01 1411-AN-R-026
1180	Mobile to build 200 call Paul N
1130	offsite

DAILY FIELD REPORT	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants

Project Name: Lanta Ardmore **Date:** 7/24/15 **Page** 2 **of** 5
Project Number: **Primary Activities:**
Field Personnel: M. Nam
Recorded By: NMM
Weather: Sunny 80s

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
1100	Mobile to building 207 meet with Kenny to retrieve vanes
1130	2 in PVC does not fit on equip, run to Home depot
1200	
~~Time~~	Vane# Pipe Velocity Range (FPM)
1205	HSF01 NMM ~~180 - 195~~
1212	HSF02 NMM ~~224 - 232~~
1218	HSF03 NMM ~~227 - 237~~
1222	HSF04 MM ~~270 - 278~~
1233	HSF05 2841 - 2873
1234	HSF06 2790 - 2804
1236	HSF07 2609 - 2614
1243	HSF08 2935 - 2967
1245	HSF09 2675 - 2705
1253	HSF04 2444 - 2461
1256	HSF03 2022 - 2031
1258	HSF02 1821 - 1834
1301	HSF01 1827 - 1853

DAILY FIELD REPORT

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7 Graphics Drive, Suite 106
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Project Name: Raritan Arsenal **Date:** 7/24/15 **Page** 3 **of** 3
Project Number: —
Field Personnel: M Mann
Recorded By: MM
Weather: Sunny 80s
Primary Activities:

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
1305	Deploy WMS at HSF01 1506-AN-R-064
1315	Deploy WMS at HSF02 1506-AN-R-055
1324	Deploy WMS at HSF03 1506-AN-R-065
1330	Deploy WMS AT DUP-01 (HSF-03) 1506-AN-R-057
1336	Deploy WMS at HSF04 1506-AN-R-056
1343	Deploy WMS at HSF05 1506-AN-R-059
1350	Deploy WMS at HSF06 1506-AN-R-060
1400	Deploy WMS at HSF07 1506-AN-R-061
1403	Deploy WMS at HSF08 1506-AN-R-067
1410	Deploy WMS at HSF09 1506-AN-R-054
1430	offsite

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DAILY FIELD REPORT

Project Name: EGTCP

Project Number: TR0979

Field Personnel: DM & PN TA

Recorded By: DM / PN

Weather:

Date: Aug 9th

Page 1 of 1

Primary Activities: Vent Pipe Vacuums and velocities

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
4258	HSF-03-B Velocity: 81 Vac 10.5
1	HSF-01-A Vel: 85 Vac 11.75
4	HSF-02-A Vel: 228 Vac 11.0
7	HSF-03-A Vel: 83 Vac 10.5
10	HSF-04-A Vel: 77 Vac 8.5
13	HSF-05-A Vel: 772 Vac 5.0
16	HSF-06-A Vel: 365 Vac 6.0
22	HSF-08-A Vel: 525 Vac 5.0
25	HSF-09-A Vel: 485 Vac: 6.0
19	HSF-07-A Vel: 485 Vac: 6.0
26	HSF09-B Vel: 435 Vac 6.0
27	HSF-09-C Vel: 555 Vac 6.0
24	HSF-08-C Vel: 899 Vac: 4.9
21	HSF-07-C Vel=475 vac =6.0
20	HSF-07-B Vel 495 vac 6.0
18	HSF-06-C Vel 596 Vac =6.0
15	HSF-05-C Vel 327 Vac 5.25
12	HSF-04-C Vel 766 Vac 8.5
9	HSF-3-C Vel 457 Vac =10.75
6	HSF-2-C Vel 187 Vac 10.75
3	HSF-1-C Vel 431 Vac 12.5
2	HSF-1-B Vel 105 Vac 11
14	HSF-5B vel 175 VAC 5.0
5	HSF 2B vel 125 VAC 12.0
11	HSF 4B vel 97 VAC 8.5
17	HSF 6B NO FLOW
23	HSF 8B Vel 41 VAC 5.25

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM, TM, PN
Recorded By: DM
Weather:

Date: Aug 9th
Page 1 of 1
Primary Activities: CO_2 test

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
11 CO	Calibration of MultiRAE
	Model # 02485
	Oxy CO LEL H_2S
	(18.0) (50ppm) (50%) (10ppm)
	All Pass
	Voc Bump test
	100ppm Iso
	Model 21907
	Mixed Gas test
	All Pass
	Voc Bump test
	100ppm Iso
	All Pass
	All low level alarms for CO_2 set at 19.5%.

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DMoh, M Marrow, T. McAlary, PN
Recorded By: DMoh
Weather: Sunny 25°C

Date: Aug 9 / Aug 10 Page 1 of ___
Primary Activities: He tests, Communication tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Aug 9	
9:00	Transient test @ Fan AB & B
9:30	Bring CO2 onto Roof
10:00	Transient test at Fan) @ AB & B
Aug 10	
820	took Bucket off VP 05
	- Retrieved VMS and formaldehyde
845	He push/pull test
	- Dose for 20 sec
	- Wait [illegible] min
	To Fill a 1L tedlar bag took
9:00	3BS - 57 sec
	3BN - 52 sec
	Atmosphere - 47 sec
	Atmosphere 107 sec
	- 2.311 "wc @ 3BS
	- 2.794 "wc @ 3BN
920	3BN sucked 1L tedlar bag in 24.4 sec

Daily Field Report

923.16 [illegible]

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DAILY FIELD REPORT

Project Name: ESTCP
Project Number: TR04 79
Field Personnel: DM MM + MM PN
Recorded By: DM
Weather: Sunny 25C

Date: Aug 10 Page 2 of ___
Primary Activities: He tests, Communication tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
~~0950~~	He push/pull @ 3BN
0950	10 sec Dose
	1 min Delay
~~1010~~	Inter well test @ 3BN
1000	3BS sucked a 1L tedlar bag in 1 min
	He push/pull @ 3BS
	10 sec Dose
	1 min Delay
1026	3BS Interwell + push pull test
	He push/pull
	10 sec Dose
	1.5 min Delay
1100	3BS2 sucked a 2/3L tedlar bag in 14 min
	Vac @ 3BS2 is 0.193
	3BS2 is 37 ft from VP3
	30 sec Dose
	5 min Delay

Daily Field Report

DAILY FIELD REPORT

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Project Name: ETEP
Project Number: TR0499
Field Personnel: DM, PN, TM
Recorded By: DM / PN
Weather:

Date: Aug 9th
Page 1 of 1
Primary Activities: Vent Pipe Pressures and velocities

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
4258	HSF-03-B Velocity 81 Vac 10.5
1	HSF-01-A Vel: 85 Vac 11.75
4	HSF-02-A Vel: 228 Vac 11.0
7	HSF-03-A Vel: 83 Vac 10.5
10	HSF-04-A Vel: 77 Vac 8.5
13	HSF-05-A Vel: 772 Vac 5.0
16	HSF-06-A Vel: 365 Vac 6.0
22	HSF-08-A Vel: 525 Vac 5.0
25	HSF-09-A Vel: 485 Vac: 6.0
19	HSF-07-A Vel: 485 Vac: 6.0
26	HSF09-B Vel: 435 Vac 6.0
27	HSF-09-C Vel: 555 Vac 6.0
24	HSF-08-C Vel: 899 Vac: 4.9
21	HSF-07-C Vel = 475 Vac = 6.0
20	HSF-07-B Vel 495 Vac 6.0
18	HSF-06-C Vel 596 Vac = 6.0
15	HSF-05-C Vel 327 Vac 5.25
12	HSF-04-C Vel 766 Vac 8.5
9	HSF-3-C Vel 457 Vac = 10.75
6	HSF-2-C Vel 187 Vac 10.75
3	HSF-1-C Vel 431 Vac 12.5
2	HSF-1-B Vel 105 Vac 11
14	HSF-5B Vel 175 Vac 5.0
5	HSF 2B Vel 125 VAC 10.0
11	HSF 4B Vel 97 VAC 8.5
17	HSF 6B NonAccess
23	HSF 8B Vel 41 VAC 5.25

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM, TM, PN
Recorded By: DM
Weather:

Date: Aug 9th
Page 1 of 1
Primary Activities: CO_2 test

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
11 20	Calibration of MultiRAE
	Model # 022485
	Oxy CO LEL H_2S
	(18.8) (50ppm) (50%) (10ppm)
	All Pass
	VOC Bump test
	100ppm Iso
	Model 21907
	Mixed Gas test
	All Pass
	VOC Bump test
	100ppm Iso
	All Pass
	All low level alarms for CO_2 set at
	19.5%

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR-0479
Field Personnel: D.Nobe, M Marcus, T. McHugh, P.N
Recorded By: D.N.
Weather: Sunny 25°C

Date: Aug 9 / Aug 10 Page 1 of
Primary Activities: He tests, Communication tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Aug 9	
9:00	Transient test @ Fan AB & B
9:30	Bring CO2 onto Roof
10:00	Transient test at Fan) @ AB & B
Aug 10	
820	took Bucket off VB 05
	- Retrieved WMS and formaldehyde
845	He ~~push/pull~~ test
	- Dose ~~Set~~ 20 sec
	- ~~Weight~~ [redacted] mg
	To fill a 1L tedlar it took
9:00	3BS - 57 sec
	3BN - 52 sec
	Atmosphere - 47 sec
	Atmosphere 107 sec
	- 2.311 "wc @ 3BS
	- 2.794 "wc @ 3BN
920	3BN sucked 1L tedlar bag in 24.4 sec

Daily Field Report

923.16 [redacted].8

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM MA + TM PN
Recorded By: DM
Weather: Sunny 25°C

Date: Aug 10
Page 2 of ___
Primary Activities: He tests, Communication tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
~~1000~~	He push/Pull @ 3BN
950	10 sec Dose
	1 min Delay
~~1010~~	Inter well test @ 3BN
1000	3BS sucked a 1L tedlar bag in 1 min
	He push/pull @ 3BS
	10 sec Dose
	1 min Delay
1026	3BS Interwell + push pull test
	He push/Pull
	10 sec Dose
	1.5 min Delay
1100	3BS2 sucked a 2/3L tedlar bag in 14 min
	Vac @ 3BS2 is 0.193
	3BS2 is 37 ft from VP3
	30 sec Dose
	5 min Delay

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTEP - HVS
Project Number: TR0479
Field Personnel: DMah, DWerts, Eckert
Recorded By: DMah
Weather: Hot, Humid

Date: 08/16/15
Page 1 of 1
Primary Activities: Velocity measurements and Dimensions of Ducts

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information				
facing	Duct	Section	Vel	Dim	Vel in kfpm
West	~~Supply~~	~~South~~	85 fpm	116 x 38	0.12
East	Exhaust	South	430 FPM	116 x 38	0.15
East	Exhaust	Middle	75 FPM	72 x 24	
West	Supply	Middle	52 FPM	36 x 36	
West	Exhaust	North	450 FPM	116 x 45	
East	Supply	North	45 FPM	116 x 45	

Daily Field Report

Daily Field Report	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants engineers | scientists | innovators

Project Name:	ESTCP - Raritan Arsenal	**Date:**	9/15/15
Project Number:		**Primary Activities:**	
Field Personnel:			
Recorded By:	Jared Brisman		
Weather:			

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0800	Arrive onsite and met with Kwong
0815	Obtained access to the roof of building 205
0825	Noted radon sampler OA-01 rolled off of initial location by approximately 25'
[illegible]	Moved sampler back to initial location
0827	Removed WMS sampler 205-V3-PO
0845	Arrive at building 205 to retrieve radon samplers
0850	close / retrieve sample C-77 / SIE 619
0853	close / retrieve sample C-5 / SIE 574
0906	close / retrieve sample C-69 / SIE 366
0911	close / retrieve sample C-204 / SIE 454
0914	close / retrieve sample C-123 / SIE 437
0916	close / retrieve sample C-211 / SIE 416
1015	filled out chain of custodys and shipped samples at fedex
1030	JB offsite

DAILY FIELD REPORT

Geosyntec Consultants
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Ewing, NJ 08628
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Project Name: Raritan Arsenal
Project Number:
Field Personnel: M. Mraw
Recorded By: MM
Weather: Sunny 70's

Date: 10/26/15 **Page** 1 **of** 1
Primary Activities: Pick up WMS

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
1345	MM Arrive onsite check in with Site Security and Kenny to gain access to Roof of Building 205
1353	Collect WMS from HSF-03
1357	Collect SF-01
1402	Collect SF-02
1405	Collect SF-03
1430	offsite

MM

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Project Name: Raritan Arsenal
Project Number:
Field Personnel: M. Mian
Recorded By: NM
Weather: Fog, 50's

Date: 12/14/15 **Page** 1 **of** 3
Primary Activities: ESTCP Bldg 205 System OMM

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0815	NM ~~Check~~ MR onsite Check in with Kuong
0830	205-S6-11 Vacuum 0.280 in H_2O
0844	HSF-03-A Vacuum 9.0 in H_2O (HVAC-A green) New
854	HSF-03-B Vacuum 9.0 in H_2O
0854	HSF-03 C Vacuum 10.2 in H_2O (UTube)
0850	HSF-03c Vacuum 8.0 in H_2O (Vacuum gauge)
0922	205-S6-12 B/B Allen key size use Health for allen key
0925	205-S6-12 Vacuum 0.727 in H_2O
0945	Cont D. Mian unable to locate 205-S6-15 and 205-S6-14
1020	205-S6-15 ~~0.044~~ 0.075 in H_2O positive pressure
1030	205-S6-14 0.005 in H_2O positive pressure
1108	1,951 fpm at ~~HF3~~ HSF-03
1110	Collect grab Samp HSF-03 Summa canister 723
1115	collect Radon grab sample HSF-03
1120	Deploy WMS at HSF-03 1511-AN-R-018
1131	Turn on Fan HSF
1133	Velocity 2,593 fpm at HSF-03
1141	Collect Summa grab sample from HSF-03
1145	collect Radon grab sample
1151	Deploy HSF-03 WMS at HSF-03 1511-AN-R-017

DAILY FIELD REPORT	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants engineers | scientists | innovators

Project Name: Rurita Arsenal
Project Number:
Field Personnel: M. Mraw
Recorded By: MM
Weather: 60's

Date: 12/14/15 **Page** 2 **of** 3
Primary Activities: ESTP Bldg 205
OMM

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
~~1205~~	offsite for lunch
1245	onsite
1247	Deploy OA-02, C115, LR7913
	Dup-0, C75, LR7812
1250	Deploy OA-01, C106, LR3136
1300	Deploy HVAC-01, C21, LS3892
1305	Deploy HVAC-02, C52, LS3770
1308	Deploy HVAC-03, C196, LR3277
~~1314~~ 1314	205-S6-15 Vacuum 0.074 mH_2O
1320	HSF-08-C Vacuum 3.8 inH_2O (U-Tube
1320	HSF-06-C 3.911 inH_2O (Zephyr)
1333	205-S6-14 Vacuum 0.030 inH_2O
1337	HSF-08B Vacuum 4.221 mH_2O
1345	HSF-08A Vacuum ~~0.052~~ 4.105 inH_2O
1348	205-S6-11 Vacuum 0.239 inH_2O
1351	HSF-03-A Vacuum 9.867
1354	HSF-03B Vacuum 9.885
1358	205-S6-12 Vacuum 0.697
1400	HSF-03C Vacuum 9.859
1425	Deploy IA-01 C-44, LR3459
1427	Deploy IA-02 C-13, LR7717
1428	Deploy IA-03 C-134, LR3329

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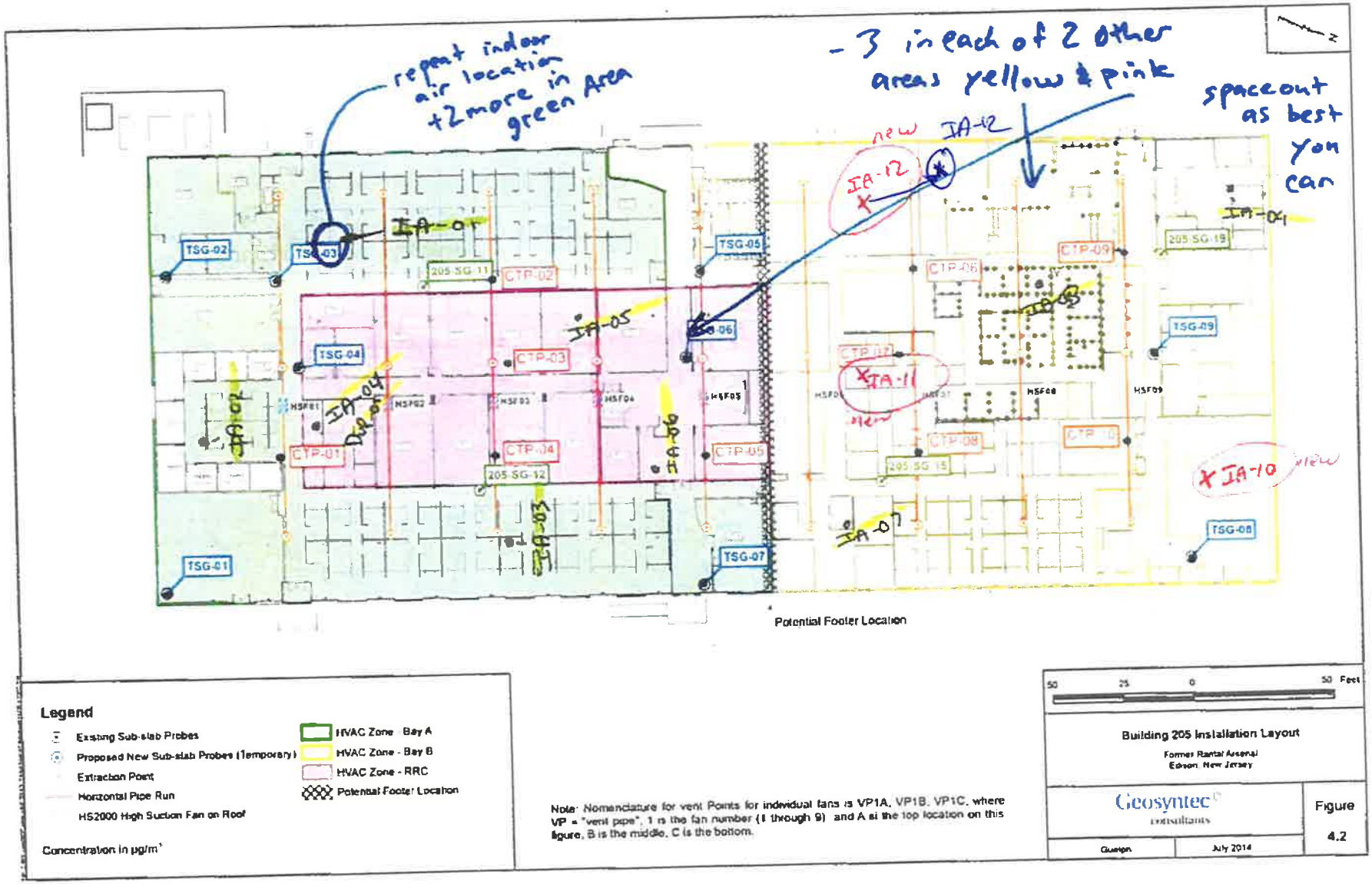
Project Name: Raritan Arsenal
Project Number:
Field Personnel: M. Maw
Recorded By: MM
Weather: 40's

Date: 12/14/15
Primary Activities: RSTP Building 205

Page 3 **of** 5

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
1435	Deploy IA-04 C108 LR3471
	Dup C76 LR3496
1437	Deploy IA-05 C-98 LR3133
	Deploy IA-06 C-70 LR7940
1441	Deploy IA-07 C-17 LR3142
1442	Deploy IA-11 C-34 LR8007
1445	Deploy IA-01 C50 LR3321
1446	Deploy IA-08 C-73 LR3105
1444	Deploy IA-12 C176 LR3148
1454	Deploy IA-10 C198 LS3680 (Behind TV)
1500	offsite

MM


repeat indoor air location +2 more in green Area
- 3 in each of 2 other areas yellow & pink
spaceout as best you can
new IA-12
IA-12
IA-11
new
IA-10
new
IA-01
IA-02
IA-03
IA-04
IA-05
IA-06
IA-07
IA-08
TSG-01
TSG-02
TSG-03
TSG-04
TSG-05
TSG-06
TSG-07
TSG-08
TSG-09
205-SG-11
205-SG-12
205-SG-13
205-SG-15
205-SG-16
CTP-01
CTP-02
CTP-03
CTP-04
CTP-05
CTP-06
CTP-07
CTP-08
CTP-09
CTP-10
HSF01
HSF02
HSF03
HSF04
HSF08
HSF09
Potential Footer Location
Legend
Existing Sub-slab Probes
Proposed New Sub-slab Probes (Temporary)
Extraction Point
Horizontal Pipe Run
HS2000 High Suction Fan on Roof
Concentration in µg/m³
HVAC Zone - Bay A
HVAC Zone - Bay B
HVAC Zone - RRC
Potential Footer Location
Note: Nomenclature for vent Points for individual fans is VP1A, VP1B, VP1C, where VP = "vent pipe", 1 is the fan number (1 through 9) and A at the top location on this figure, B is the middle, C is the bottom.
50 25 0 50 Feet
Building 205 Installation Layout
Former Raritan Arsenal
Edison, New Jersey
Geosyntec consultants
Figure
4.2
Guelph
July 2014

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0779
Field Personnel: DM BW EC
Recorded By: BW
Weather:

Date: 08/16/15 Page 1 of 1
Primary Activities: IA Samples

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	CAN	PE	INI	TIME FIN
	205-IA-01-GS	#1053	0523	29.75	13:19
	205-IA-02-GW	#1856	0540	29.77	13:19
12:59	205-IA-03-GS	#1984	0527	29.62	13:26
12:59	205-IA-04-GW	#1553	0611	29.63	13:26
12:56	205-IA-05-PS	#1554	0508	29.66	13:22
12:56	205-IA-06-PS-1	#1611	0705	29.77	13:22
12:56	205-IA-07-PW	1704	0672	29.71	13:22

WMS Deployment at VP-03 B205

Sample ID	~~Sampler~~ ID
205-V3-P.O.	1506-AN-R-078

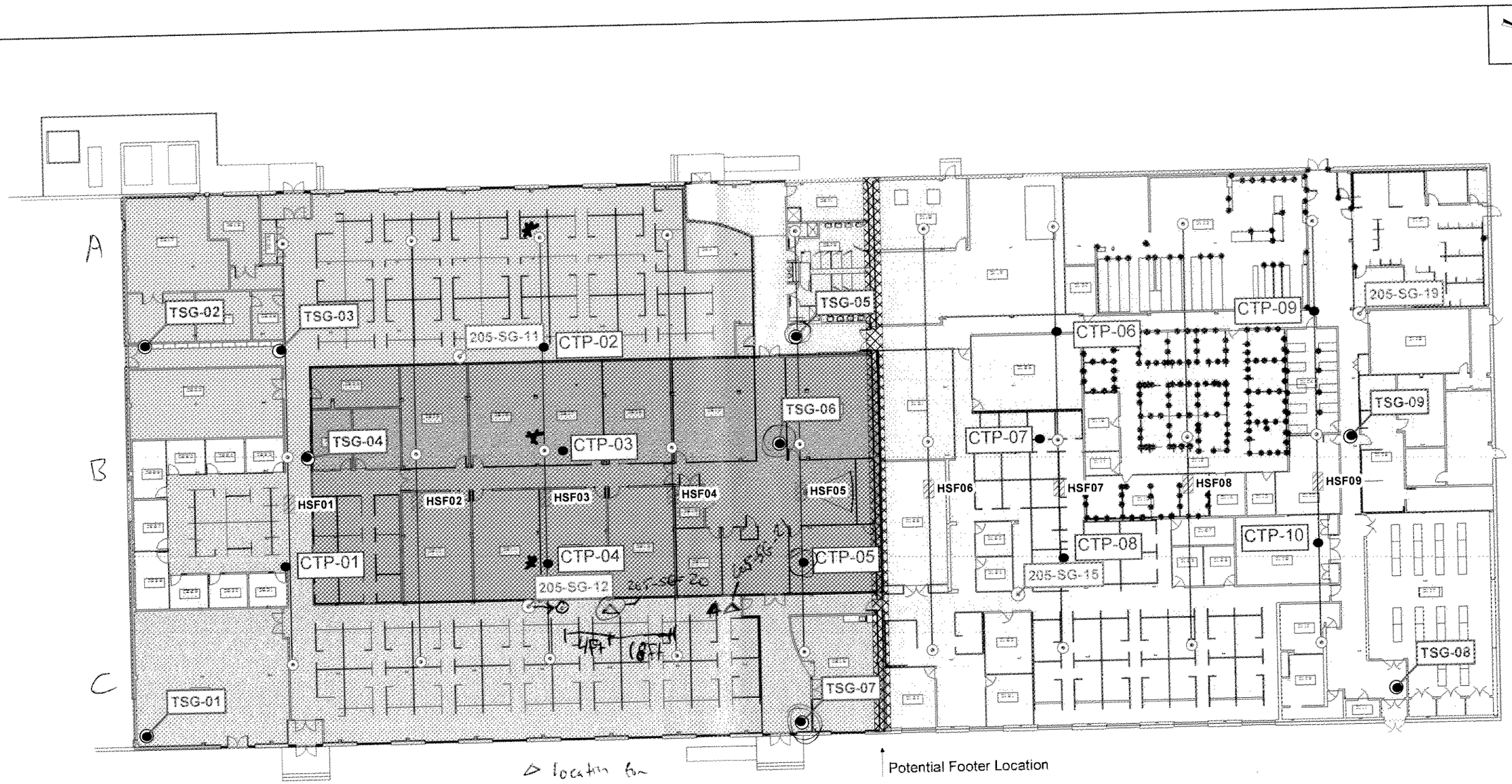
Time	Date	Method
15:40	08/16/15	TO-17

Daily Field Report

C1.2

Site #1: Building 205

Tracer Tests



* injection

Legend

- Existing Sub-slab Probes
- Proposed New Sub-slab Probes (Temporary)
- Extraction Point
- Horizontal Pipe Run
- HS2000 High Suction Fan on Roof
- HVAC Zone - Bay A
- HVAC Zone - Bay B
- HVAC Zone - RRC
- Potential Footer Location

Concentration in µg/m^3

Note: Nomenclature for vent Points for individual fans is VP1A, VP1B, VP1C, where VP = "vent pipe", 1 is the fan number (1 through 9) and A si the top location on this figure, B is the middle, C is the bottom.

50 25 0 50 Feet

Building 205 Installation Layout

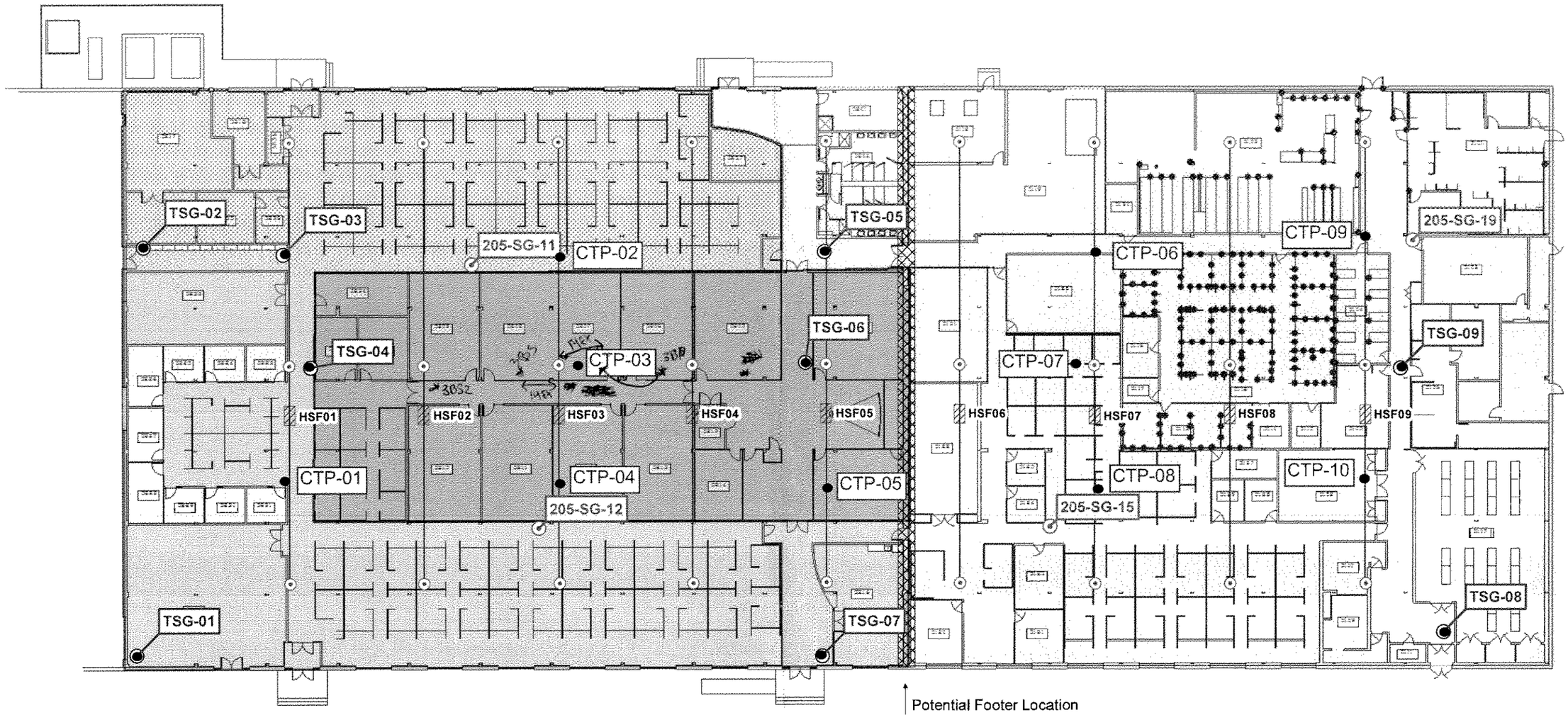
Former Raritan Arsenal
Edison, New Jersey

Geosyntec consultants

Guelph | July 2014

Figure 4.2

He Push Roll / Interwell locations



Legend

- Existing Sub-slab Probes
- Proposed New Sub-slab Probes (Temporary)
- Extraction Point
- Horizontal Pipe Run
- HS2000 High Suction Fan on Roof
- HVAC Zone - Bay A
- HVAC Zone - Bay B
- HVAC Zone - RRC
- Potential Footer Location

Concentration in µg/m^3

Note: Nomenclature for vent Points for individual fans is VP1A, VP1B, VP1C, where VP = "vent pipe", 1 is the fan number (1 through 9) and A si the top location on this figure, B is the middle, C is the bottom.

50 25 0 50 Feet

Building 205 Installation Layout

Former Rarital Arsenal
Edison, New Jersey

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Guelph | July 2014

Figure **4.2**

SAB

Time	He ppm
42:45	0
44:45	0 ppm
50:00	0 ppm
52:00	0 ppm
55:00	0 ppm
~~60:00~~ 62.00	0 ppm

Time	Loc	Helium
1:06:17	TS6-03	275
1:09:29	TS6-03	300-275
1:11:00	TS6-03	300
1:14:43	TS6-03	300-325

pressure 0.167 at TS6-03

1:19:19	205-36-11	0
1:19:39	TS6-03	0

drill holes

take sample(s)

vacuum holes

5 - [illegible] BC

DAILY FIELD REPORT

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Project Name: _____ **Date:** _____ **Page** ___ **of** ___

Project Number: _____ **Primary Activities:** _____

Field Personnel: _____

_____

Recorded By: _____

Weather: _____

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
	Location	He Conc	Description
11:30	5 [illegible] BC	0	
17:00	5 [illegible] BC	0	
30:40	5 [illegible] BC	0	
32:30	5 BC	0	
45:35	5 BC	0	
47:00	5 BC	0	
49:30	5 BC	0	
57:00		0	
60:00		0	* started FAN 9
1:20:00		0	
1:22:00		0	
1:25:00	Vent 5C	900 ppm	
1:40:00	Probe 5 B	1800	

Daily Field Report

Helium Flood 205-SG-21

elapsed time	He (ppm)
30:00	75
32:00	150
34:00	225
36:00	275
41:12	475
42:30	500
44:0	575
46:30	650
53:30	900
1:02:00	1325
1:21:30	2325
1:31:00	2650

Location 205-SG-20 (New Drilled hole)

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DAILY FIELD REPORT

Project Name: _____ Date: _____ Page ___ of ___

Project Number: _____ Primary Activities: _____

Field Personnel: _____

_____

Recorded By: _____

Weather: _____

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	Location Helium Description
634	75
650	175
750	200
756	225
802	250
813	275
847	350
912	400
938	475
1000	525
1020	575
1258	~~1100~~ 1050
1350	1175
1425	1300
1450	1375
1530	1500
1745	~~2000~~ 1950
1930	2250 Adjusting He to 2.2%
2010	2350
2105	2475
2200	2600
23:30	2950
24:30	3125
25:30	3275
26:30	3450
27:30	3650
38:00	5600
56:00	7300
59:00	7525
1:29:00	9475

Daily Field Report

FMM-MD SENSOR ASSEMBLY LOGSHEET

Geosyntec consultants
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DAILY FIELD REPORT

Project Name: ESTCP
Project Number: TR0479
Field Personnel: DMall PNicholson
Recorded By: DMall
Weather: Sunny 30°C

Date: Aug 8 2014 Page 1 of 2
Primary Activities: Radon/HC#0 sampling
Daily Hrs:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information				
	Indoor	Out door	VP09	VP01	VP02
SA serial	017M13	016M13	018M13	018M13	016M13
FMM-MD Serial	SA#01	SA#03	SA#02	SA#02	SA#03
Site ID	IN01	EX01	VP09	VP01	VP02
Measurement type	Cont	Direct	Direct	Direct	Direct
At start of exp Sample #	001	201	101	102	103
Date	Aug 8	Aug 8	Aug 8	Aug 8	Aug 8
Time	848	917	904	1039	1052
Prior exp?	Y	Y	Y	Y	Y
Photograph taken?	Y	Y	Y	Y	Y
End of Exp Date	Aug 8	1049	10:35	12:11	12:23
Time	~~2104~~	Aug 8	Aug 8	Aug 8	Aug 8
Last Read	~~[illegible]~~ 1800	<10ppb	<10ppb	<10ppb	<10ppb
Replace SA and Place in bag	903	No	No, taking another sample	No	No

Daily Field Report

FMM-MD SENSOR ASSEMBLY LOGSHEET

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DMal; PNicholson
Recorded By: DMal
Weather: Sunny 30°C

Date: Aug 8 2014
Page 2 of 2
Primary Activities: Radon/HCHO Sampling
Drill Holes

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information					
	VP03	VP04	VP05	VP06	VP07	VP08
SA Serial	018M13	016M13	018M13	016M13	018M13	016M13
FMM Serial	SA#02	SA#03	SA#02	SA#03	SA#02	SA#03
Site ID	VP03	VP04	VP05	VP06	VP07	VP08
Measurement type	Direct	Direct	Direct	Direct	Direct	Direct
At Start of Exp Sample #	104	105	106	107	108	109
Date	Aug8	Aug8	Aug8	Aug8	Aug8	Aug8
Time	12:13	1225	1352	1402	1528	1534
Prior Exp?	Y	Y	Y	Y	Y	Y
Photo taken?	Y	Y	Y	Y	N[sic]	N
End of Exp Date	Aug8	Aug8	Aug8	Aug8	Aug8	Aug8
Time	1550	1401	1524	1532	1718	1719
Last Reading	<10ppb	<10ppb	37ppb	44ppb	<10ppb	
Replace SA in Foil?	No	No	No	No	No	No

Daily Field Report

FMM-MD ~~018M13~~ 016M13
SA ~~#02~~ #03
SAMPLE # 200
CONTINUOUS MODE
INDOOR

START 19:23
STOP 21:05
12ppb

FMM-MD SENSOR ASSEMBLY LOGSHEET

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DAvis, PNicholson, DHill, Hulsey
Recorded By: DAvis
Weather: Sunny 30°C

Date: Aug 8 2014 Page 1 of 2
Primary Activities: Radon/HCHO Sampling

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information				
[redacted]	Indoor	Out door	VP09	VP01	VP02
SA serial	017M13	016M13	018M13	018M13	016M13
FMM-MD Serial	SA#01	SA#08	SA#02	SA#02	SA#03
Site ID	IN01	EX01	VP09	VP01	VP02
Measurement type	Cont	Direct	Direct	Direct	Direct
At start of exp Sample #	001	201	101	102	103
Date	Aug 8	Aug 8	Aug 8	Aug 8	Aug 8
Time	848	917	904	1039	1052
Prior exp?	Y	Y	Y	Y	Y
photograph taken?	Y	Y	Y	Y	Y
End of Exp Date	Aug 8	1049	10:35	12:11	12:23
Time	~~1210~~ 2104	Aug 8	Aug 8	Aug 8	Aug 8
Last Reading	~~1ppb~~ 18ppb	<10ppb	<10ppb	<10ppb	<10ppb
Replace SA and Place in bag	YES	NO	No, taking another Sample	No	NO

Daily Field Report

C1.3
Site #1: Building 205
Radon Sampling

Radon Sampling Sheet

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DAILY FIELD REPORT

Project Name: ESTCP
Project Number: IR0479
Field Personnel: D.Mali P. Nicholson
Recorded By: D.Mali
Weather: Sunny 30°C

Date: Aug 8 2014 Page 2 of ___
Primary Activities: Radon/HCHO Sampling
Drilling Holes

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1144	Serial # 3707
	Sample ID RADVP04
	Purge Began
1148	Start Sample
1250	Finished Sample
1207	Serial # 3523
	Sample ID: RADVP05
	Started Purge
1203	Started Sample
1303	Finished Sample
1253	Serial # 3707
	Sample ID: RADVP06
	Started Purge
1255	Started Sample
1356	Finished Sample
1309	Serial # 3523
	Sample ID: RADVP07
	Started Purge
1310	Started Sample
1411	Finished Sample
1358	Serial # 3707
	Sample ID: RADVP08
	Started Purge
1359	Started Sampling
	Finished Sampling

Daily Field Report

* 87ft from front edge of building 3 102ft from ISRG Prop to GS

Radon Sampling Sheet.

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DAILY FIELD REPORT

Project Name: ESTCP
Project Number: IR0479
Field Personnel: DMoll PNicholson
Recorded By: DMoll
Weather: Sunny 30°C

Date: Aug 8 2014 Page 1 of ___
Primary Activities: Radon & HCHO Samples and Drill Holes

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
905	Serial # 3707
	Sample ID: ~~RADEX09~~ RADVP09
	Purging began
9:20	Started Sampling
10:16	Finished Sampling
9:16	Serial # 3523
	Sample ID: RADVP01
	Purging began
9:41	Started Sampling
10:41	Finished Sampling
10:27	Serial # 3707
	Sample ID: RADVP02
	Purging Began
10:38	Sampling Began
11:40	Finished Sampling
10:47	Serial # 3523
	Sample ID: RADVP03
1056	Started Purge
11:57	Finished Sampling.

©Daily Field Report

Radon Sampling Sheet

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: IR0479
Field Personnel: DMak, D. Nicholson
Recorded By: DMak
Weather: Sunny 30°C

Date: Aug 8 2014 Page 2 of ___
Primary Activities: Radon/HCHO Sampling
Drilling Holes

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1144	Serial # 3707
	Sample ID RADVP04
	Purge Began
1148	Start Sample.
1250	Finished Sample
1201	Serial # 3523
	Sample ID: RADVP05
	Started Purge
1203	Started Sample
1303	Finish Sample
1253	Serial # 3707
	Sample ID: RADVP06
	Started Purge
12.55	Started Sample
1356	Finished Sample
1309	Serial # 3523
	Sample ID: RADVP07
	Started Purge
1310	Started Sample
1411	Finished Sample
1358	Serial # 3707
	Sample ID: RADVP08
	Started Purge
1359	Started Sampling
	Finished Sampling

Daily Field Report

* 87ft from fan to edge of building 3 102ft total
ISCR Proj Mgr

Radon Sampling Sheet.

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0478
Field Personnel: DMoll PNicholson
Recorded By: DMoll
Weather: Sunny 30°C

Date: Aug 8 2014 Page 1 of ___
Primary Activities: Radon & HCHO Samples and Drill Holes

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
905	Serial # 3707
	Sample ID: ~~RADEX09~~ RADVP09
	Purging begin
9:20	Start sampling
10:30	Finished Sampling
9:16	Serial # 3523
	Sample ID: RADVP01
	Purging began
9:41	Started Sampling
10:41	Finished Sampling
10:27	Serial # 3707
	Sample ID: RADVP02
	Purging Began
10:38	Sampling Began
11:40	finished Sampling
10:47	Serial # 3523
	Sample ID: RADVP03
1056	Started Purge
11:57	Finished Sampling.

Daily Field Report

C2.0

Site #2: Building 200

Former Raritan Arsenal

C2.1
Site #2: Building 200
General Notes

DAILY FIELD REPORT	Geosyntec Consultants 7 Graphics Drive, Suite 106 Ewing, NJ 08628 (609) 895-1400 Fax (609) 895-1401	Geosyntec consultants

Project Name: Raritan Arsenal **Date:** 7/24/15 **Page** 1 **of** 3
Project Number: **Primary Activities:**
Field Personnel: M. Mraw
Recorded By: NM
Weather: Sunny

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information			
0800	Arrive at USEPA Raritan Arsenal			
	Check in with Kevin at bldg 207			
0805	Health and Safety ladder safety			
	3 points of contact			
~~0820~~ 0820	Mobilize to bldg 200 Nurse station.			
0825				
	Location	Vacuum in H2O	Velocity Rate (FPM)	Vent Pipe off
0831	ASDS 200-1	-2.832	35 - 36	NA
0849	ASDS 200-2	2.786	36 - 37	NA
0852	ASDS 200-3	2.801	35 - 37	NA
0900	ASDS 200-1	2.912	41 - 42	200-2, 200-3
0905	ASDS 202	3.133	36 - 39	200-1, 200-3
0910	ASDS 203	3.106	35 - 41	200-1, 200-2
0920	Set up Summa Canister for Sampling at 200-1			
0942	Sampled ASDS-200-1 Can 668, Vac 29.2 to 0.6 in Hg			
	Batch L1515395-02			
958	Sampled ASDS-200-2 Can 875, Vac 28.2 to 1.1 in Hg			
	Batch L1515395-02			
1000	Sampled ASDS-200-3 Can 573 Vac 29.2 to 0.9 in Hg			
	Batch L1515395-02			
1025	Deploy WMS at ASDS-200-1 1506-AN-R-0606			
1035	Deploy WMS at ASDS-200-2 1506-AN-R-062			
1040	Deploy WMS at ASDS-200-3 1506-AN-R-063			

Kevin 732-241-4185

DAILY FIELD REPORT

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Project Name: ESTCP HIS
Project Number: TR0479.
Field Personnel: D Mah W. Weitz E Ockel
Recorded By: DMah
Weather: Sunny

Date: 08/13/15 Page 1 of 1
Primary Activities: Meet & Greet, Radon Samples

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1312	- Meeting with Kwong, Steve, & Barry of the maintenance. Bill, Darius & Emily from Geosyntec.
	- going over what we need from their crew.
	- Mike & Jim joined from operations.
	- Plan of action is to manually position the dampers, turn off the supply & keep the exhaust going
	- estimates +/- 1.5 HER
	- runs in occupied vs unoccupied mode.
	- Ask security to call Northside on radio.
	L Northside will let us in to B200
	- Contact Steve or HVAC via radio.
1415	- went to Building 200 to set up for Radon samples
1730	- took Stakre vacuum measurements at 9/11 SSD locations, and made 3 New SSD locations 3 ft from vent pipes.
1845	- taking Radon & thoron measurements from all 3 Vent pipes & Combined vent pipe
2215	- Finish sampling leaving site.

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: IR0479
Field Personnel: DMoll, W Weitz, E. Ockert
Recorded By: D Moll
Weather: Very Hot, Humid

Date: 08/18/15 Page 1 of 2
Primary Activities: Radon, Thoron, IA, Samples, Pressure transducer collection

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
705	- Arrived on Site
	- Going to build stack extention
920	Called Scott (HVAC team) to
	ask which way the exhaust is facing,
	he told me west in the North East
	in the South and not sure in the middle
930	took Velocities of Ducts
1007	took Sample at South Duct. on roof
1015	took Sample at Middle Duct on roof
1023	took sample at North Duct on roof
1107	Not installed Stack anymore after
	talking with Todd.
1230	- Bill taking Stationary & walk around
	Samples on B205
	- Dames taking Thoron & Tedlar Radon Samples
	in B205, same locations as Manometer
	Meters.
1230	- Purple Radon collected at 1230. (B205 Indoor Radon Samples)
1246	- Green - ~~East~~ East collected at 1246. (B205 Indoor Radon Samples)
1259	- Green - West collected at 1259 (B205 Indoor Radon Samples)
1305	- Yellow - East called at 1305 (B205 Indoor Radon Samples)
1406	- took tedlar bag Sample at B205
1408	- started RAD7 Single at B200
	L for Thoron.
	- Also took tedlar bag Samples for Radon Analysis

Daily Field Report

DAILY FIELD REPORT

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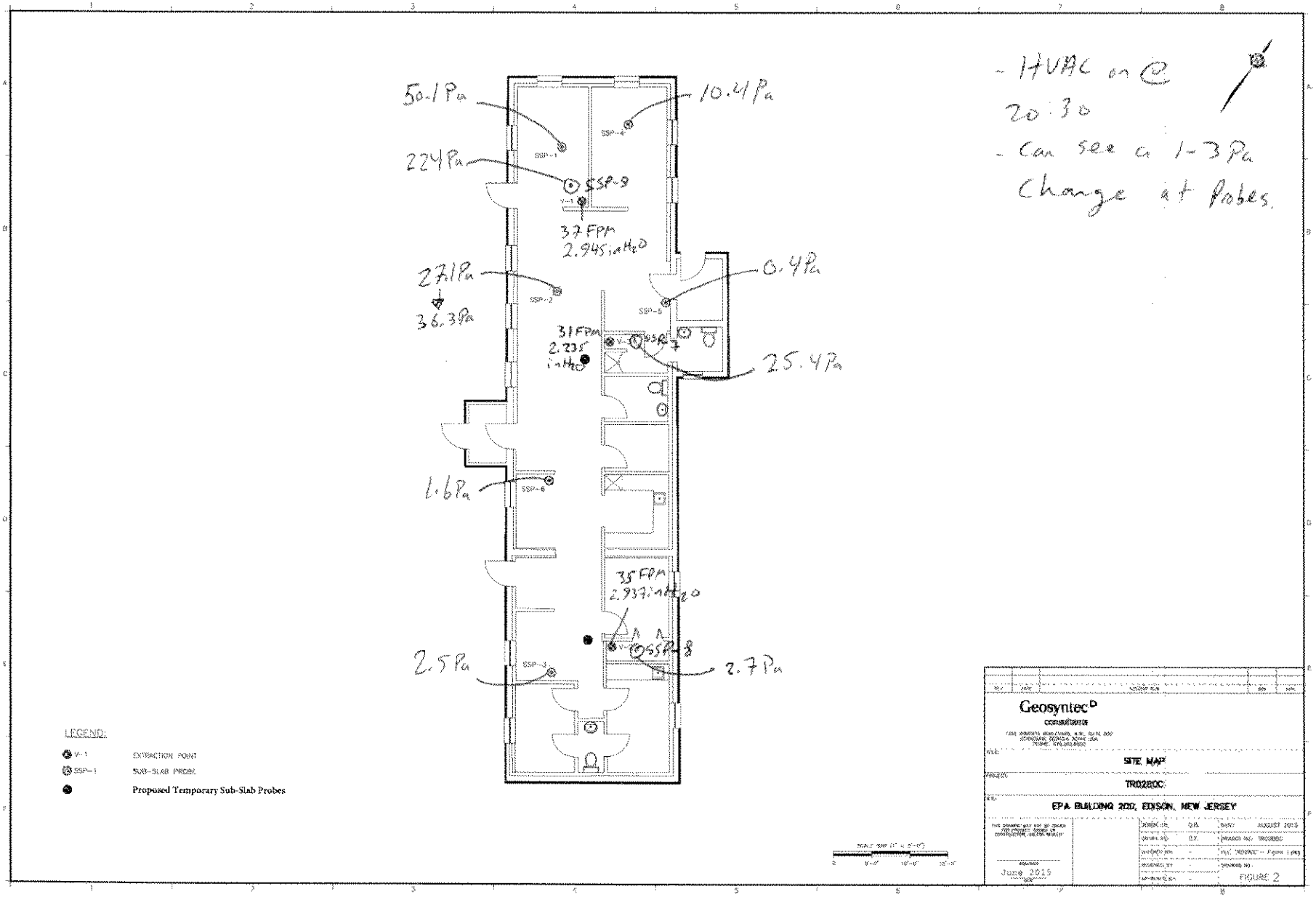
Project Name: ESTCP
Project Number: IR0479
Field Personnel: D Mali, W Weitz, E. Oakes
Recorded By: D Mali
Weather: Very Hot, Humid

Date: 08/16/15 Page 2 of 2
Primary Activities: IM, Radon, & Thoron Samples

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1415	Deploying Ecorns in B700.
1605	left Site for Airport.

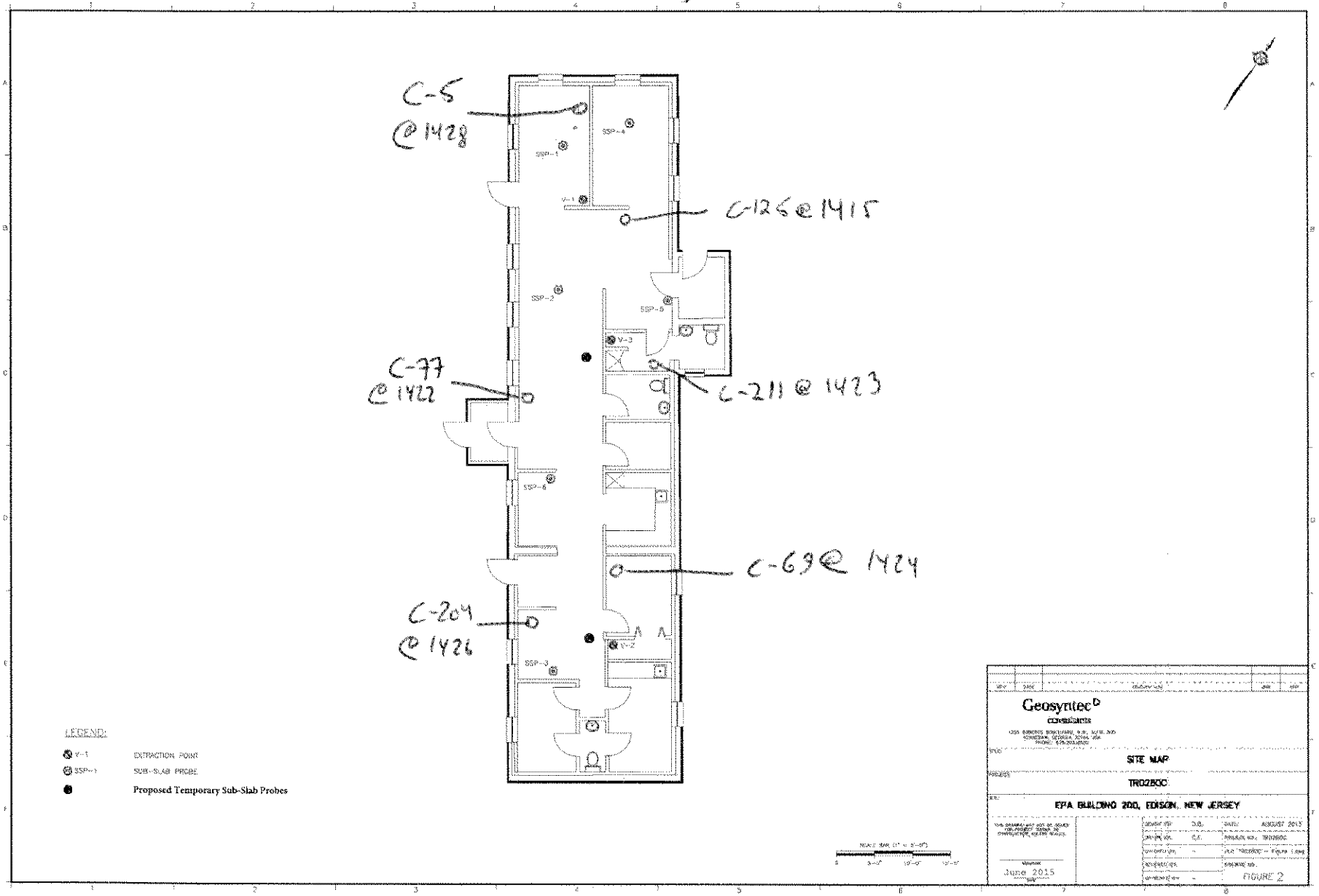
Daily Field Report

STATIC VACUUMS AT SSP & Vacuum / Flow Rates at VENT PIPES. 08/13/15

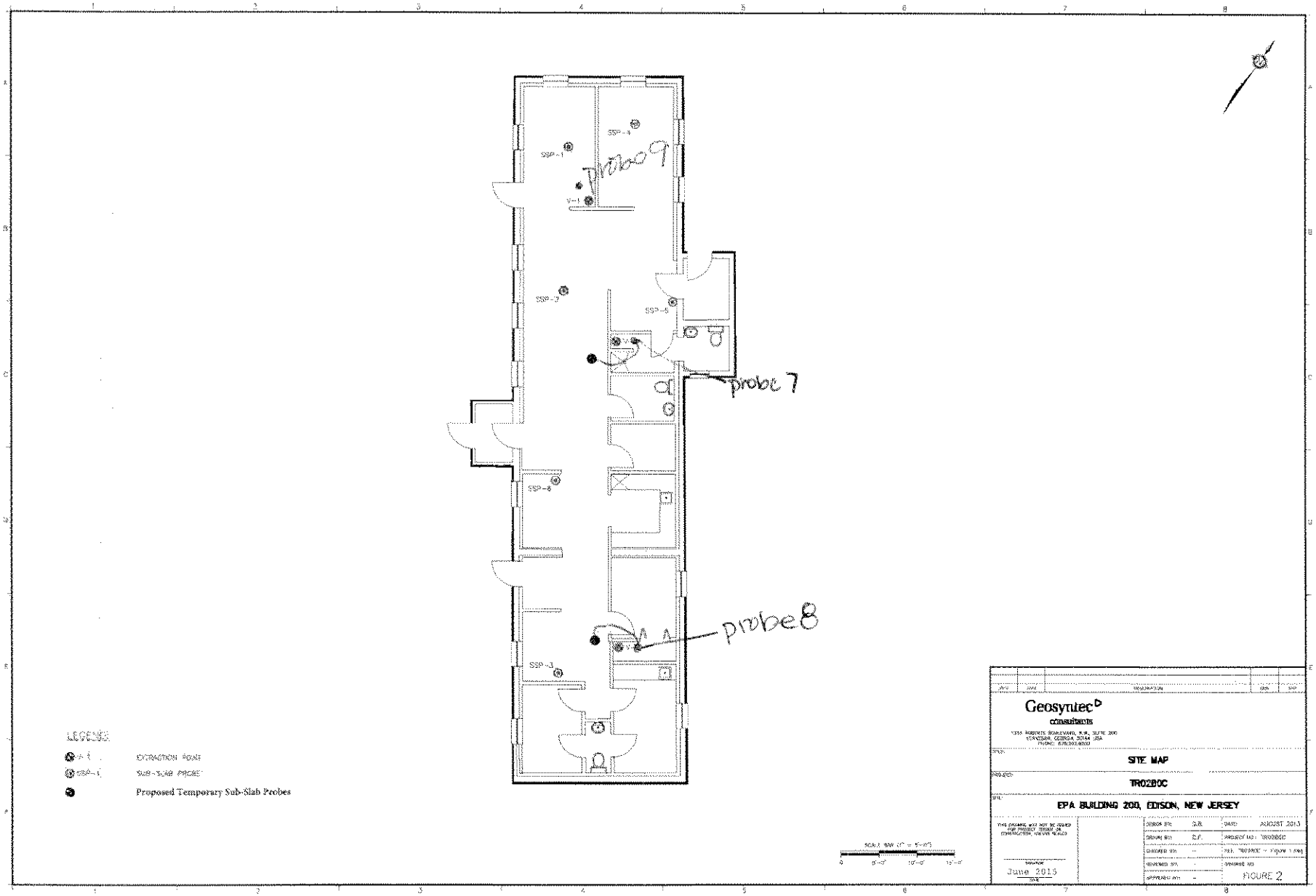


08/10/15

EPerm1 locations



NEW PROBE INSTALLS
(TEMP)



DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW EO TM
Recorded By: DM EO
Weather:

Date: 08/14/15 Page 1 of 1
Primary Activities: Tracer tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
	Vent Pipe	Probe #	distance (in)
	1	2	137
	1	1	103
	1	4	145
	1	5	157
	1	7	207
	3	7	36
	3	2	98
	3	1	297
	3	4	330
	3	5	122
	3	6	213
	2	6	271
	0	6	
	2	3	
	2	8	36
	2	3	107
	3	7	36
	1	9	36

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: M. Mraw (MM)

Recorded By: MM
Weather: Sunny 60's

Date: 4/15/16 **Page** 1 **of** 2
Primary Activities: Fan Replacement

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0745	MM onsite Site Security opens up B2000
0803	Vacuum exterior 4.462 in H_2O with Zephyll +
0806	Dwyer Velocity 110 fpm Range on Dwyer 1500
	Range set to 5000 215 fpm
813	Range set to 500 – 105 fpm
817	ASDS-2000-1 Vacuum 4.334 in H_2O
	Velocity 99 fpm
820	ASDS-2000-3 Vacuum 4.327 in H_2O
	velocity 92 fpm
0840	Kenny attempt to find key for locked
	room in B2000 with ASDS-2000-2
0900	James + helper, Bob (Electrician) onsite
	helper forgot ~~license~~ license will not
	be allowed onsite, helper also gave security attitude
0905	Conduct H+S discuss regarding head
	Safety ladder safety
	JAMES MUSARRA
0920	ASDS-2000-2 Vacuum 4.122 in H_2O
	Velocity 92 fpm

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: M. Mraw (MM)

Recorded By: MM
Weather: Sunny 60's

Date: 4/15/10 **Page** 2 **of** 2
Primary Activities: Fan Replacement

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
924	~~0.5 amps at 240V~~ 240V for old System ~~(1.0 amps)~~ 120W
0925	Shut down system begin install of new system
0947	Interim velocity measurement Suspect interior measurements do not add up to exterior
1044	finish install full throttle in new fan 1.8 amps at 120 V 216W
1100	Call Bill Bigham how to throttle down fan, Begin to throttle down fan to 5 in H_2O
1108	0.5 amps at 120V 60W
1120	James & Bob offsite
1122	Vacuum 5.079 in H_2O exterior
	velocity 118 fpm exterior
	Vacuum 5.065 in H_2O ASDS-200-1
	Velocity 112 fpm ASSD-200-1
1128	Vacuum 5.030 in H_2O ASDS-200-3
	Velocity 110 fpm ASDS-200-3
1131	Vacuum 5.025 in H_2O ASDS-200-2
	Velocity 110 fpm ASDS-200-2
1230	Turn back on old system with bleed valve open to ambient air to check System
1245	offsite

DAILY FIELD REPORT

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Project Name: Raritan Arsenal ESTCP
Project Number:
Field Personnel: M. Marra
Recorded By: MM
Weather: Sunny 60s

Date: 4/19/16 **Page** 1 **of** 1
Primary Activities: Install of Alarm & collect measurements

Time	Description of activities – location of work, work performed, equipment & personnel used, incidental information
0815	MM onsite check in with Site Security
	& Arrive at Bldg
0820	Gather equipment
0826	Exterior Vac 5.126 in H_2O
0834	Pitot tube vac -0.565 in H_2O
	velocity 3012.546 ft/min
	Flow 145.913 ft^3/min
0845	ASDS-200-1 Vac 5.014 in H_2O
	Pitot tube vac -0.003 in H_2O
	Vel 214 ft/min Flow 10.632 ft^3/min
0903	ASDS-200-3 Vac 4.935 in H_2O
	Pitot tube -0.001 in H_2O
	vel 126.734 Flow 6.134 ft^3/min
0920	Install audible alarm at ASDS-200-1
	Pitot tube vac -0.630 in H_2O exterior
	velocity 3181.117 ft/min 154.078 ft^3/min
0943	Pitot tube exterior -0.275 in H_2O
	-0.125 in H_2O
1054	ASDS-200-1 Pitot tube -0.001 in H_2O
	ASDS-200-3 Pitot tube -0.001 in H_2O
1105	ASDS-200-2 Vac 4.890 in H_2O
	Pitot tube 0.010 in H_2O

C2.2
Site #2: Building 200
Tracer Testing

Project Number: TR0479 Primary Activities: SF6 and He Tracer Tests

Recored by: Bill W.

SF6 Tracer Test at Building 200

Meter SN	Vent Pipe #	Elapsed Time After SSV Start (min)	IA Concentration (ppm)	Vent Concentration (ppm)	% IA in Vent
Note: Measured IA and Vent Concentrations differed depending on which meter was used. Overall the IA concentrations were evenly distributed and diminished slightly over the course of the test. Sf6 was added to the IA after testing Vent 1 & Vent 3 (i.e. before testing Vent 2).					
1123594	1	18-21	128	48.0	37.5
0006593	1	25	160	60.0	37.5
0006593	1	45-52	165	90.0	54.5
1123594	3	18-21	128	20.0	15.6
0006591	3	41:22	126	20.0	15.9
0006591	3	47:20	128	25.6	20.0
Redose IA with SF6					
0006593	2	64:25	150		
0006593	2	67	141		
0006593	2	73	164	0.0	0
0006593	2	81:45	108		
0006591	2	87:32	99.5	0.0	0

Building 200 Transient Response Tests
8/14/2015

Transient Test 1 Vent Pipe 1 off 2 minutes then on with vent 2 & 3 open

Start Cycle 1 Closed Time: 10:06 Open Cycle 1 Time: 10:08
10:08

Start Cycle 2 Closed Time: 10:10 Open Cycle 2 Time: 10:12

Complete test 10:14

HVAC off @ ~10:13
Transient Test 2 Vent Pipe 2 off 2 minutes then on with vent 1 & 3 open

Start Cycle 1 Closed Time: 10:14 Open Cycle 1 Time: 10:16

Start Cycle 2 Closed Time: 10:18 Open Cycle 2 Time: 10:20

HVAC on @ 10:16: 28
HVAC off @ ~10:22:02
HVAC on @ ~10:30:30
HVAC off @ ~10:39 ?
HVAC on @ 10:45:18
HVAC off @ 10:??? (<10:53)
HVAC on @ 10:59:36
HVAC off @

Transient Test 3 Vent Pipe 3 off 2 minutes then on with vent 1 & 2 open

Start Cycle 1 Closed Time: 10:21 Open Cycle 1 Time: 10:23

Start Cycle 2 Closed Time: 10:25 Open Cycle 2 Time: 10:26

Transient Test 4 Vent Pipe 1 & 3 off 2 minutes then Vent Pipe 1 on then off two minutes with vent 3 closed and vent 2 open

Start Cycle 1 Closed Time: 10:29 Open Cycle 1 Time: 10:31

Start Cycle 2 Closed Time: 10:33 Open Cycle 2 Time: 10:35

Transient Test 5 Vent Pipe 1 & 3 off 2 minutes then Vent Pipe 3 on then off two minutes with vent 1 closed and vent 2 open

Start Cycle 1 Time: 10:37 Open Vent 3 Time: 10:39

Start Cycle 2 Time: 10:41 Open Vent 3 Time: 10:43

Transient Test ~~6~~ Vent Pipe 2 & 3 off 2 minutes then Vent Pipe 2 on then off two minutes with vent 3 closed and vent 1 open

Start Cycle 1 Time: 10:45 Open vent 2 Time: 10:47

Start Cycle 2 Time: Open Cycle 2 Time:

10:49 Pipe 1 open late therefore re do test

Transient Test 6 (redo) Vent Pipe 2 & 3 off 2 minutes then Vent Pipe 2 on then off two minutes with vent 3 closed and vent 1 open

Start Cycle 1 Time: 10:51 Open vent 2 Time: 10:53

Start Cycle 2 Time: 10:55 Open vent 2 Time: 10:57

All open at 10:59

HVAC off @ 11:35:25~

Transient Test 7 Blower off two minutes with vent 3 vents open
Start Cycle 1 Time: 15:38 Open Cycle 1 Time:15:40

Start Cycle 2 Time: 15:42 Open Cycle 2 Time: 15:44

Transient Test 8 Blower off two minutes with vent 3 vents open recirculation valve off

Start Cycle 1 Time: Open Cycle 1 Time: 15:47

Start Cycle 2 Off Time:3:49 Open Cycle 2 Time: 15:51

Off Time 15:53

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW EO TM
Recorded By: BW
Weather:

Date: 08/14/15 - 08/15/15 **Page** 1 **of** 3
Primary Activities: He Tests, SF_6 tests

Time of Injection	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
	Helium Probe	He Concentration	
		08/14/15 (8pm)	08/15/15 (8AM)
19:35	1	2.1%	1.8%
19:38	9	4.3%	3.1%
19:39	2	3.5%	1.7%
19:41	5	2.5%	0.85%
19:43	4	3.0%	1.0%
19:44	7	8.4%	1.7%
19:45	6	0.0%	0.0%
19:46	3	0.8%	~~0.99%~~ 1.4%
19:46	8	10.8%	0.99%
19:47	VP-2	18.3%	11.2%
	VP-1	4.3%	3.7%
	VP-3	10.7%	4.4%
		08/14/15 (Noon)	
Same as	1	1.5%	
above.	9	2.5%	
	2	1.2%	
	5	3750 ppm	
	4	8700 ppm	
	7	1.3%	
	6	0 ppm	
	3	1.2%	
	8	5800 ppm	
	VP-2	7.8%	
	VP-1	24%	
	VP-3	1.9%	

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: FSTCP
Project Number: TR0479
Field Personnel: DM BW EO TM
Recorded By: BW
Weather:

Date: 08/15/15 **Page** 2 of 3
Primary Activities: He tests, SF_6 Tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	SF_6 in B200
	Ambient
	136 ppm @ 5min 5sec
	131 ppm @ 13min 40 sec
	130 - 140 ppm throughout 15 min
	SF_6 in Ambient 128 ppm @ 18 min
	Serial # 1123594
	VP-1: 48 ppm = 35% @ 21 min
	VP-3: 20 ppm = 15.6% @ 21 min
	Serial # 006593 VP-1: 160 ppm (ambient) : 60 (VP-1) @ 25 min
	↳ 37.5%
	Serial # 006591
	Ambient VP3
	126 20 = 15.9% @ 41min 22sec
	128 25.6 = 20% @ 47min 20 sec
	Serial # 1123594
	1/3
	Serial # 006593
	165 @ 45 min
*	Redosing using Serial # 006593
	Ambient time
	150 64min 25sec
	141 67min
	132 73min
	108 81min 45sec

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW EO TM
Recorded By: BW
Weather:

Date: 08/15/15 Page 3 of 3
Primary Activities: He tests, SF6 Tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	Redosing using Serial # 1123594
	Ambient line
	120 77min 46sec
	109 81min 45sec
	Redosing using Serial # 0006591
	Ambient line
	99.5 89min 32sec
	IA near UP-2
	Serial # 1123594
	Ambient conc line
	86.3 86min 39sec
	Serial # 0006591
	99.5 86min 39sec
	Serial # 0006553
	122 86min 39sec

Daily Field Report

Elapsed Time :	SF-6 :	Helium :	Vent #1
~~7:00~~ 7mins	~~17.1 ppm~~	6000 ppm	
10mins		7750 ppm	
17:39 mins		6950 ppm	
23:30		5175 ppm	
39 35		4725 ppm	
47:30		4150	
65:00		3575	
100:00		3625	

Time:	SF-6:	Helium:	Vent #2
74:54		9825	
77:46 (SN # 1123544)	120	~~9825~~	~~0.0~~
79:26		9500	
80:45	109		
84:24	94.7	9125	0.0
90:23		9125	

addicks

Time:	SF-6:	Helium: Vent #3
1420		9300
1427		5800
elapsed time (min)		
1		8580
1:30		8750
2		8775
3:30		8550
6		7950
8:30		7450
12		6850
27:01		5550
30:27		5350
32:00		5250
41		4850
47		4625

09/15/16

DAILY FIELD REPORT

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Project Name: _____ Date: _____ Page ___ of ___
Project Number: _____ Primary Activities: _____
Field Personnel: _____
_____
Recorded By: _____
Weather: _____

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	Helium flow rate test
Filled	3L in 5.28 sec
	$3L/5.28 = \frac{0.568L}{5ec} = \frac{0.020059\ ft^3}{5ec} \times \frac{60sec}{1min} \times \frac{60min}{1hr}$
	$= 72\ ft^3/hr.$
	- Videos of interwell tests are started at midpoint of injection eg 4sec injection video started at 2sec of injection
	- existing vacuum at VP-3 is 720 Pa. Loosened dilution closet and increased to 9.33 in H_2O vacuum
@VP3 -	Helium flood velocity from 3" pipe is L 55 ft/min → max conc 10.2%
	$\pi r^2 = \pi(0.825)^2$
@VP1 -	Helium flood #2 velocity from 3" pipe is L 140 ft/min → max conc 4.3%
@VP2 -	Helium flood #3 max conc of 18.6%
	L 60 ft/min

Daily Field Report

C3.0
Site #3: Sun Devil Manor
Hill Air Force Base

C3.1
Site #3: Sun Devil Manor
General Notes

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Darius Mal, Bill Wertz, Todd McAlary, Ming Guo
Recorded By: Todd
Weather: Sunny + Hot

Date: June 6 2016 Page 1 of 6
Primary Activities: Step test with Land Drain Closed

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:30	Team arrived at SDM and discussed plans. Two new items since workplan was written: 1) granular fill layer is up to 1 ft 2) fan now has variable frequency drive
	Consequences: need either a higher flow rate or longer tests to purge sufficient volume to approach steady state at each step
	Building Area = 910 ft²
	Fill Thickness = 1 ft (max)
	assumed porosity = 0.25
	one pore volume = 228 ft³
	max flow rate = 80 scfm ∴ 2.8 min
	Team decided to run 80 scfm test first and monitor in real time until [TCE] stabilizes
	Ming can run a sample every 40 minutes or so
	∴ decided to collect samples after 3, 6, 9, 18 and 27 minutes to capture any transient changes, analyze 9 minute sample and another after 49 minutes to assess whether system has reached steady state
9:40am	Step test began @ 1130 ft/min flow rate = 98.6 scfm and 15.4 Pascals vacuum on pitot tube = 984 ft/min 85.9 scfm
	vacuum in vent pipe = 203 Pa

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Dawn Ball Todd + Ming
Recorded By: Todd
Weather: Sunny + Hot

Date: June 6 2016 Page 2 of 6
Primary Activities: step test with land drain closed.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
11:20	end of first step of step test @ 85 scfm
	plumbed shop vac to test at lower flow rates
1145	start of second step of step test @ 40 scfm
	Samples planned for 18, 60, 100, 140 min
	approximately 3, 11, 18 and 25 pore volumes
	if no leakage
	alternatively, if there is 85% leakage (as
	indicated by the SF_6 data during the first step)
	then samples correspond to pore volumes of
	0.5, 1.6, 2.6 and 3.7
1225	terminated the second step after 100
	minutes based on low TCE concentrations
	in the vent pipe samples
	re-plumbed the system to use the
	radon fan instead of the shop vac
200pm	to 209pm
	adjusted flow to 625 Ft/min in 4 inch pipe
	and 1550 Ft/min in 2 inch bleed
	total flow = 54.5 Ft^3/min
	dilution flow = 33.8 Ft^3/min
	oo extraction rate = 20.7 Ft^3/min

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Darius Bill Ming + Todd
Recorded By: Todd
Weather: Sunny + Hot

Date: June 6 2016 Page 3 of 6
Primary Activities: step test with land drain closed and interwell tracer test

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
3:55pm	first interwell tracer test ~9.5 ft 100% He injected at subslab probe #3 (radius ~12ft) 20 scfm extraction from vent-pipe injected for 40 seconds at about 0.5 L/second peak He reading in vent pipe was 3.2% at 3 min 10 seconds Helium reading returned to zero in ~10 min
4:14pm	Second interwell tracer test 100% He injected at subslab probe #6 (radius =14ft) 20 scfm extracted from vent pipe injected for 40 seconds at about 0.5 L/second first arrival at < 4 min peak ~ 0.86% at ~6 min 10 sec
	#5 not #6 DJM
4:30	third interwell tracer test 100% He injected at subslab probe #6 (radius =17ft) injected into 6 foot deep probe by mistake test aborted and probe purged with lung box at 1.3 L/min for about 3 hours to zero ppm
5:12pm	~~fourth~~ third interwell tracer test probe #4 (radius =19 ft) 100% He injected at sub slab for 60 seconds 20 scfm extraction no Helium was detected at the vent pipe
	so a lung box was used to pull ~~gas~~ from subslab probe #4 and He started at about 27% and after about 2 hrs at 2 L/min decreased to < 1000 ppm
7:20pm	flow from SSD system set to 10 scfm using Helium tracer
7:45	leave for the day

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW TM MG
Recorded By: DM + TM
Weather: Sunny + Hot

Date: 06/07/16 Page 1 of 9
Primary Activities: Interwell tests (Land drain closed)
Step tests (Land drain open

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
750	Testing the flow rate on vent pipe
	using He as a tracer in the bleed air line
	Initial 4150 ppm
	245 Pa
	780 ft/min Q_{total} = 67.86 ft³/min
	Valve closed to subsurface ΔQ = 4 scfm
	final 5225 ppm
	273 Pa
	580 ft/min Q_{total} = 50.46 ft³/min (all bleed)
	~~ΔQ = 17.4 ft³/min~~
	ΔQ = 0.84 scfm (which is within measurement error)
	Bleed air valve test
	ΔP = 245 Pa $\bar{v}$ = 735 Q = 63.9 ft³/min
	ΔP = 273 Pa $\bar{v}$ = 590 Q = 51.3 ft³/min
9:00 am	Interwell tracer test from subslab probe 6
	injected ~ 30L of 100% He
	vent pipe open to subsurface, bleed air closed + taped
	velocity = 1050 ft/min
924	Interwell tracer test from subslab probe #1 ($\bar{v}$ = 1454)
	injected ~ 20L of He
	aborted after 20 minutes (no helium at all)
1059	Started Step test with Land drain open
	flow velocity = 1040 ft/min @ 204 Pascals

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Todd, Darius, Bill Mug
Recorded By: Todd
Weather: Sunny + Hot

Date: June 7 2016 Page 2 of 9
Primary Activities: interwell tests with land drain closed and step test

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
11 35	Interwell tracer test from subslab probe #3 injected ~10L He over ~10S velocity 1040 ft/min so flowrate 90.5 scfm
1145	Interwell tracer test from subslab probe #6 injected ~10L He over 45 seconds
1148	Pitot tube differential pressure 15 Pascals = 85.6 scfm
1200	Interwell test at subslab probe #5 injected He for 45 seconds
12:20	Interwell test from land drain injected for 45 seconds at 60L/min Helium no Helium observed at subslab probe 6 Helium monitored by video at subslab 5 + vent pipe

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Todd Ball Dorcus Mug
Recorded By: Todd
Weather: Sunny + Hot

Date: June 7 2016 Page 4 of 9
Primary Activities: Interwell + step tests with the land drain open

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1:50	reduced flow to 20 scfm
	Q (scfm) Helium (ppm)
	Bleed air 40.26 6625
	Total flow 60.9 2225
	Sub slab 20.64 0
	Helium data supports anemometer both 3X
4:26	pm 20 scfm step test ended
	one interwell test was done from the land drain @ 20 scfm 45 seconds of He injection to match previous test monitored SS-5 and vent pipe by video
4:40	set step to 60 scfm land drain open
	flow verification for 20 scfm step test
	@ 4:20 pm $\bar{V}_{Bleed}$ = 1740 Ft/min Q = 38.3 ft3/m
	$\bar{V}_{total}$ = 750 Ft/min Q = 65.3 ft3/m
	ΔP = 250 Pa Q = 26.8 ft3/m
	@ 430 $\bar{V}_{Bleed}$ = 1720 → 38 scfm
	$\bar{V}_{total}$ = 720 63 scfm
	25 scfm

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Todd Bill Ming + Darius
Recorded By: TMcA
Weather: Sunny + Hot

Date: June 7 2016 Page 7 of 9
Primary Activities: step tests, land drain open

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
6:00pm	started step test @ 120 scfm (land drain open) using shop vac with radon fan capped wellhead vacuum = 300 Pascals
6:30	attempted Summa canister sample from vent-pipe but terminated prematurely because fitting was questionable. Remaining vacuum in canister was >22in Hg so repaired fitting and continued to collect Summa canister.
7:10	terminated step test

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW TM MG
Recorded By: DM
Weather: Hot sunny

Date: 06/08/16 Page 1 of 8
Primary Activities: Tracer tests, He Flood

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:30	Arrived on site with Todd, Bill, Darius and Ming, H&S Meeting
7:45	- Tracer test at location SS3, injection for 20 sec, response of ~3500 ppm
	- Another tracer test at location SS3 injection for 30 sec, response of ~ 6100 ppm
8:10	- Tracer test at location SS6, injection for 45 sec, response of ~ 1.8 %
	- Tracer test at location SS5, injection for 45 sec, response of ~3.2 %.
8:37	repeat interwell test from SS-5 with 10 scfm He
9:00	repeat interwell test from SS-6 with 10 scfm He
	PREP FOR HELIUM FLOOD, land drain closed
	test ended after 1 hour and 13 min
9:30	setup shop vac to blow air into vent pipe adjusted bleed air valve to 90 scfm injection (velocity of 4090 ft/min in 2 inch pipe)
	He flow set to 10L/min - expected injection 4,000 ppm
10:42	adjusted to 3000 ppm within first 30 seconds of test (started a little low @ 1200 ppm)
	after instrument read 2.5% or ~~2.3%~~ - bag apparently had residual He

12 500 ppm 11500 12900
Serial # 021836 14357 R6133
would not zero - regenerated dessicant and got 12800

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0478
Field Personnel: DM BW TM MG
Recorded By: DM
Weather: Hot Sunny

Date: 06/08/16 Page 2 of 8
Primary Activities: Tracer tests, He floods

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1156	End of Helium Flood
1255	The tee was closed on the vent pipe to eliminate dilution. Turned the fan back on to full capacity and recorded helium concentration on 5-SS, 5-3BS and the Ventpipe (Videos)
1327	- opened landdrain to see if any change on Videos
1402	- end of test / Videos
1415	Off site.

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW NG
Recorded By: DM
Weather:

Date: 06/09/16 Page 8 of 8
Primary Activities:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
9:02	Start VAC no HE
	V= 4032
	- Samples of intake conc tested every 10 min
	1040 #02183 1051 Am
Mins→	1 - 13875 ppm 13650 ppm
	10 - 9575 ppm 8675 ppm
	20 - 11675 ppm 11450 ppm
	30 - 12950 ppm 12725 ppm
	40 - 8275 ppm 8100 ppm
	50 - 4250 ppm 4275 ppm
	60 - 12375 ppm 12375 ppm
	68 - 13325 ppm 13550 ppm
11:15	Recorded the conc on video of Helium being extracted from the subsurface, after we unbagged the stack, turned the valve on tee so no dilution
12:30	left site

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 1 of 8
Primary Activities: Transient tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Test 1	Transient Tests - SSP-05 - Drain Open
	DG700 - 41677
	SSP-5
	Ch A 5-SS
	Ch B 5-3BS
	DG700 - 41676
	Ch A 5-6BS
	Ch B 5-9BS
	Ming Monitoring
	SS01, SS02, SS03, SS06
Run 1	Starting time 1420
	HVAC came on at 1421
	Turned off HVAC at 1422
	Fan off @ 1423
Run 2	Fan on 1427
	Fan off 1431
	End of test.

Daily Field Report

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DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 2 of 3
Primary Activities: Transient tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Test 2	Transient Tests - SSP-02 - Drain Open
	DG700-41677
	SSP-02
	ChA 2-SS
	ChB 2-3BS
	DG700-41676
	ChA 2-6BS
	ChB 2-9BS
	Mixing Monitoring
	SS01, SS03, SS05, SS06
Run 1	Start time 14:45
	OFF time 14:49
Run 2	Start time 1452
	off time 1455
	Comparrison test at SSP-02 SS
	start time 15:08
	Stop time 15:09

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM AL
Recorded By: DM
Weather:

Date: 06/05/16 Page 3 of 8
Primary Activities: Transient test

7 - 4, -55, 3
+6 65

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Test 3	Transient test SSP-04 (SS+03) SSP-07C (SS)
	DG700-41677 Drain Open
	SSP-04
	Ch A 4-55
	Ch B 4-3BS
	DG700-41676 ~~PBit has data~~
	Ch A 7-55
	Ch B N/A
	Mim Monitoring
	SS01, SS02, SS03, SS05, SS06
Run 1	Start time 15:19
	Stop time 15:23
Run 2	Start time 1527
	Stop time 1532

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 4 of 8
Primary Activities: Transient test.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Test 4	Transient test SSP-04 (SS 103) SSP-07 (SS)
	DG700 - 41677 Drain Closed
	SSP-04
	ChA 4-55
	ChB 4-385
	DG700 -41676
	ChA 7-55
	ChB N/A
	Mag Meters
	SS01, SS02, SS03, SS05, SS06
Run 1	Start time 1729
	Stop time 1732
Run 2	Start time 1736
	Stop time. 1740

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 5 of 8
Primary Activities: Transient test.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
Test 5	Transient Tests - SSP-02 - Drain Closed
	DG 700 - 41677
	SSP-02
	Ch A 2-5S
	Ch B 2-3BS
	DG 700 - 41676
	Ch A 2-6BS
	Ch B 2-9BS
	Ming Monitoring
	SS01, SS03, SS05, SS06
Run 1	Start time 1752
	Stop time 1755 ← may be slight spike
Run 2	Start time 1759 due to fan clipped ON/OFF
	Stop time. 1802 by accident.

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BW DM MG
Recorded By: DM
Weather:

Date: 06/05/16
Page 6 of 8
Primary Activities: Transient tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
Test 6	Transient Test - SSP-05 - Drain Closed		
	DG 700 - 41677		
	SSP-5		
	Ch A 5-5S	C	O
	Ch B 5-3BS	-25	-25
	DG700 41676	-17	-14
	Ch A 5-6BS	-28	-27
	Ch B 5-9BS	+50	-34
	Ming Monitoring		
	SS01, SS02, SS03, SS06		
Run 1	Start time 1814		
	Stop time 1818		
Run 2	Start time 1822		
	Stop time 1826		
Closed →	Vent Pipe Vacuum = 194 Pa		
	Velocity = 1020 ft/min / 970 Pitot in 4" pipe		
	Ming's data is on Arizona time PST (3hr Diff)		
	DG700 data is on Eastern time EST (0)		
	Notes are on Utah time MST (2hr Diff)		

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 7 of 8
Primary Activities: Specific Capacity tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
~1615	Specific Capacity tests (in wc) Drain Open
Probe ID	0.1 0.3 0.5 L/min
6-5S	0.01 0.03 0.05
6-3BS	0.16 0.31 0.6
6-6DS	0.21 0.51 0.85
6-9BS	~~>100~~ ~~>100~~ ~~>100~~
3-5S	<0.01 0.02 0.05
3-3BS	0.13 0.31 0.55
3-6BS	034 0.67 1.30
3-9BS	>100 >100 >100
7-5S	<0.01 0.03 0.05
2-5S	0.05 0.08 0.10
2-3BS	0.14 0.31 0.46
2-6BS	029 061 0.95
2-9BS	>100 >100 >100
5-5S	002 0.05 0.07
5-3BS	014 033 0.50
5-6BS	037 080 1.6
5-9BS	>100 >100 >100
4-5S	004 009 0.14
4-3BS	025 0.5 0.9
4-6BS	029 0.6 1.1
4-9BS	>100 >100 >100
1-5S	0.18 0.43 0.7

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW MG
Recorded By: DM
Weather:

Date: 06/05/16 Page 8 of 8
Primary Activities: Specific Capacity tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
~ 19:00	Specific	Capacity	tests (in WC) Drain Closed
Probe ID	0.1	0.3	0.5 L/min
4-5S	0.03	0.07	0.09
4-3BS	0.22	0.5	0.9
4-6BS	0.29	0.7	1.2
4-9BS			
1-5S	0.15	0.40	0.70
1-3BS	0.19	0.42	0.80
1-6BS	0.26	0.60	1.1
1-9BS			
5-5S	0.02	0.04	0.06
5-3BS	0.14	0.34	0.60
5-6BS	0.35	0.80	1.50
5-9BS			
2-5S	0.02	0.04	0.06
2-3BS	0.12	0.24	0.42
2-6BS	0.21	0.48	0.80
2-9BS			
7-5S	0.02	0.04	0.07
3-5S	0.01	0.03	0.05
3-3BS	0.13	0.31	0.50
3-6BS	0.30	0.65	1.30
3-9BS	~~0.02~~	~~0.03~~	~~0.06~~
6-5S	0.02	0.03	0.06
6-3BS	0.17	0.39	0.70
6-6BS	0.23	0.49	0.90
6-9BS			

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW TM MG
Recorded By: DM
Weather:

Date: 06/06/16 Page 4 of 6
Primary Activities: Step tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	Static Vacuum - ST-LDC-80
	Pa (Transient tests LDC)
6-SS	8.3
6-3BS	12.1
6-6BS	13.2
6-9BS	162.7
3-SS	60.5
3-3BS	52.4
3-6BS	49.2
3-9BS	57.4
4-6BS	14.8
4-9BS	47.3
3-SS	23.4
3-3BS	20.2
3-6BS	18.6
3-9BS	270
6-SS	3.4
6-3BS	5.4
6-6BS	5.7
6-9BS	+80
5-SS	7.4
5-3BS	10.5
5-6BS	10.7
5-9BS	+81
7-SS	560

Use the rest of the static vacuums from the transit test data..

STATIC VAC - ST-LDC-40

4-SS	9.5
4-3BS	9.7
4-6BS	4.8
4-9BS	458
2-SS	44
1-SS	17
1-3BS	225
1-6BS	71.3
1-9BS	-402

Daily Field Report

DAILY FIELD REPORT

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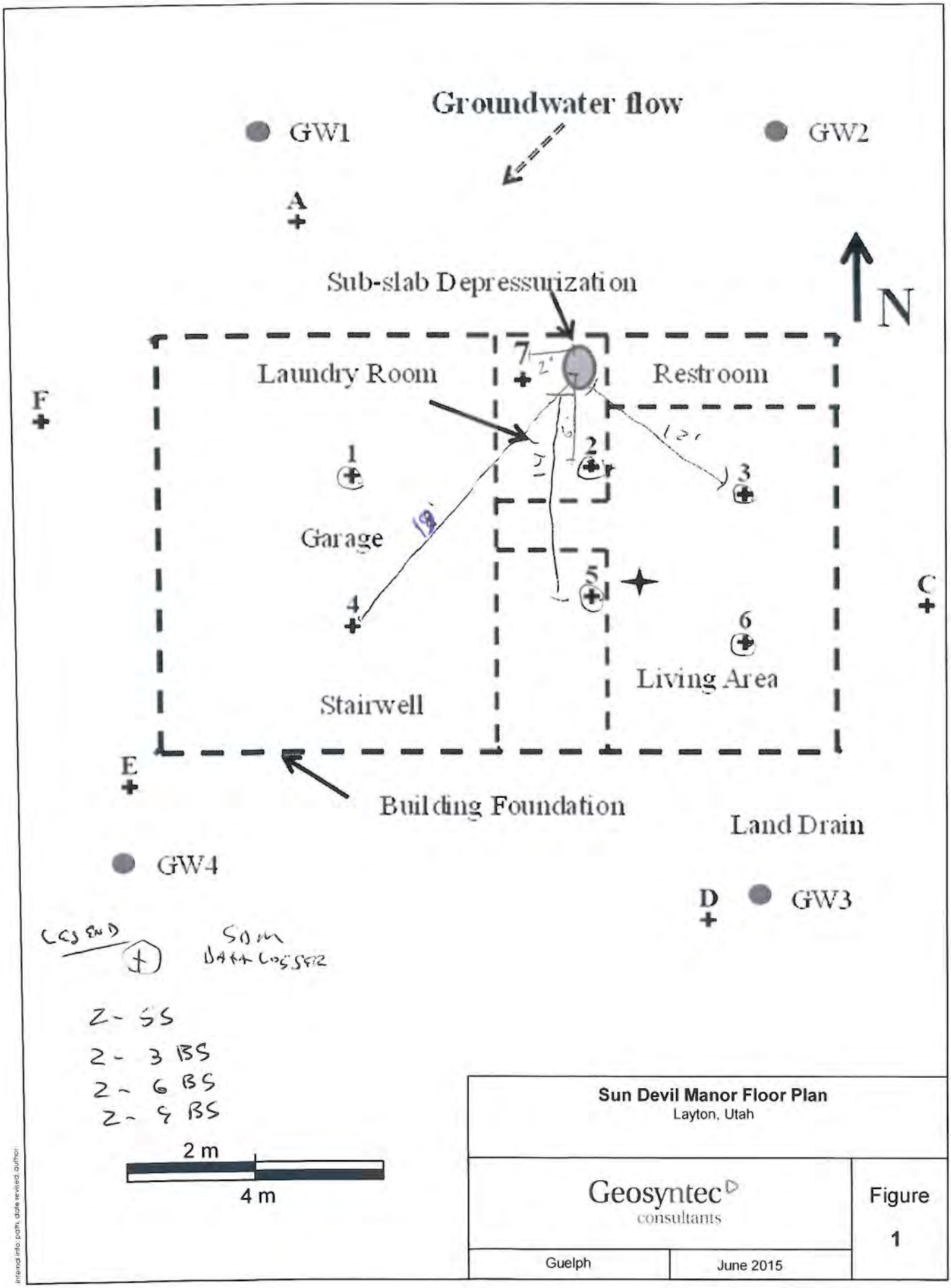
Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW TM AG
Recorded By: DM
Weather:

Date: 06/06/16 Page 5 of 6
Primary Activities: Step tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
	STEP TEST - 80 Vac: 203 Pa
	Sample time Flow: 98.6 scfm Ann (1130 ft/min)
	3 - on hold = 85.95 cfm Pitot
	6 - on hold
	9 - ming sampled for SF_6 & TCE initially
	18 - ming sampled for SF_6, TCE on hold
	27 - ming sampled for SF_6, TCE on hold
	45 - ming sampled for SF_6 & TCE
	92 - collected Radon Sample
	Fan off @ 1h40min. End of first step.
	11:44 STEP TEST - 40 Vac: ~~75~~ 75 Pa
	Start time Vel: 2080 ft/min (45.4 ft³/min)
	18 - ming to Sample SF_6 & TCE = 2120 (half ming)
	60 ~~60~~ - ming to Sample SF_6 & TCE → 55min collected at
85→	1h25min - collected Sample for SF_6
	90 - collected for SF_6 & TCE
	~~130~~ 100 - collected Radon Sample
start	1409 STEP TEST - 20 Vac:
	36min - SF_6 & TCE Vel:
	1~~6~~min Sample for SF_6
	85min - SF_6 + TCE
	140 min - " "
	245 - " "
	246 Radon Sample

Daily Field Report

~~Q~~ 100 cfm = $\pi r^2 * V$
908 ft/min = 20 cfm



Sun Devil Manor Floor Plan
Layton, Utah

Geosyntec consultants

Guelph | June 2015

Figure 1

internal info: path, date revised, author

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0479
Field Personnel: Bill Todd Darius and Ming
Recorded By: Todd
Weather: Sunny + Hot

Date: June 7 2016 Page 3 of 9
Primary Activities: step test and interwell tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
120	round of static vacuum measurements at 90 cfm with land drain open
	Probe — Vacuum (Pa)
	SS 7 — 134
	2-3BS — 90.7
	2-6BS — 77.6
	2-9BS — 0.8
	2-SS — 109
	6-3BS — 9.5
	6-6BS — 11.6
	6-9BS — 0.0
	6-SS — 5.2
	3-SS — 59.2 / 60.5
	3-3BS — 49.4
	3-6BS — 48.4
	3-9BS — +24 Pa
	5-3BS — 26.4
	5-6BS — 28.0
	5-9BS — + 57.5
	5-SS — 14.6
	4-SS — 18.0
	4-3BS — 15.8
	4-6BS — 14.0
	4-9BS — + 28.0
	1-3BS — 52.4
	1-6BS — 53.3
	1-9BS — +5.4
	1-SS — 42

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0 479
Field Personnel: BILL TODD DARIUS
Recorded By: B. WERTZ
Weather: SUNNY & HOT

Date: JUN 7 2016 Page 5 of 9
Primary Activities: STEP TESTS & INTERWELL TESTS

AP

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	DRAW OPEN
3:15	55-7 - 27.1	
	2-3BS - 14.4	
	2-6BS - 8.9	
	2-9BS - 0.1	
	2-~~6~~55 - 21.24	
	6-3BS - 2.0	
	6-6BS - 2.4	
	6-9BS + 0.1	INDOOR
	6-55 2.16	REF
	3-55 - 11.81	
	3-3BS - 9.3	
	3-6BS - 9.1	
	3-9BS + 80	
	5-3BS - 5.2	
	5-6BS - 5.8	
	5-9BS + 93	
	5-55 - 4.02	
	4-55 - 4.5	
	4-3BS - 3.8	GARAGE REF
	4-6BS - 5.7	
	4-9BS + 71.0	
	1-3BS - 6.0	
	1-6BS - 10.1	
	1-9BS + 1.2	GARAGE REF
	1-55 - 9.24	
	LAND DRAIN + 2.87	INDOOR REF

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0479
Field Personnel: BILL TODD DARIUS
Recorded By: B. WERTZ
Weather: SUNNY & HOT

Date: JUNE 7 2016 Page 6 of 9
Primary Activities: STEP TESTS & INTERWELL TEST
DRAIN OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
	55-7	-68.7	
	2-3BS	-45.7	
	2-6BS	-39.2	
	2-9BS	+44.6	
	2-5S	-54.7	
	6-3BS	-4.9	
	6-6BS	-6.5	
	6-9BS	+40.6	INDOOR
	6-5S	3.5	REF
	3-5S	-29.8	
	3-3BS	-24.5	
	3-6BS	-24.2	
	3-9BS	+27.6	
	5-3BS	-13.7	
	5-6BS	-14.3	
	5-9BS	+8.5	
	5-5S	-8.7	
	4-5S	-9.9	
	4-3BS	-16.1	
	4-6BS	-6.8	
	4-9BS	+38.3	GARAGE REF
	1-3BS	-22.0	
	1-6BS	-25.4	
	1-9BS	-0.1	
	1-5S	-20.4	
	LAND DRAIN	-2.5	1A REF

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM JM BW MG
Recorded By: DM
Weather:

Date: 06/07/16 **Page** 8 of 9
Primary Activities: Step test
Land Drum open

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	
	Sampling form	
10:59	ST-LDO-80	Vel 1040 ft/min ~ 90.5
3	Sample for SF_6 & TCE	Vac 204 Pa
6	on hold → Sample	Ptot tube 150 Pa = 85.6
9	on hold → Sample	
18	Sample for SF_6 & TCE	
27	Sample for SF_6 & TCE	
52	Sample for SF_6 & TCE	
62	Radon Sample	End of test
133	Sample for SF_6 & TCE	Vel 1050 ft/min
		Vac 202 Pa.
1350	ST-LDO-20	
1	Sample for SF_6 & TCE	Vel 2" 1830
10	Sample for SF_6 & TCE	Vel 4" 700
24	Sample for SF_6 & TCE	Vac 252
~~110~~	" "	
~~160~~ 60	" "	
~~170~~ 70	~~Radon~~ " "	End of test.
110	" "	Vel 2" 1740 ~~38.5~~
75	Radon	Vel 4" 750 ~~65.25~~
150		total = 26.75 ft³/min
	2h 35 Stop test	Vac 250
	Started adjustments at	1677 end test
		Vel 2" 1720
		Vel 4" 720
1640	ST-LDO-60	
1	Sample SF_6 & TCE	50 SF_6 & TCE ~~Vac~~ Vac 196 Pa
10	Sample SF_6 & TCE	87 pulse Vel 4" 1003 ft/min
25	Sample SF_6 & TCE	60 min end of test (1740) 1460 ft/min

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM TM BW MG
Recorded By: DM
Weather:

Date: 06/07/16 Page 2 of 2
Primary Activities: Step tests
LDO

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
1800	ST - LDO - 120 Vac 301
2	SF_6 & TCE Flow = 124 cfm
10	SF_6 & TCE Vel = 5650 ft³/hr
20	SF_6 & TCE
1850 (48 min)	Summa start time
66	SF_6 & TCE
	19:10 Shut down systems

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM BW MG
Recorded By: DM
Weather:

Date: 06/09/16 Page 7 of 8
Primary Activities: Helium Flood

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
730	- Arrived on site
	- H&S meeting
745	- took Radon Sample during LDD, at 80-90 CFM
759	- velocity in 4" VP = 1160 ft/min Vac = 20 "Hg before opening the blend valve on 2" pipe
806	Calibration of Helium meters
	Serial / Conc / Std (10000)
	21836 15500
	14357 15100
NEW STD	~~15000~~
	R6133 14500 High End
	~~5000~~
	21836 14250
	~~R6133~~
	021836 3475
	14357 3300 Low End
NEW STD	6133 3400
	14357 3350
1032	Calibration After test. → Stand (10000)
	Serial / Conc / Indoor air
	14357 18000 3800
	6133 16100 1975
	021836 14500 526

Daily Field Report

C3.2

Site #3: Sun Devil Manor

Tracer Tests

DAILY FIELD REPORT

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Project Name: ESTCP SDM
Project Number: TR0 479
Field Personnel: TODD DARIUS BILL MING
Recorded By:
Weather: Sunny Hot

Date: 6/8/16
Page 3 of 8
Primary Activities: HELIUM FLOOD DRAIN CLOSED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information LOCATION 2			
	SUB SLAB	3' BG	6' BG	9' BG
1410 ~~1420~~		7825		
1528			0	
2619	8025			
~~2803~~		~~1850~~		
2836			0	
3738		6595		
DM 6723	5625			
DM 6830			1475	
DM 6924		3900		

DM = 21836 #

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP SDM
Project Number: JRO 479
Field Personnel: T, D, B, M
Recorded By:
Weather: SUNNY Hot

Date: 06/8/16 Page 4 of 8
Primary Activities: HE FLOOD
DRAIN CLOSED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information LOCATION 5			
	SUB SLAB	3' BG	6' BG	9' BG
1425	7025			
1540		0		
2344	8055			
2441		625		
3044		0		
3614		2675		
7228			0	
7310		1125		
	1156 END OF TEST			

RM
DA
DM

Daily Field Report

DM = # 021836

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP SDM
Project Number: TR0479
Field Personnel: T, D, B, M
Recorded By:
Weather: SUNNY Hot

Date: 6/8/16 Page 5 of 8
Primary Activities: HE FLOOD
DRAIN CLOGED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information LOCATION 6			
	SUB SLAB	3' BG	6' BG	9' BG
1.50 PM	75			
2.02	300			
3.00	1425			
7 20	2250			
2053	8150			
2924		0		
4533		625?		
63:00	6900 (14357)			
1:11 53		0 (14357)	~~0 (14357)~~	

checked and all data used in plots

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP SDM
Project Number: TRO 4379
Field Personnel: T, D, S, M
Recorded By:
Weather: Sunny 40+

Date: 5/18/16 Page 6 of 8
Primary Activities: HE FLOOD
DRAIN CLOSED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information LOCATION 3			
	SUB SLAB	3' BG	6' BG	9' BG
22[illegible]0	7950			
2952		0		
4721		0		
50:00	6825 (6633)			
51:00	6550 (14575)			
52:00		0 (14575)		
1:05	6200			
1:08		10:50 (14575)		
1:09			0 (14575)	

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP SDM
Project Number: TR2479
Field Personnel: T, D, B, M
Recorded By:
Weather: SUNNY Hot

Date: 6/8/16 Page 7 of 8
Primary Activities: HE FLOOD
DRAIN CLOSED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information Location 4			
	SUB SLAB	3' BG	6' BG	9'BG
6:10	~~625~~	BAD M+R		
~~7:00~~ 17:20	~~2025~~ 5350			
~~24~~:00	2050			
25.0°		4625 DIRECT	Not VALID METER Not ON FLOW THRU.	
26:30	2050			
27:00		4250 DIRECT		
34:30	2150			
36:00	2425			
37:00	2550	1725 FLO THRU		
38:30				
DM 6312			1625	
DM 6417		2375		
DM 6530	3100			

DM = 2183

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP SVM
Project Number: TR0429
Field Personnel: TDBM
Recorded By: TDBM
Weather: SUNNY HOT

Date: 6/8/16 Page 8 of 8
Primary Activities: HE FLOOD DRAIN CLOSED

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information (LOCATION)			
	SUB. SLAB	3' BG	6' BG	9' BG
~~10:00~~	~~2700~~	RAD METER		
10:28	375			
13:00	175			
16:20	3025			
21:30	3350			
28:30	3600			
30:00		4600 DIRECT	NOT USED NO FLOW THRU	
33:00	3900			
40:00		3125 FLO THRU		
42:00	4175			
~~55:00~~ 58:30	3925	2775		
DM 59:48	3650			
DM 62:30			1150	

DM = 21836

INFLUENT CONCENTRATION

t			
Serial #	02836	14357	ming
45 min	~~4100~~ 7700	7400	
55 min	8425	7850	1250

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: SDM
Project Number: TR0 479
Field Personnel: B D M
Recorded By:
Weather: SUNNY HOT

Date: 6/9/16 Page 1 of 8
Primary Activities: HE FLOOD DRAIN OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information LOC 1			
	55	3' BG	6' BG	
03:45	150			
07:15	150			
12:00	100			
14:00		0		
18:26	~~950~~ 700			
21:04	950			
24:06		250		
25:39	1200			
34:55	~~1275~~ 1275			
39:30	575	- R6133		
40:40	2025			
47:17	~~2050~~ 2050			
55:23		500		
59:15	~~1925~~ 2250			
1:02:30	2050			
1:05:48		575		
1:09:34	~~1975~~ 2100			

Daily Field Report

905 start of test

Reading ~ 2000 ppm in indoor air

DAILY FIELD REPORT

#14357

Geosyntec consultants

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Project Name: ESTCP SDM

Project Number: TR0479

Field Personnel: B, D, M

Recorded By:

Weather: Sunny Hot

Date: 6/9/16 Page 2 of 8

Primary Activities: HF FLOW

DRAIN OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information			
	LOC 2 SS	3' BG	6' BG	
609	7650			
830		0		
954	7025			
1210		0		
13.48	7125			
18.11		0		
19.02	6025			
24.12	7000			
29.40		2750 ?		
34.50	7276			
37.20		2500		
44.50	7650			
46.57		3850		
47.40			0	
56.20			2775?	
56.50		5700		
5830	7825			
66.03			3700	
67.00		5925		

2250

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: ESTCP SDM
Project Number: TRO 479
Field Personnel: B, M, D
Recorded By:
Weather:

Date: 6/9/16 Page 3 of 8
Primary Activities: HE FLOW DRAIN OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information			
	LOC 3			
	95	3' BG	6' BG	
5:30	7725			
6:30		0		
8:30	7600			
11:00		0		
12:30	7450			
14:30	7125			
15:00		0		
23:00	6875			
24:00		0		
25:30	6700			
32:00	6375			
36:30	6200			
49:00	6225			
51:30		600		
53:00	6150			
54:00	INDOOR AIR 500 PPM			
~~55:00~~		575		
60:00		1125		
62:00		900		
63:00		625		
69:00		600		
		700		

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP SDM
Project Number: TR0 479
Field Personnel: B, D, M
Recorded By:
Weather: Sunny Hot

Date: 6/9/16 Page 4 of 8
Primary Activities: HE FLOOD DRAIN OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information Loc 4			
	SS	3' BG	6' BG	
05:42	~~225~~ 225			
10:30	250			
19:44				
27:10	~~350~~ 325			
31:40		500		
42~~4~~	1600 —	F6133		
44:30	2175			
48:5 6	~~2200~~			
51:27		~~350~~ 375		
57:00	2400			
1:04:39	2425			
1:0~~8~~:30		~~500~~ 550		

Daily Field Report

10:5 END of TEST.

#14357

DAILY FIELD REPORT

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Project Name: ESTCP SDM
Project Number: IRO479
Field Personnel: B, D, M

Date: 6/1/16 Page 5 of 8
Primary Activities: HE FLOOD DRAIN OPEN

Recorded By:
Weather: Sunny Hot

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information Loc 5			
	SS	3'BG	6'BG	NOTES
6:00 AM	0	0	0	OVERNIGHT DRAIN OPEN PRE TEST
7.08	7525			
10.55	6925			
14.38	7050			
21.08	6700			
21.02		0		Dec change
32.20		950		
33.06	8025 (flow through)			
39.12	7175			
40.30		1650		
42.40			~~[illegible]~~	
49.11			0	
50.24		2200		
51.54	8125			
62.09			525	
63.40		3125		
64.50	8075			
69.10			1600	

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP SDM
Project Number: RC 479
Field Personnel:
Recorded By: B, D M
Weather:

Date: 6/9/16 Page 6 of 8
Primary Activities: HS FLOW
DRAW OPEN

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information			
	LOC 6			
	SS	3' BG	6' BG	
3:30	7150			
4:00	7350			
4:30	7425			
9:30	7375			
13:30	7200			
30 MIN	CHANGE DES - NEW DES IA			900 PPM
22:00	7175			
28:00	INDOOR AIR	300	PPM	
29:00	6550			
29:30		0		
31:00	6575			
33:00	6350			
34:00		0		
35:00	6200			
38:00	6350			
46 50	6625			
47 00	INDOOR AIR	500	PPM	
48:00		0		
50:00	6000			
58:00		0		
59:00	6025			
65:00		0		
66:30	5625			

Daily Field Report

C4.0

Site #4: Building 11193

Vandenberg Air Force Base

C4.1
Site #4: Building 11193
General Notes

SSP Screen
~~DAILY FIELD~~ REPORT
6/5/17

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Project Name: UDB 1113
Project Number:
Field Personnel:
Recorded By:
Weather:

Date: Page ___ of ___
Primary Activities:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	PID	GEM		
SSP 1A 08:11	0.16 @ 50 mL/min	6.1	0.0	0.1	20.2
		PID	CH_4	CO_2	O_2
SSV-MP-5	0.37 @ 500	103.1	0.0	11.8	6.6
SSV-MP-10	0.42 @ 500	160.5	0.0	14.1	3.7

Daily Field Report

DAILY FIELD REPORT

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Project Name: VDB 11193
Project Number: TR0626
Field Personnel: WERTZ
Recorded By: WERTZ
Weather: SUNNY MILD

Date: 06 16 17
Page 1 of ___
Primary Activities: DOWN LOAD PRESSURE DATA
PREP FOR SSV TESTS

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
09:00	ARRIVE ON SITE
	DG700 REPORT = IA
11:00	DOWNLOAD PRESSURE DATA DG-700 44062
	FRONT CORNER OF BUILDING - SSP-1-E = CHANNEL A
	& RESTART CROSS-BUILDING = CHANNEL B
11:20	DOWN LOAD PRESSURE DATA DG700-44063
	& RESTART SVP-1-55= CHANNEL A
	SVP-1-5' = CHANNEL B
11:42	DOWN LOAD PRESSURE DATA DG700-44289
	& RESTART SVP-2-55 = CHANNEL A
A	NOTE - CHANNEL IS HOOKED TO SVP-2-10' WHEN DATA DOWNLOADED SVP-2-5' = CHANNEL B
12:00	DOWNLOADED PRESSURE DATA DG700-41676
	& RESTART SVP-3-55 = CHANNEL A
	SVP-3-5' = CHANNEL B
12:15	DOWNLOADED PRESSURE DATA DG700-44286
	& RESTART SVP-4-55 = CHANNEL A
	SVP-4-5' = CHANNEL B
12:30	DOWNLOADED PRESSURE DATA DG700-41677 BLOWER DOOR A
	CHANNEL A = CROSS BUILD
14:15	PID-SCREENING CHANNEL B = FAN
	SS POINTS
15:15	LEAVE FOR FEDEX

Daily Field Report

DAILY FIELD REPORT

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Project Name: [redacted] UDR Ellis
Project Number: TR0626 / TR0479
Field Personnel: WORTZ
Recorded By: WORTZ
Weather: SUNNY WARM

Date: 06 16 17
Page 2 of 2
Primary Activities: E-PERM DEPLOYMENT

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
16:30	DEPLOY E-PERM IN CLOSED BUILDING FOR BACKGROUND RADON.
16:35	DEPLOYED EPERM # SJF993 } 1/2 WAY BETWEEN
	DEPLOYED EPERM # SJF405 } CENTRAL WALL & SVP-4
16:40	DEPLOYED EPERM # SIQ565 AT PRESSURE AIR PIPE IN CENTRAL AREA OF ROOM NEXT TO SVP-1
16:47	DEPLOYED EPERM # SIQ560 ON TABLE NEAR SVP-2 AND GC-7 SAMPLE PORT (ASU)
16:50	DEPLOYED EPERM # SJF891 ON HOMER BUCKET NEAR SVP-3
17:10	STARTED SSV
	ΔP MEASUREMENTS
17:15	SSP-1-E VACUUM = -4.7 to -5.2 Pa
	SSP-2-E VACUUM = -5.0 to -5.6
17:25	[redacted] SVP-4-SS = [redacted] -32.5 Pa
17:45	[redacted] CONNECTED DG700-41677 to EOC
	PERFORM SSV TRANSIENT
	SSV HAS BEEN RUNNING SINCE 17:10
17:59	FAN OFF - 18:03 FAN OFF
18:04	FAN ON 18:05 FAN ON
[redacted]	[redacted] STACK VELOCITY = ≈900 FPM
[redacted]	18:12 FAN OFF

Daily Field Report

DAILY FIELD REPORT

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Project Name: VDB 1193 Date: 061817 Page 1 of 3
Project Number: TR0479 Primary Activities:
Field Personnel: WERTZ PID THROUGH MEASUREMENTS
Recorded By:
Weather:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
11:30	ARRIVE ON BASE
[redacted]	DEPLOYED EPERM # SJF804
12:02	UPGRADIENT OUTDOOR AIR SAMPLING LOCATION
12:30	CALIBRATED PID & GEM
13:00	CLOSED & RETRIEVED OUTDOOR EPERM
	SCREENED PROBES

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: [redacted] Date: 06/8/17 Page 2 of [redacted]
Project Number: _____ Primary Activities: _____
Field Personnel: WSP+2 _____
_____ _____
Recorded By: _____ _____
Weather: _____

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	
	[redacted] ELECTRET BACKGROUND @ GARBAGE CAN IN BUCKET	
	SS SSV-MP-5 & 10 SCREEN ✓	
	GEM	
	SSV VACUUM @ ELBO	
	PID ELBO	
	VACUUM @ 3' PROBE	
	VACUUM @ SSP-N-2	
	VACUUM @ SSP-4-B	
17:39	SSV ON	PURGE AT 18:44 ←
17:40	INITIAL PURGE 7.4PPM PID	7.3 PPM
17:50	GEM CH_4 CO_2 O_2	CH_4 CO_2 O_2
	0.0 0.1 20.0	0.0 0.1 20.5
	STOPPED SSV TO REPLACE VACUUM GAUGE	
18:07	RESTART	
	30" H_2O VAC @ WELL HEAD	
	-30.1 PA AS SVP-2-SS -14.5 Pa @ SVP-2-5'	
	FLOW = [redacted] CFM 900 (est)	

18:55 FAN OFF
19:00 DEPART

DAILY FIELD REPORT

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Project Name: VDB 11193
Project Number: TR0479
Field Personnel: WERTZ, MCALARY, MALI
Recorded By: WERTZ
Weather: SUNNY, MILD

Date: 061917
Page 1 of ___
Primary Activities: SSV OPERATION & TESTING

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
0:700	ARRIVED ON SITE
	CALIBRATE METERS
	TAPE EXTRACTION PIPE
16:24	NOTICED that PRESSURE PORTS at SSV-1-SS AND SSV-1-5'
	WERE SWITCHED (5' = A, SS = B). REVERSED
	PORTS TO COMMON THEME SS = A, 5' = B
06:37 to 17:45	PID & GEM SCREEN STACK, SSP-N-2 & SVP-4-SS
17:45	COLLECTED SSV STACK SAMPLE 450 CFM
17:48	10" H2O
	NOTE CAN WAS LEFT OPEN BRIEFLY AFTER REMOVAL
	FROM STACK
18:30	COLLECTED & PROCESSED OUTDOOR AIR SAMPLES
18:45	DEPART

Daily Field Report

DAILY FIELD REPORT

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Project Name: [redacted] UDB 11183
Project Number: TR0479
Field Personnel: TM, DM, WW
Recorded By: WW
Weather: Sunny Cool – AM Fog

Date: 06 2017
Page 1 of [redacted]2
Primary Activities: Optimization

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
[redacted]	
07:15	ARRIVED ON SITE
	CALIBRATE PID, GEM
	DEPLOYED OA SAMPLES
	SAMPLED SSU STACK (PID, GEM, SUMMA, RADON)
09:25	PID SCREEN SUB-SLAB FAN @ 450, 10" H_2O

SS	PID (ppm)	SS	PID
SSP-2-E	1.2	SS	PID
SSP-W-3	0.8	SSP-W-1	0.8
SSP-1-E	0.4	SSP-1-B	2.4
SUP-1-SS	2.7	SUP-4-SS	185.9
SUP-1-5'	[redacted] 10.1	SVP-4-5'	830 [redacted]
SUP-1-10	34.9	SUP-4-10'	1881.0
SUP-N-2	1.2		
SSP-4-B	392.7	FLOW DURING @ [redacted]	
SSP-4-E	11.1	SUP-4-10 0.25" @ 500mL/min	
SUP-2-SS	7.6	★ SUP-4-5 80.0" @ 500 mL/m ★	
SVP-2-5'	33.3		
SVP-2-10'	30.1		
SSP-S-2	0.7		
SSP-3-E	11.2		
SSP-E-3	105.4		
SUP-3-SS	40.4		
SUP-3-5'	137.9		
SVP-3-10'	137.7		
SSP-E-2	3.6		
SSP-2-B	4.5		
11:10			

Daily Field Report

DAILY FIELD REPORT

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Project Name: VDB 11493 Date: 6 20 17 Page 2 of 2
Project Number: TR0479 Primary Activities:
Field Personnel: TM, DM, WW PD (ASU) STRESS TEST OF SSV
Recorded By: WW
Weather: SUNNY 60's (PM)

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
15:00	± SWITCHED SSV to FULL FLOW
	W/ BLOWER DOOR CONSTANT STRESS
	to SEE IMPACT OF GREATER SSV FLOW
	SUPER STACK – W/ AIR FORCE SHOP VAC
	TIMEON = 16:15
	VAC @ WELL HEAD
	FLOW through STACK
	PID
	SAMPLE @ BLOWER DOOR
	SAMPLE @ STACK
	NOTE: COMBINED OPERATION OF SHOP VAC & OBAR CAUSED OBAR to QUIT
	~~TESTING~~ TESTING W/ SHOP VAC SUSPENDED
	OBAR STARTED AGAIN AT FULL SPEED W/O SHOP VAC
17:35	OBAR +

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM TM WW
Recorded By: DM
Weather:

Date: 06/19/17 Page 1 of 1
Primary Activities: Step test, interwell tests

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:00	Arrival on site
8:45	At 11193
9:00	Collect & electrets
1000	Deploy OA Samples upwind & Downwind.
1020	Helium Cal Check
	33323 27827 R6134
	87.8 % 90.8 % 90.1 %
	34.6 % 34.5 % 34.0 %
11:00	Helium Interwell tracer tests
1300	Deployed RAD STAR near RAD 7 by the crack in the floor.
	Building Volume ~ 101045 ft³
1450	STEP Test 1 Sample (Summa taken) 44 CFM
	intial Vac 29.05 Final Vac 2.18
	STEP 1 - 44 → B11193-061917-SSV-1-44
15:01	Radon Sample Collected STEP1-44
15:05	Pneumatic tests collected at
	SSP-3B chB
	SSP-E1 chA 15:24 END.
1527	SSP-S2 chA
	SSP-S1 chB 15:35 END
1539	~~SSV-MP~~
	5ft chA
	10ft. chB
1550	Changed flow to 450 ft/min
1600	off site.

* Ran out of Helium

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM drw TM.
Recorded By: DM
Weather:

Date: 06/20/17 Page 1 of 1
Primary Activities: Stress test.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:30	- on site
	- Round of static vacuums
	- Summa sample at 10" H_2O & 450 ft/min
	- Radon Sample
9:00	- Added fresh air line to dilution valve, increased velocity to 510 ft/min and vacuum to 12" H_2O
	- Outdoor Air Samples deployed
10:30	Regulators on site, gave tour and explained the tests
10:00 —	10:45 Sealed floor
13:44	Started Blower Door @ -10 Pa (Difference of -5Pa)
	~ 5200 CFM
1445	Indoor Air & SSV Samples taken for Stress Test 1
15:00	Bleed Valve closed on System
15:32	Flow with cracks sealed 1200 ft/min vacuum 30" H_2O
15:38	Disconnected the Helium test & Plugged in to the Subslab Point at SSV4-SS. Also changed the monitoring from 5ft depth to 10ft depth
16:15	Shop Vac added to Flow rate
	Flow rate 136 cfm @ 35"

Ran at -10 Pa, Not -5Pa

Summa samples taken at around 4pm that evening

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM TM WW
Recorded By: DM
Weather:

Date: 06/21/17 **Page** 1 of 2
Primary Activities: Stress test, Helium flood, pneumatic tests.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:00	arrival on site
8:05	started Blower door operations
8:36	Radon Sample taken at ST-44 SCFM
9:05	Collected IA sample infront of Blower door
	running at ~5200 CFM
	Collected SSV sample running at ~ 58 CFM 30" H_2O
942	Connected Shop Vac to SSV running at
	36" H_2O & 1100 FPM
1038	Connected 2 Shop Vacs & OBAR to system.
	Running at 44" H_2O 65 CFM (1328 ft/min)
1036	SSP-3E has +1.0 Pa Pressure Building at -50 Pa
	depressurization, Probe reading -40 Pa
11:10	Reconfigured system to a singe exhaust Point
	Vel = 1300 ft/min / 64 CFM / 41 in H_2O
12:10	IA at Blower face and SS Sample at SSV
	collected. Radon sample at SSV collected
1219	Turned blower down to -5 Pa.
13:15	PID reading 8.8 ppm
	Vacuum 42 in H_2O vel = 1300 ft/min 65 CFM
1335	IA at Blower face SS Sample and Radon Sample
	collected at -5 Pa / 64 CFM / 42 in H_2O
1358	Switched to just OBAR running, noticed it
	was only drawing 10" H_2O. Turned off to
	cool. Flange on OBAR was broken
15:06	Transient tests Conducted at 30" H_2O
	1185 ft/min = 58 CFM with Shop Vac
	running
1523	on 3rd effort at SSP3B & SSP E1 started with

Valve closed, then started vacuum. Same but reverse when turned off vacuum

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: WW DM TM
Recorded By: DM
Date: 06/21/17 Page 2 of 2
Primary Activities:
Weather:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
16:13	- Started Blower Door at -5Pa
	- Shop Vac on at -30 in H_2O 58 scfm
16:30	off site

Daily Field Report

DAILY FIELD REPORT

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Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM WW TM
Recorded By: DM
Weather:

Date: 06/22/17 Page 1 of
Primary Activities: Helium flood

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:00	Arrived on site.
7:30	tested helium flow rate to ~ 45 sec/10L to mimic ~1% of 55 CFM (current flow of OBAR)
830	Helium Cal check
	R 11188 R 6134 (AGU) 27827 33322
	32.1 4.7 33.1 33.2
953	Helium • flood test done at 350 ft/min because exhaust was plugged. when unplugged the ~~test~~ flow was too high and the plate on the SSV leaves. Test terminated
1115	downloaded Building Pressure Monitoring Data for DG-700 at SUP-4
1132	~~downloaded~~ SUP 2
1141	Model 41670 I ~~could not connect~~ to. Data NOT ~~downloaded~~ yet.
1152	Printed RAD STAR DATA.
1200	Downloaded SUP 1 DG-700
1203	Downloaded SUP3 DG-700
1208	Downloaded OA DG-700
1330	Made Map of Building.

Daily Field Report

Geosyntec consultants

924 Anacapa Street, Suite 4A
Santa Barbara, California 93101
805-897-3800 (phone) 805-899-8689 (fax)

DAILY FIELD REPORT

PROJECT: VAFB - Building 11193
LOCATION: Building 11193 PROJECT NO.: TR0626 TASK NO.:
DESCRIPTION: Demo Plans DATE: 5 day 6 month 17 year
CONTRACTOR(S): BC2 Env., Sentom Head
WEATHER, TEMPERATURE: Cold, overcast.

0630 - Depart Santa Barbara

0730 - Arrive onsite (VAFB). Meet Kathy Gerber and Bill Mertz (Geosyntec) at Building 11193. Conduct walkthrough. Conduct safety tailgate meeting to discuss scope for the day.

Tasks completed:
- Construct SSV stack
- Install vapor pins at monitoring points SSPE3, SSPE2, SSP3c, SSPS2, SSP2c

0930 - Wrap up and depart site.

6/5/17

NAME: D. Fisher PROJECT NO.: TR0626 HOURS:

Sheet No. 1 of 1

Geosyntec consultants

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DAILY FIELD REPORT

PROJECT: VAFB Building 11193
LOCATION: Building 11193 PROJECT NO.: TR0626 TASK NO.:
DESCRIPTION: Demo Plans DATE: 6 day 6 month 17 year
CONTRACTOR(S): BC2 Env. , Senborn-Head
WEATHER, TEMPERATURE: Cold, overcast

0700 - Arrive e site
0715 - BC2 Arrives site. Bill Werts arrives @ sit. Conduct safety tailgate meeting with discussions including air ventilation. Discuss scope.
0740 - Conduct walk Through with BC2.
0815 - Calibrate MiniRae 3000 & GEM 2000
PID = reading 100ppm & Cal gas = 100ppm isobutylene
GEM2000 = ready CH_4 = 48.9% CO_2 = 33.7% ~~O_2 = 8~~ Nitrogen Balance = 19.3%
(Cal gas CH_4 = 50% & CO_2 = 35%)
1000 - Begin coring holes for direct push drilling at location SVP-1.
Core thickness = 4inches.
Continue coring. Well screen set ~~at~~ 8'-13'. Annular set = 0.5ft of bentonite chips. DTW = 10ft (6.71ft PID) btos (below top of surface)
1600 - Mob to location SVP-2 & begin hand augering GW well. Setup drill rig on Soil Vapor (SV) well.
1630 - Begin drilling at SVP-2 @ soil vapor well (SV). Collect soil cores. Set probes at 5 & 10 ft. →(GW+SV)
1630 - set well boxes for SVP-1 & SVP-2 (SV) & begin wrapping up.
1815 - Drillers depart site.
1830 - Depart site & mob to Staples to purchase scale to weigh VOC samples.
1915 - Depart Staples
All PID readings in breathing zone = 0.0 ppm

1330 - Don (RWQCB) & Kathy Gerber (VAFB) onsite for approx. 0.75 hrs.

10/6/17

NAME: PROJECT NO.: HOURS:

Geosyntec consultants

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DAILY FIELD REPORT

PROJECT: VAFB - Building 11193
LOCATION: Building 11193 PROJECT NO.: TR0626 TASK NO.:
DESCRIPTION: Demo plans DATE: 7 day 6 month 7 year
CONTRACTOR(S): BC2 Env., Seaborn - Head
WEATHER, TEMPERATURE: Cold, overcast

07^{00} - Arrive @ site. Conduct safety tailgate meeting. Setup on SVP-2-GW well. Calibrate PID = 100.3ppm (Iso).
07^{18} - Begin drilling SVP-2-GW. Install well screen 8-13' bgs. DTW = 11 ft bgs. Wellbox set. Air readings = 0.0ppm
08^{45} - Mob to well SVP-4. Clear ducting / ceiling tiles above borehole locations. Begin hand augering SVP-4-GW.
0.3 to 1 ft soil screen = 0.7ppm (SVP-4-GW)
Downhole PID readings = ~~0~~ 3ppm, (SVP-4-GW)
[PID] 2 ft soil screen = 0.5ppm (")
2.5 ft soil screen = 0 ppm. (")
4 ft (clay) soil screen = 0.5ppm (")
Downhole PID reading = 3.1ppm (")
9^{30} - Drill SVP-4-SV. Install probes @ 5 and 9.5 ft bgs.
[PID] 10ft soil screen = 0.1 ppm PID (SVP-4-SV)
7ft soil screen = 2.0 ppm (SVP-4-SV)
10^{45} - Drill SVP-4-GW. Install screen from ~~8'-13' ft bgs~~ 8.[illegible] - 13.75 ft bgs.
7.2 ft soil screen = 4.2ppm (SVP-4-GW)
13^{00} - Drill SSV-MP. Install probes @ 5 & 10 ft bgs
[PID] 5 ft soil screen = 0.3ppm (SSV-MP)
10 ft soil screen = 0.0ppm (SSV-MP)
13^{40} - Drill SVP-3-GW. Screen set 8.7 - 13.7 ft bgs. DTW = 10.7 ft bgs.
[PID] Downhole reading - 2.8ppm (SVP-3-GW) - after 5 ft core removed.
7ft - 8.5 ft soil screen = 0.9ppm (")
Downhole reading - 10.2 ppm (") - after 10 ft core removed. Breath Zone = 0.0 ppm.
14^{50} - Drill SVP-3-SV. Set probes @ 5 & 10 ft bgs.
[PID] Downhole reading - 4.4 ppm (SVP-3-SV) - after 1-5 ft core removed

NAME: D. Fisher PROJECT NO.: TR0626 HOURS:

Geosyntec consultants

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DAILY FIELD REPORT

PROJECT: VAFB - Building 11193

LOCATION: Building 11193 PROJECT NO.: TR0626 TASK NO.: _____

DESCRIPTION: Demo Plans DATE: 7 day 6 month 17 year

CONTRACTOR(S): BC2, Sanborn-Head

WEATHER, TEMPERATURE: _____

15[15] - Regulators onsite
16[45] - Regulators offsite
17[15] - Paul/Dahlen onsite
18[00] - Paul offsite
18[15] - Drillers & all others offsite
*All breathing zone PID readings = 0.0 ppm.

6/7/17

NAME: D. Fisher PROJECT NO.: TR0626 HOURS: _____

Sheet No. 2 of 2

Geosyntec consultants

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DAILY FIELD REPORT

PROJECT: VAFB Building 11193
LOCATION: Building 11193 PROJECT NO.: TR0626 TASK NO.:
DESCRIPTION: Demo Plans DATE: 8 day 6 month 17 year
CONTRACTOR(S): ~~BCT Env.~~
WEATHER, TEMPERATURE: Cold overcast

0730 - Onsite with Bill Wertz. Conduct safety tailgate meeting. Paul Dahlen onsite.

Tasks completed:

- Install (complete install) of sub-slab monitoring points with vapor pins.
- Seal openings in building including windows, doors, & roof exhausts / penetrations.
- Well development + GW monitoring for VOCs
  - Note well SVP-4 partially developed when GW sample collected. This well had slow recharge. All other wells (SVP-1 thru 3) had good recharge + stability.
- Paul set up GC / other equipment + conducted blower door baseline testing.

6/8/17

NAME: D. Fisher PROJECT NO.: HOURS:

Sheet No. 1 of 1

DAILY FIELD REPORT

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Project Name: VAFB-Building 1193
Project Number: TR0626
Field Personnel: D.Fisher P.Dahlen B.Wertz
Recorded By: DFisher
Weather: cold, overcast

Date: 6-9-17
Page ___ of ___
Primary Activities:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
07^{30}	Onsite. Conduct tailgate safety meeting. Setup on (R)
09:15	Set up to sample SVP-1 SS, 5', 10'
955/10^{15}	Sample time for SVP-1-SS
10^{29}/10^{55}	Sample time for SVP-1-10
10^{59}/11^{19}	Sample time for SVP-1-5
11^{30}	Set-up to sample SVP-2 SS, 5', 10'
12^{03}/12^{27}	Sample time for SVP-2-SS
12^{20}/12^{43}	Sample time for SVP-2-5
12^{40}/12^{58}	Sample time for SVP-2-10
13^{00}	Setup on sample location SVP-3 SS, 5', 10'
14^{09}/14^{24}	Sample time for SVP-3-SS
14^{20}/	Sample time for SVP-3-5
1505 ~~14^{37}~~/15^{35}	Sample time for SVP-3-10

Daily Field Report

DAILY FIELD REPORT

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Project Name: VAFB - 1149
Project Number: TR0626
Field Personnel: WERTZ
Recorded By: WERTZ
Weather: SUNNY MILD

Date: 6/10/17 Page 1 of ___
Primary Activities: SAMPLE SVP's & SSP's

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
~~0700~~	
09:15	ARRIVE ON SITE
	CALIBRATE GEM, PID
	SWITCHED PID - PREVIOUS ONE STOPPED @ 400 PPM
15:40	He DETECTOR QUIT WHILE ON SVP-4-10
1600	GEM QUIT - REPLACED & RALIBRATED NEW ONE
16:00	CLOSE UP & LEAVE

DAILY FIELD REPORT

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Project Name: VDB 11193
Project Number: TR0626
Field Personnel: WERTZ
Recorded By: WW
Weather: SUNNY WINDY

Date: 061117
Page 1 of 1
Primary Activities: SET UP & TEST SSD
DEPLOY PRESSURE METERS

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
0:900	ARRIVE ON SITE & PREP DG700 # 44062
0:9:30	- START to DEPLOY PRESSURE METERS
	END OF BUILDING DOORS OPEN
10:37	SSP-1-E ON LINE
	CHANNEL A = SS } QUITE
	CHANNEL B = OUTSIDE } WINDY
10:45	# 44289 DG 700
	SSP-W-3 - CHANNEL A
	~~SSP-E-3~~.
	SSP-2-E - NOT YET HOOKED UP
	CHANNEL B NEED TUBING ~ (HOOKED UP AT 11:38)
10:50	CLOSED WOOD SHOP END DOORS
	INDOOR = REF
-	SSP-3-E = CHANNEL A } NOTE HOOK UP
	OUTSIDE = CHANNEL B } OPPOSITE OF WHAT
	# 44063 DF DID
	DG700
11:20	SVP-4-SS = CHANNEL A # 44286 } NOTE: Forgot to OPEN VALVES
	SVP-4-S' = CHANNEL B
	DATA ~ 6:00 PM
12:00	FILLED CORE HOLE WHERE UTILITY PIPE
	HAD BEEN UNCOVERED
12:30	SUPPLY RUN
5:20	FAN HOOKED UP & RUNNING
	SSD
6:30	DEPART

DAILY FIELD REPORT

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Project Name: VDB 11193
Project Number: TR0626
Field Personnel: DAWSON, WORTZ
450 → DAHLEN, KUO
Recorded By: WW
Weather: SUNNY COOL WINDY

Date: 061217
Page 1 of 2
Primary Activities: PREP FOR BPC
DO BUILDING LEAKAGE CURVE

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
07:30	ARRIVED ON SITE, DAWSON AWAITING PASS.
08:10	DAWSON ARRIVES HEALTH & SAFTEY BRIEFING
9:50	SWITCHED OA TO REF ON PRESSURE METERS
10:00	SWITCHED BACK TO NORMAL - REF = INDOOR
10:00	SWITCHED BLOWER DOOR SO REF IS INDOOR
10:08	SWINCHED BLOWER DOOR SO REF IS OUTDOOR
	PLAYING WITH BLOWER DOOR SETUP
10:16	STARTED BLOWER DOOR TEST to -10 Pa ~~ADJUSTED FOR~~ BASELINE PDR - 16.6 Pa
10:27	FAN OFF
10:28	FAN ON — FAN @ -10 PA TARGET
	DECIDED NOT to ADJUST FOR BASELINE
	~~No change needed to~~ This doesn't impact K-factor readings as the flow rate stayed the same
	FAN @ MAX UNDER BOTH CONDITIONS i.E- SAME FLOW RATE (30
1:08	- REMOVE 44289 -
1:21	44063 -
1:35	HOOKED 44063 to SUP-1-55 CHANNEL A
	SUP-1-5 CHANNEL B
644	HOOKED UP 44289 to -
	SUP-2-55 CHANNEL A
	SUP-2-5 CHANNEL B

DAILY FIELD REPORT

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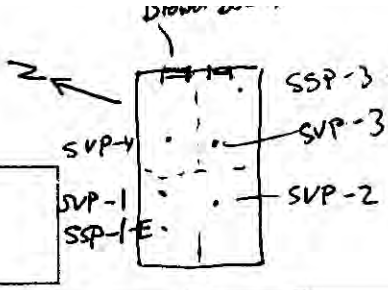
Project Name: UDB 111193
Project Number: TRO 626
Field Personnel: DAWSON, WORTZ
ASU DAHLEN, GUO
Recorded By: WW
Weather: SUNNY WINDY

Date: 06 12 17
Page 2 of 2
Primary Activities: BPC PRELIM.

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
2:00	CALIBRATE PID
	WALK AROUND AND TEST CRACKS W/ PID
	(SEE Photos) - NOTE BUILDING ~~UNDER~~ IS POSITIVELY PRESSURIZED
	WIND PICKING UP ΔP = +21.4
	@ 14:10 to 15:10
3:30	FAN TEST - OPEN FAN
	to SEE WHAT WE CAN DEPRESSURIZE to.
	FAN @ -20 Pa
	SOME VI PRESENCE BASED ON
	6.1 PPM IN CRACK by POOL
	2.6 PPM IN CRACK by SVP-4
	9.1 PPM IN WALL DRAIN BELOW POOL
17:30	DEPART SITE



DAILY FIELD REPORT

Geosyntec consultants
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Project Name: TR0626 VB11193
Project Number: 0
Field Personnel: H. Dawson, B. Wertz
Recorded By: H. Dawson
Weather: Windy Fair

Date: 6/12/17
Page 1 of 2
Primary Activities: BPL Pap

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	
13:19	SVP-3-S ~ +5 to +4	x-s ↑
13:19 PM	SVP-3-SS ~ -1 to +1	x-s ~
13:22	SSP-3-Outside ~ -6 to +2 Channel B Outside Ref = inside	x-B (~ +)
13:28	SSP-1-Outside ~ +20 to 0 Channel B Outside Ref = inside	x-B (—)
13:28	SSP-1-SS +0 to +1.5 Channel A SSP-1 "	x-S ↑
13:36	SVP-4-SS ~ -0.1 to 0.1 Channel A "	x-Sh ~
13:37	SVP-4-S +1.7 to ~4.0 Channel B "	x-Sh ↑
14:02	SVP-4-SS ~0.5 to 0.1 ↑	~
14:02	SVP-4-S ~2 to 5	↑
14:05	SVP-1-SS ~ -1.0 to 0.8 ↑	~
14:05	SVP-1-S ~ +12 to 7.0	↑
14:06	SVP-2-SS ~ -1.5 to +0.7 ↑	~
14:06	SVP-2-S ~ +3.0 to 7.0 ↑	↑
14:08	SVP-3-SS -0.7 to +4.0 ↑	~
14:08	SVP-3-S +6.0 - 5.7	↑
	SUMMARY OF MOVES DG-700	
	#44289 6/11/17 @ SSP-W-3 Channel A	
	@ SSP-2-E Channel B	
	6/12 @ SVP-2-SS A	
	SVP-2-S B	
	#44063 6/11/17 @ SSP-3-E A #44062 6/11 @ SSP-1-E A	
	Outside B Outside B	
	6/12/17 @ SVP-1-SS A	
	SVP-1-S B	
	#44286 6/11/17 @ SVP-4-SS A	
	SVP-4-S B	
	#41676 6/11/17 @ SVP-3-SS A	
	SVP-3-S B	

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: VB11193 Date: 6/12/2017 Page 2 of 2
Project Number: TR0626 Primary Activities:
Field Personnel: H. Dawson, B. Wertz BPC Prep
Recorded By: H. Dawson
Weather: Windy Fair

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
15:13	BPC X-Bldg 14:13 - 15:13 +22.2
15:29	BPC set to -10
15:30	Flow P2(Pa) stabilized ~ Flow @ ~6017 over 6.5 minutes
15:40	SVP-4-SS ~ -0.5 to 3.0
15:40	SVP-4-S 6 to 15
15:42	BPC set to -22
15:47	ΔP = -13.9 F = 5534 49 seconds
15:54	ΔP = -22.9 F = 4844
16:17	SVP-3-SS +3.4 - +16
16:17	SVP-3-S +38.0
16:20	Panels Door at 30 sec interval logs ~ 6100 CFM
16:23	SVP-2-SS +3. - +6
16:23	SVP-2-S +36 39
16:25	SVP-1-SS +2 +1.0
	SVP-1-S +40 +45
16:28	SVP-4-SS +2 +3
16:28	SVP-4-S +13 +15
	Cook

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: B11193
Project Number: TR0626
Field Personnel: H. Dawson, B. Wertz
Recorded By: H. Dawson
Weather: Fair

Date: 6-13-17
Primary Activities: BPC

Page 1 of 2

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
08:00	Set up blower door
08:12	Baseline POR = +7.5 Pa
08:18	Redo: Baseline POR = +5.6 Pa
08:22	POR NID Unsealed ~5.9 Pa 5832
08:32	3150 14.5 Pa
	3200 -90.
08:55	Tied the external ΔP ports of the two blower doors together. ΔP much more stable now.
09:05	(B) HD 2375 - 2400 (2385 - 2395) ~9
	(A) HD 2660 avg at -90 Pa over past 1.2 minutes
09:32	(A)(HD): 2726 -9.3 avg over 32-37 minutes
09:30	(A)(HD) 2730 -9.4 avg over past 30 minutes
9:34	B 2351 -9.5 CFM_{TOTAL} = 2730 + 2351 =
9:49	Building Dimensions H
	11'6" 15'10"
	~~54'2" - 80'8" + 8"~~ = 1355
	W = 80'
	69'4" + 67'8" = 137' A_{BLDG} = 10,960 ft²
	H_{BLDG} = 13.25 ft
	V_{BLDG} = 145,220 ft³
10:12	Avg Blower Door A = -9.2 2743 CFM_{50} = 2743 + 2351 = 5094
	AER = 1/28 min
10-12:30	Set up SVP-SS and IA and OA sample umbrella
	Collected samples over approx 20-40 min

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: B11193 Date: 6-13-17 Page 2 of 2
Project Number: TR0626 Primary Activities: DPC
Field Personnel: H. Dunn, B. Wertz
Recorded By: H. Dunn
Weather: Fair

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
12:47	Tech log program stopped recording. Reset and started new file to contain N10 test.
12:54	N20 test w/ Ring A-
12:57	N20 test w/ no rings - unsealed
13:05	N20 test flows balanced at both doors ~ 4000 - 4500 CFM
13:17	N20 stab for BLC:
	A -20.0 ~~4447~~ 4447 over 5 minute
	B -20.0 4350
	Air Exchange/Rate 1/17 min
14:00	Collected IA and SVP-SS-10-1 samples, COC, forms, etc., prep for IA/OA-20
15:40	Deployed IA-A-20, B-20, C-20, OA-A-20
15:42	BLC: A -19.8 4360
	BLC: B -19.7 4460
16:15	Started collecting IA-A/B/C-20 and OA-A-20
16:45	Finished pressing " " "
16:54	BLC DATA: A: -33.8 5431 over 10 minute previous
	B: -33.3 5850 ~
16:41	Bumped Blower Door Fan up to max
	A: -34.8 avg over 27 minute 5428
	B: -34 5920

DAILY FIELD REPORT

Geosyntec consultants
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Project Name: VDB 11193 Date: 061317 Page 1 of ___
Project Number: TR0624 Primary Activities:
Field Personnel: DAWSON, WURTZ, LAUSCH BPC
ASU→ DAHLEN, GUO
Recorded By: WW
Weather: SUNNY COOL

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
7:10	ARRIVED AT BUILDING
	PREP FOR BPC
8:15	SET UP FOR LEAKAGE TEST
8:45	CONNECT OUTDOOR PRESSURE TUBES FROM BOTH
	BLOWER DOORS
	NOTE: B11193-061317-OA-B-20
	WILL BE REPLACED by B11193-061317-IA-B-20
	BPC - 35±
	CHECKED CRACKS W/ PID
18:30	DEPART

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: VDB 11493
Project Number: TR0626
Field Personnel: WERTZ
DARLEN, GUO (ASU)
Recorded By: WERTZ
Weather: Cool, Foggy IN AM

Date: 06 14 17 Page ___ of ___
Primary Activities: ASU - LONG DURATION BPC @ -10 Pa

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
6:45	ARRIVE ON SITE
	DEPLOY BASELINE INDOOR AIR CANS @ A, B, C & OA
08:00	RETRIEVED CANS
09:00	STARTED ASU BLOWER DOOR @ -10 Pa, LOCATION 10
	X-BUILDING PRESSURE @ LOCATION A and B TIED TOGETHER
	AS DONE 06/13/17
	PREPED SAMPLES - SUMMA - IA, OA - 55
17:20	SAMPLERS DEPLOYED
18:10±	STOPPED SAMPLING
18:30	DEPART
	NOTE: 55 SAMPLES AT SVP-1-55-10-2
	B11493-061417-SVP.1-55-2
	B11493-061417-SVP-1-55-2-DUP
	MAY BE BIASED LOW BECAUSE THE VALVE TO THE
	DG-700 WAS OPEN FROM 17:40 - 17:50
	ONCE THAT WAS NOTED, THE VALVE WAS
	CLOSED AND SAMPLING CONTINUED UNTIL
	18:10

Daily Field Report

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: VDB 11193
Project Number: TR0626
Field Personnel: WSR+Z
DAHLEN, 600 (ASU)
Recorded By: WSR+Z
Weather: SUNNY, COOL, MORNING FOG

Date: 061517
Page 1 of ___
Primary Activities: BPC - POSITIVE PRESSURE TEST

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information
[redacted]	
07:10	ARRIVE
	PREP
	VAC TEST @ S&LEGO
	SSV-MP-55, 5', 10'
~9:50	HOOKED UP [redacted] TUBES TO DG700 @ SVP-3-55
	to SEE IF EXTENDING REFERENCE LOCATION
	OUT OF FAN FLOW WOULD IMPACT ΔP READINGS
1:30 -	TRAVEL to FEDEX SANTA MARIA
3:00	to SHIP CANS (9 BOXES)
3:45	SET UP FOR BPC -20
	SAMPLE 15:20 - 15:58 - LOCATION E = FRONT WINDOW LEDGE WINDOW SLIGHTLY OPEN to CREATE FLOW PATH
	ADDED BLOWER DOOR @ LOCATION A
	SAMPLE ~16:50 → 17:30 - SAMPLES ID'D AS Z-FAN
18:00	DEPART

C4.2
Site #4: Building 11193
Indoor Air Sampling

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB11193 Project ID TR0626

Sampler Name WFR+Z

Sample Location: Building 11193 Floor ~~SF~~ SLAB Room

Sample Type: 6 Liter Summa ✓ Weather Conditions SUNNY, MILD-MOD WIND

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

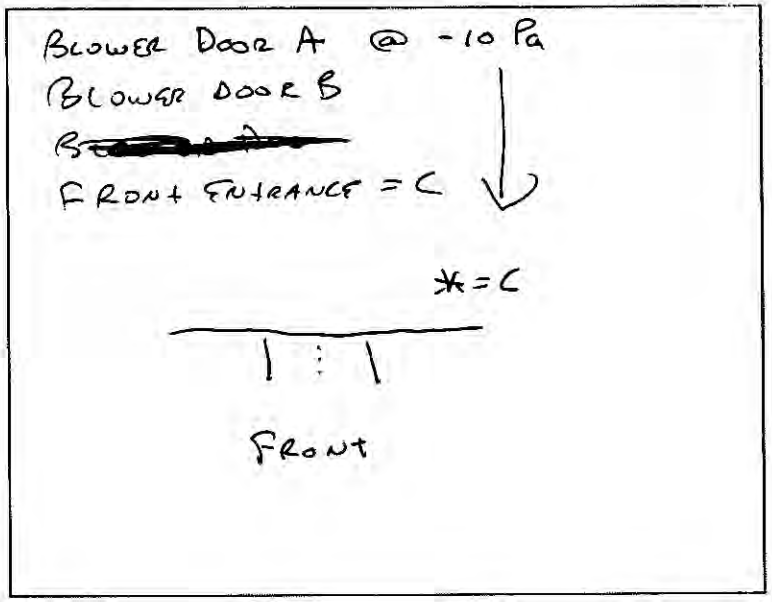
Sample ID	~~Canister ID~~	CAN Regulator ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-061317-	BPC-IA-A-10-1	GL16~~84~~ 22759	29.05	11:49	06-13-17	1.07	12:33	06-13-17
B11193-061317-	BPC-IA-B-10-1	01816 21090	28.86	~~12:51~~ 11:50	06-13-17	-0.9	12:51	06-13-17
B11193-061317-	BPC-IA-B-10-1	-DUP 6L0902 22208	28.83	~~12:51~~ 11:50	06-13-17	-2.06	12:51	06-13-17
B11193-061317-	BPC-IA-C-10-1	6L0868 20619	27.78	11:50	06-13-17	-2.37	12:30	06-13-17

Room Temperature

PID Reading (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)



Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 111 93 Project ID TR0626

Sampler Name WERTZ

Sample Location: Building 111 93 Floor CONCRETE Room BLOWER DOORS & ENTRANCE ↓ C

Sample Type: 6 Liter Summa ✓ Weather Conditions SUNNY, SLIGHT TO MODERATE WINDS ↓ A, B

Analytical Method (circle one): (TO-15 SIM) and TO-15 Scan

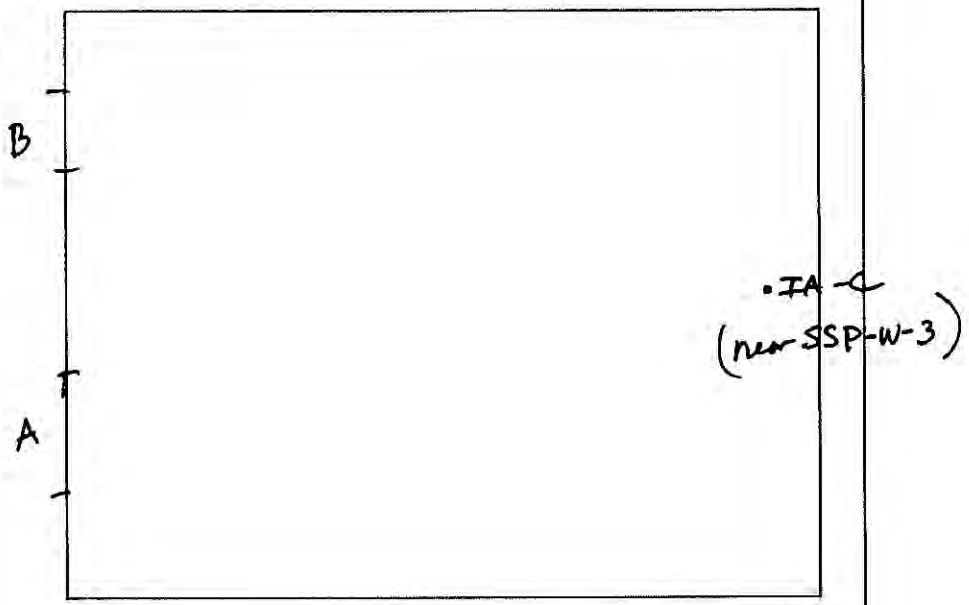
Sample ID	Canister ID	CAN Regulator ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B1193-061317-BR	IA-A-20	6L0708	28.86	15:40	06-13-17	2.65	16:21	06-13-17
B1193-061317-	BR-IA-B-20	6L0471	28.68	15:40	06-13-17	0.92	16:33	06-13-17
B1193-061317-	BPC-IA-C-20	6L0822	29.75	15:40	06-13-17	2.54	16:31	06-13-17
B1193-061317	BPC-OA-A-20	03380	28.75	15:40	06-13-17	3:06	16:21	06-13-17

Room Temperature

PID Reading (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)



Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VAB 1163 Project ID TR0626

Sampler Name WCR+T

Sample Location: Building 1163 Floor _____ Room _____

Sample Type: 6 Liter Summa ✓ Weather Conditions _____

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

Sample ID	~~Canister~~ ID	CAN Regulator ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B1163-061317-B	BPC-OA-A-10-1	01261	25.77	11:51	06-13-17	1.13	12:37	06-13-17
B1163-061417-	BPC-IA-C-10-2	6L 1218	29.28	17:25	06 14 17	4.18	18:05	06 14 17

Room Temperature _____

PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)

OUTDOOR AIR - 061317

IA-C-AIR - 061417

Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 Project ID TR0626

Sampler Name WERTZ

Sample Location: Building 11193 Floor _____ Room _____

Sample Type: 6 Liter Summa ✓ Weather Conditions S

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

Sample ID	~~Canister ID~~	CANISTER ~~Regulator~~ ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-061417	-BCP-IA-A-BASELINE	01782	29.3	06:53	061417	0.98	07:51	061417
B11193-061417	-BCP-IA-B-BASELINE	01246	28.86	06:57	061417	1.12	07:54	061417
B11193-061417	-BCP-IA-C-BASELINE	01716	29.46	06:56	061417	1.06	07:56	061417
B11193-061417	-BPC-OA-A-BASELINE	01925	29.34	06:54	061417	1.16	07:52	061417

Room Temperature _____

PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

BASELINE SAMPLES COLLECTED MORNING AFTER BLOWER DOOR TEST W/ BUILDING CLOSED PREVIOUS NIGHT

Sketch of Sample Location (s)

Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 Project ID TR0626

Sampler Name WERTZ

Sample Location: Building _____ Floor _____ Room _____

Sample Type: 6 Liter Summa ✓ Weather Conditions SUNNY, MILD, GENTLE AM BREEZE

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

Sample ID	~~Canister ID~~	CAN ID ~~Regulator ID~~	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-061417-BPC-10A-A-10-Z		1653	26.45	17:21	061417	3.21	17:54	061417
B11193-061417-BPC-IA-D-10-Z		6L1230	29.37	17:20	061417	1.53	1807	061417
B11193-061417-BPC-IA-B-10-Z		01613	29.47	17:21	061417	2.65	18:14	061417
B11193-061417-BPC-IA-B-10-Z-DUP		6L0760	29.43	17:21	061417	0.77	18:15	061417

Room Temperature _____

PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)

IA-D - IS LOCATED AT SUP-4
THERE IS NO IA-A FOR THE
BPC-10-Z EVENT BECAUSE
WE WERE ONLY USING BLOWER
DOOR B TO DEPRESSURIZE BUILDING

Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 Project ID TR0626

Sampler Name WERTZ

Sample Location: Building 11193 Floor _____ Room _____

Sample Type: 6 Liter Summa Weather Conditions _____

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

Sample ID	~~Canister ID~~	CANISTER ~~Regulator ID~~	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-061517	BPC-IA-D-10-P-2FAN	/ 02648	29.34	16:53	061517	3.68	17:31	061517
B11193-061517	BPC-IA-D-10-P	/ 6L0624	29.56	15:22	061517	2.46	16:04	061517
B11193-061517	BPC-IA-E-10-P	/ 6L0773	29.26	15:20	061517	4.29	15:58	061517
B11193-061517	BPC-IA-E-10-P-2FAN	/	28.75	16:55	061517	3.25	17:33	061517

Room Temperature _____

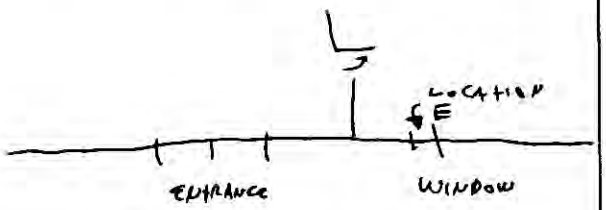
PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)

B11193-061517-BPC-IA-D-10-P
LOCATED AT SVP-4

B11193-061517-BPC-IA-E-10-P
LOCATED ON WINDOW LEDGE NEAR FRONT OF BUILDING WITH WINDOW OPEN TO DIRECT FLOW



Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 Project ID TR-0479

Sampler Name Mali

Sample Location: Building UPGRADIENT 11193 Floor _____ Room _____

Sample Type: 6 Liter Summa ✓ Weather Conditions SUNNY, WARM

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

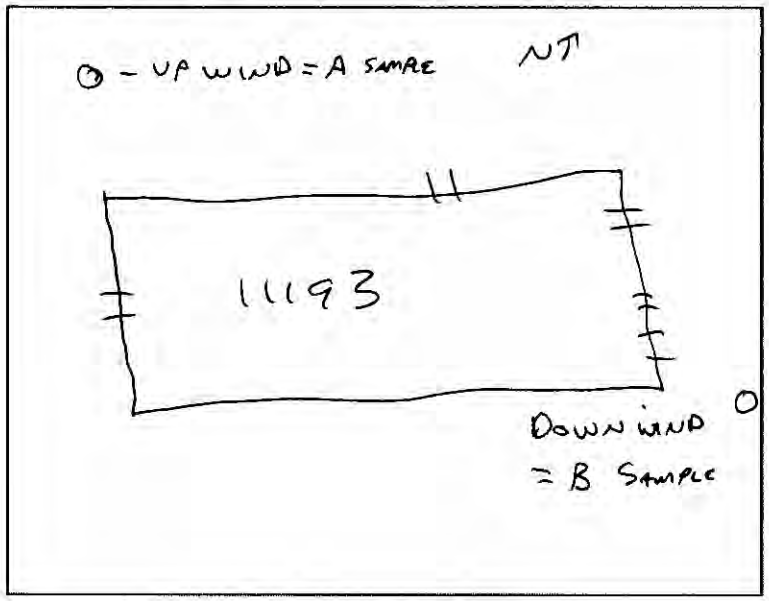
Sample ID	~~Canister~~ ID	CANE Regulator ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-06-19	17-SSV-0A-A	01048	29.06	09:56	061917	3.59	18:28	061917 ✓
B11193-061917	17-SSV-0A-B	6L0772	29.21	10:06	061917	4.65	18:38	061917 ✓
B11193-062017	7-SSV-0A-A	6L1565	29.31	07:54	062017	3.67	16:04	062017 ✓
B11193-0620	17-SSV-0A-B	6L0842	29.34	07:55	062017	4.68	16:05	062017 ✓

Room Temperature _____

PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)



Air Monitoring Form.ai

06/19 06 2017 2 of 3

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 DM Project ID TR0479

Sampler Name WSR+Z

Sample Location: Building 11193 Floor ____ Room ____

Sample Type: 6 Liter Summa ✓ Weather Conditions ____

Analytical Method (circle one): TO-15 SIM and TO-15 Scan

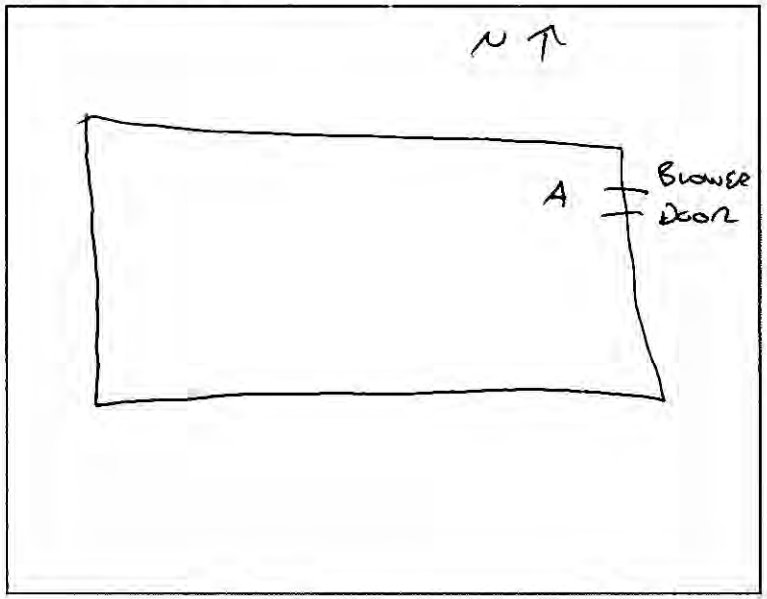
Sample ID	~~Canister ID~~	CAN # ~~Regulator ID~~	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-062017-ST-1-IA-A-10		6L0979	29.33	14:45	06 20 17	2.03	14:53	06 2017
B11193-062017-ST-1-IA-A-10-Dup		6L0719	27.78	14:45	06 20 17	1.97	14:53	06 2017
B11193-062017-ST-2-IA-A-10		9946	29.18	16:02	06 2017	2.09	16:12	06 2017
B11193-062117-ST-3-IA-A-10		6L1735	29.34	9:05	06 21 17	2.71	9.15	06 21 17
B11193-062117-ST-4-IA-A-10		1848	29.46	12:10	06 21 17	0.91	12:20	06 21 17

Room Temperature ____

PID Reading ____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)



Air Monitoring Form.ai

AIR MONITORING FORM

Geosyntec consultants

Site Name VOB 11193 Project ID TR0479

Sampler Name D Mali

Sample Location: Building 11193 Floor _____ Room _____

Sample Type: 6 Liter Summa Weather Conditions _____

Analytical Method (circle one): (TO-15 SIM) and TO-15 Scan

Sample ID	Canister ID	~~Regulator ID~~ Can #	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-062117-ST-5-IA-A-5	6L1260		29.26	13:35	06/21/17	3.92	1350	06/21/17
B11193-062117-SSV-OA-B	01853		29.27	07:25	06/21/17	5.94	15:35	06/21/17
B11193-062117-SSV-OA-A	6L1568		29.41	07:25	06/21/17	5.61	15:35	06/21/17
B11193-062117-ST-6-IA-A-5	6L0387		29.37	1750	06/21/17	3.18	1805	06/21/17

Room Temperature _____

PID Reading _____ (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)

Air Monitoring Form.ai

Radon Detector/Monitor
Version 1.6
Serial#: 02024
Calib.#: 00318 Bkgnd16
TestID#: 80212

No Delay
Interval Report

Hour	T	B	AC	pCi/L	Temp	Hum	Alph
001				000.1	079	059	0006
002				000.2	078	057	0008
003				000.1	080	055	0004
004				000.0	080	052	0002
005				000.1	080	050	0006
006				000.0	079	050	0000
007				000.0	076	052	0000
008				000.0	075	055	0000
009				000.1	073	057	0004
010				000.0	072	058	0000
011				000.0	071	059	0000
012				000.0	070	060	0000
013				000.0	069	061	0000
014				000.0	068	061	0000
015				000.0	068	062	0000
016				000.0	068	062	0000
017				000.0	068	063	0000
018				000.0	068	063	0000
019				000.0	069	062	0003
020				000.0	070	062	0000
021				000.0	072	062	0000
022				000.1	073	060	0005
023				000.0	075	059	0000
024				000.1	077	056	0005
025				000.0	078	052	0000
026				000.0	078	051	0000
027				000.0	078	051	0000
028				000.0	076	051	0000
029				000.0	074	053	0000
030				000.0	073	056	0000
031				000.0	071	058	0000
032				000.0	070	059	0000
033				000.0	070	059	0000
034				000.0	069	060	0000
035				000.0	068	061	0000
036				000.0	068	062	0000
037				000.0	068	062	0000
038				[illegible]			
039							
040							

043	000.0	067	064	0000
044	000.0	068	064	0000
045	000.0	070	064	0000
046	000.0	072	063	0000
047	000.0	073	059	0000
048	000.1	074	057	0000
049	000.0	074	058	0000
050	000.0	074	058	0000
051	000.0	075	056	0000
052	000.0	075	055	0000
053	000.0	074	056	0001
054	000.0	071	057	0000
055	000.0	071	058	0000
056	000.0	070	059	0000
057	000.0	069	060	0000
058	000.0	068	060	0000
059	000.0	068	060	0000
060	000.0	068	060	0000
061	000.0	068	061	0000
062	000.0	067	061	0000
063	000.1	067	062	0006
064	000.1	067	062	0005
065	000.0	067	062	0000
066	000.0	067	063	0002
067	000.0	069	062	0002
068	000.0	071	063	0000
069	000.0	073	063	0000

Avg: 000.0
Max: 000.1
Min: 000.0

Start Date/Time

End Date/Time

Address

Location of Instrument

Tested By

C4.3
Site #4: Building 11193
Soil vapor Monitoring

SOIL GAS PROBE MEASUREMENTS During SSV Full

Geosyntec consultants

① Project Name: VOB 1193
Date: 06/19/17 Project Number: _____
Site Location: _____
Weather: _____
Field Personnel: _____
Recorded By: _____

Probe No.: SSP-N-2 ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other_____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed, ____ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
06/19/17	11:10	~30 sec		1		1	0.0	0.0	21.0				9.8
	11:13			1		2	0.0	0.0	21.0				5.8
	11:17					3	0.0	0.0	21.1				4.9
	11:22					4	0.0	0.0	21.0				4.2
	11:30		PURGED	5L to SEE IMPACT		10	0.0	0.0	21.1				2.7

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)

Comments:

SOIL GAS PROBE MEASUREMENTS Durus SSV 10" H_2O 450 FPM

Geosyntec consultants

① Project Name: VAB 11193
Date: 061917 Project Number:
Site Location: Bld 11193
Weather: Sunny Warm
Field Personnel: Wertz McAlary Mali (Oahlen - ASU)
Recorded By: T. Miller Miller (Engineering)

Probe No.: SSP-N-2 ☒ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other
Surface Thickness inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe (L)

⑤ Shut in test prior to pneumatic test completed, in. H_2O held for seconds.

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) in. H_2O

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
061917	17:13					1	0.0	0.0	21.3				6.7
	17:15					2	0.0	0.0	21.3				4.5
	17:18					3	0.0	0.0	21.3				3.7
	17:20					4	0.0	0.0	21.3				3.3
	17:24					5	0.0	0.0	21.3				2.7

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)

Comments:

SSV ~~SOIL GAS PROBE MEASUREMENTS~~ STACK SAMPLE

Geosyntec consultants

① Project Name: [redacted] VDB 11193
Date: 061917 Project Number: TR0626
Site Location: Building 11193
Weather: Sunny Mild
Field Personnel: Wertz, McAuley, Mari DaLeo(ASU), Tony Mira Entanglement
Recorded By: Wertz

Probe No.: ☐ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other
Surface Thickness ____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe ____ (L)

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) ____ in. H_2O

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading ____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
061917	10:06-10:07	B1193-061917-SSV-COMB-1	1L1635			28.86	2.19
06 19 17	14:50	B11193-061917-SSV-1-44	1L2746			29.05	2.18

Comments: OPENED FLOW CONTROLLER VALVE TO INCREASE FILL RATE

Geosyntec Consultants Vandenberg Air Force Base SSV Sampling Form

Date: 06/8/17 Weather SUNNY, MILD Personnel WORTZ, MCALEER, MALI
ASU-DAHLEN | SUBCONTRACTOR TONY M MIKE

PID # 7320 GEM # 4484 (PINE) Flow (fpm) 880 Fan Vac (in H_2O) 30"

Sample Time	VOCs PID (ppm)	CH_4(%)	CO_2(%)	O_2(%)	Comments
08:37	11.8	0.0	0.2	20.7	
08:44	12.8	0.0	0.2	20.7	
08:48	12.0	0.0	0.2	20.8	
08:54	11.8	0.0	0.2	20.7	
08:56	8.6	0.0	0.2	20.8	
09:00	9.1	0.0	0.1	20.9	
09:05	9.5	0.0	0.2	20.8	
09:08	8.5	0.0	0.1	20.9	
09:14	9.7	0.0	0.1	20.9	
09:19	10.0	0.0	0.2	20.9	
09:21	9.3	0.0	0.2	20.9	
09:25	9.6	0.0	0.1	20.9	
09:28	9.4	0.0	0.1	20.9	
09:32	9.4	0.0	0.2	20.9	

Geosyntec Consultants Vandenberg Air Force Base SSV Sampling Form

Date: 061917 Weather _____ Personnel _____

PID # _____ GEM # _____ Flow (fpm) _____ Fan Vac (in H_2O) _____

	Sample Time	VOCs PID (ppm)	CH_4(%)	CO_2(%)	O_2(%)	Comments
	09:36	9.7	0.0	0.2	21.8	
	09:40	9.7	0.0	0.1	21.0	
	12:00	10.1	0.0	0.1	21.1	
	12:10	8.5	0.0	0.0	21.2	
	12:15	7.7	0.0	00	21.2	
SVP-4-SS	12:30	399	0.0	0.0	21.3	
STACK	15:45	10.2	0.0	0.0	21.2	900 FPM
PHASE 3→	17:45	8.8	0.0	0.0	21.2	950 FPM

50% Flow

Geosyntec Consultants | Vandenberg Air Force Base | SSV Sampling Form

Date: 061917 Weather Sunny, warm Personnel _____

PID # _____ GEM # _____ Flow (fpm) 450 Fan Vac (in H_2O) 10"

	Sample Time	VOCs PID (ppm)	CH_4(%)	CO_2(%)	O_2(%)	Comments
STACK	15:50	7.5	0.0	0.0	21.1	450 FPM
	15:59	8.2	0.0	0.0	21.2	
	16:02	8.5	0.0	0.1	21.2	
	16:06	8.5	0.0	0.0	21.2	
	16:09	8.5	0.0	0.0	21.2	
	16:13	8.3	0.0	0.0	21.2	
	17:45	6.8	0.0	0.0	21.2	

SSV STACK SAMPLE
~~SOIL GAS PROBE MEASUREMENTS~~

Geosyntec consultants

① Project Name: VDB 11493
Date: 06 20 17 Project Number: _____
Site Location: 11493
Weather: Cool Foggy
Field Personnel: Wright McClay Mah Dahlen
Recorded By: Wright

Probe No.: SSV STACK ☐ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other_____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑤ Shut in test prior to pneumatic test completed,____ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐Yes ☐No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
06 2017	08:30					1	0.0	0.3	20.8	[redacted]	-		9.1
	09:10					2	0.0	0.3	20.8				9.0

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
062017	08:48 08:52	B11193-062017-SSV-3-22	1L 2579			29.32	0.71
06 2017	14:45	B11193-062017-SSV-4-22	1L 3063			29.03	0.80
06 2017	14:45	B11193-062017-SSV-4-22-Dup	1L 2940			29.21	0.78

Comments: STACK SAMPLE - AFTER OVERNIGHT RUN OF SSV @ 450 CFM = #3
STACK SAMPLE @ BPC -10 = #4 and #4 DUP

SSV Stack Sample
~~SOIL GAS PROBE MEASUREMENTS~~

Geosyntec consultants

(1) Project Name: VDB 11193
Date: 06 20 17 Project Number: _____
Site Location: B 11193
Weather: Sunny Warm
Field Personnel: _____
Recorded By: _____

Probe No.: SSV Stack ☐ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

(2) Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other_____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

(3) 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

(4) Initial Vacuum (prior to pumping) _____ in. H_2O

(5) Shut in test prior to pneumatic test completed,____ in. H_2O held for ___ seconds.

(6) Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

(7) Field tubing blank reading (ppm_v) completed? ☐Yes ☐No PID Reading _____ ppm_v

(8) Shut in test prior to purging completed? Yes ☐ No ☐

(9) Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)

(10) Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

(11) Shut in test prior to sample collection completed? Yes ☐ No ☐

(12) Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
06 20 17	16:02	B11193-062017-SSV-5-59	1L2721			28.85	0.15
06 21 17	9:05	B11193-062117-SSV-6-59	1L2610			28.19	1.97
06 21 17	12:10	B11193-062117-SSV-7-65	1L1926			28.50	2.92

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 06/21/17 Project Number: TR0473
Site Location: 11193
Weather:
Field Personnel: DM TM UW
Recorded By: DM

Probe No.: ☒ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
06/21/17	13:35	B11193-062117-SSV-8-65	IL2450	–	–	27.51	2.92
06/21/17	17:59	B11193-062117-SSV-9-58	IL1546	–	–	24.97	2.55

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 June 2017 Project Number: 10479
Site Location: B11193
Weather: Fair 22C
Field Personnel: TMCA
Recorded By: TMCA

Probe No.: SVP1 SS ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp (10.6) / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other none

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other
Surface Thickness 4 (inches/centimeters) ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) -13.6 ~~in. H_2O~~ Pa

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☑ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☑

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													1.7

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☑

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22 June 17	12:04	B11193-062217-SVP1SS	1026	none		29.03	2.91

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 June 2017 Project Number: TR0479
Site Location: B11193
Weather: fair 22C
Field Personnel: TMcA
Recorded By: TMcA

Probe No.: SVP255 ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp (10.6) / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness 4 (inches)/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) -28.5 ~~in H_2O~~ Pa

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													4.7

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22 June 17	12:11	B11193-062217-SVP255	1L2303	None		29.00	2.59

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 June 2017 Project Number: TR0479
Site Location: B11193
Weather: Rain 22c
Field Personnel: TM&A
Recorded By: TM&A

Probe No.: SVP3 SS ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other
Surface Thickness 4 (inches) centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) -9.4 in ~~H_2O~~ Pa

⑤ Shut in test prior to pneumatic test completed. ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													34

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22 June 17	11:38	B11193-062217-SVP3SS	1L2293	none		-29.15	~~-5.50~~ -3.57 TM&A

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 Jun 2017 Project Number: TR0479
Site Location: B11193
Weather: Fair 22C
Field Personnel: TMcA
Recorded By: TMcA

Probe No.: SVP4 SS ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness 4 (inches) centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) -39.5 in. ~~H2O~~ Pa

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													85

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22 Jun 2017		B11193-062217-SVP4SS	IL2651	none		28.96	6.52

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 Jun 2017 Project Number: TR0479
Site Location: B11193
Weather: fair 22C
Field Personnel: TMcA
Recorded By: TMcA

Probe No.: SSPE3 ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other_____
Surface Thickness 4 (inches/centimeters) ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed,____ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) -1.7 in ~~H_2O~~ Pa

⑦ Field tubing blank reading (ppm_v) completed? ☐Yes ☐No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													70

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22 Jun 17	11:49	B11193-062217-SSPE3	IL 2472	none		29.05	~~3.57~~ 0.38 TMcA

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: ESTCP
Date: 22 June 2017 Project Number: TR0479
Site Location: B11193
Weather: Rain 22°C
Field Personnel: TMcA
Recorded By: TMcA

Probe No.: SSPN2 ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: 18121 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other_____
Surface Thickness 4 (inches) centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ I Casing Volume
☑ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) -34.7 in~~H₂O~~ Pa

⑤ Shut in test prior to pneumatic test completed, ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
													0.1

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
22June17	11:14	B11193-062217-SSPN2	1L 2401	none		28.96	8.88

Comments:

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45 SCFM

INTERWELL HELIUM TESTS

Page 1 of 1

Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM JM WW
Recorded By: DM

Date: 06/19/17
Primary Activities: _____

Injection Location	Time of Injection	Velocity (ft/min)	Vacuum (in H2O)	Peak Time	Comments
SSP 2A	2 sec	880	30	Nothing	Start time 2m 31 sec
" "	5 sec	880	30	" "	Start time 0:00
" "	5 sec	"	"	" "	
" "	" "	" "	"	✓	" "
SSP-S1	5 sec	880	30		Start 0:00, Pump not on
SSP-S1	5 sec	880	30	~15 sec	✓
SSP-S2	10 sec	880	30	2 min	Start at 0:00 ✓
SSP-3C	10 sec	880	30	~2.5 min	" " ✓
SSP-3B	5 sec	880	30	19 sec	" " ✓
SSP-E1	5 sec	880	30	20 sec	" " ✓
SSV-MP	5 sec	880	30	Nothing	5 ft depth
1338 SSP-4-S5	10 sec	880	30	[illegible]	✓
SSP-2B	5 sec	880	30	~18 sec	✓
SSP-1B	5 sec	880	30	45 sec	14:24 ✓

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Cracks sealed running at half speed

Page 1 of 1

INTERWELL HELIUM TESTS

Project Name: ESTCP
Project Number: TR0479
Field Personnel: DM TM WW
Recorded By: DM

Date: June 20
Primary Activities:

Time	Injection Location	Time of Injection	Velocity (ft/min)	Vacuum (in H2O)	Peak Time	Comments
9:11	SSP-3B	5 Sec	510	12	20 sec	25CFM ✓
922	SSP-E1	5 sec			48 sec	25CFM ✓
936	SSP-S1	5 sec			24 sec	25CFM ✓
947	SSP-S2	10 sec			3min 30sec	25CFM ✓
1043	SSP-3C	10 sec				Pump Not working 25CFM
	~~SSP-3C~~	~~10 sec~~				25CFM
1157	SSP-2B	5 sec			38 sec	Video description (2E) wrong 25CFM ✓
1218	SSP-3C	10 sec			4min	25CFM ✓
1514	SUP4SS	15 sec			16min	running at full speed (crack sealed) ✓ 45 CFM

Geosyntec consultants

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Guelph, Ontario, Canada N1G3Z2
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www.geosyntec.com

HELIUM FLOOD TESTS

Page ___ of ___

Project Name: _____
Project Number: _____
Field Personnel: _____
Recorded By: _____

Date: _____
Primary Activities: _____

Initial Information

Probe Name: SSP-1B

Velocity: _____
Flow Rate: _____
(X-sec 3" pipe =0.049 ft^2)

Vacuum: _____

Start Time: ___ _____

Subtract 2 min from Elapsed time for actual start time (video time)

Elapsed Time	Helium Concentration	Comments
~5 min	18700	moved to next location
		so that I did not miss it

PID SCREEN. & RESULTS
6/18/17

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

- Proposed Nested SSP, 5 ft SGP and 10 ft SGP
- Proposed Temporary SSV Extraction Point
- Proposed Communication Test Point (SSP)
- Proposed Nested Test Points at depths of 0.5, 5 and 10 feet
- Floor drain

Figure 8. Planned locations for testing instrumentation in Building 11193

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SSP SCREEN

~~DAILY FIELD~~ REPORT

~~6/1~~ 6/10/17

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Project Name: VAS Build 1193 Date: _____ Page ___ of ___

Project Number: _____ Primary Activities: _____

Field Personnel: _____

Recorded By: _____

Weather: _____

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information	PID	CH4 CO2 O2 GEM
10:40	SSP3C 0.1" @ 500 ML/MIN	102.5	0.0 0.5 20.1
	SSP4B 0.11 @ 500	77.1	0.0 0.1 20.8
	SVP-4-10 0.26 @ 500	SEE SAMPLING FORM	
★	SVP-4-55 0.32 @ 500 NOTE high VAC	SEE SAMPLING FORM	
1701	SSP-W-2 0.14 @ 500	121	0.0 0.3 20.6
1714	SSP-4-E 0.17 @ 500	28	0.0 0.1 21.2
1725	SSP-1-E 0.12 @ 500	13.4	0.0 1.0 18.8
1735	SSP-W-3 0.21 @ 500	7.9	0.0 1.8 19.3
1745	SSP-2-E 0.14 @ 500	7.6	0.0 5.6 15.1
1805	SSP-S-2 0.10 @ 500	6.2	0.0 1.7 19.8
1820	SSP-E-2 0.15 @ 500	66.7	
	SWITCHED to 6FM 6M07654 -	~~66.7~~	0.0 0.1 19.4
1857	SSP-3-C	11.9	0.0 0.3 19.8
1850	SSP-E-1 0.10 @ 500	5.7	0.0 0.1 20.3
1857	SSP-3-B 0.2 @ 500	4.1	0.0 0.1 20.4
17:55	SSP-S1 0.17 @ 500	4.1	0.0 0.3 20.4
17:15	SSP-2-A 0.10 @ 500	3.9	0.0 0.2 20.5
17:30	SSP-1-B 0.12 @ 500	4.5	0.0 0.2 20.5
	POSITIVE Pa (20) 6/15/17 MOST OF THE DAY		
	6/16/17	PPM	
	14:15 PID DIRECT SSP-3-C	~~12.3~~	
	SSP-S-E	4.1	
	SSP-E-3	126.5	
	SSP-W-1 ← SSP-1-W	7.3	
	SSP-2-B	11.2	
	SSP-4-E	9.2	
	SWP-4-55	417 (∞)	

6/12/17 PID READINGS H Dawson

5.2 Baseline Characterization Activities

5.2.1 Design and Layout of Technology Components

Field construction tasks will include soil boring, whole soil sampling, soil vapor probe installation, and groundwater monitoring well installation at each of the four interior locations shown on Figure 10 (SVP1, SVP2, SVP3, and SVP4). The locations were selected to represent each quadrant of the building. Continuous minimally disturbed soil cores will be collected using a Geoprobe drill rig (or equivalent) and the dual tube system. The initial boring at each location

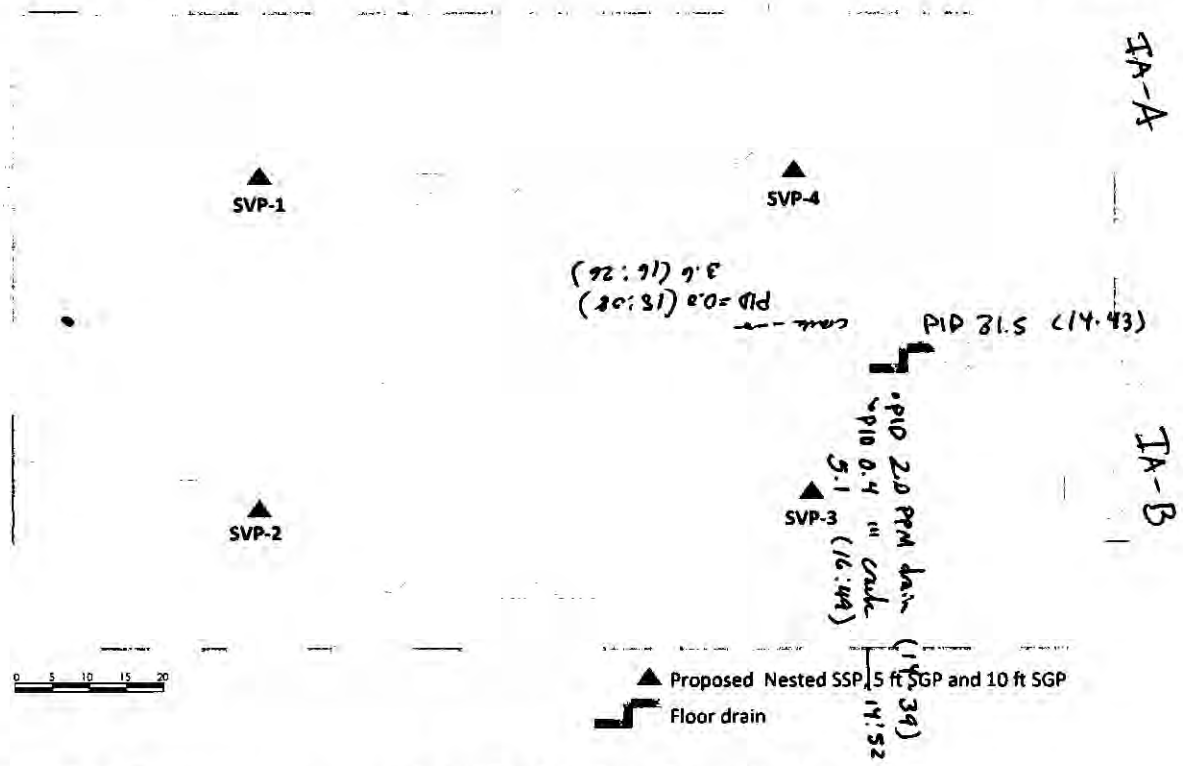

Figure 10. Proposed groundwater, soil and soil vapor sampling locations.

will be advanced to approximately three feet below the water table, which will be assessed by visual inspection of the soil cores and sounding of the borehole. A groundwater monitoring well will installed in the boring and a groundwater sample will be collected (Section 5.4.1). Soil from the extracted soil cores will be visually logged and subsampled for testing (Section 5.4.2). The information obtained from each location's initial boring will be used to position the deep (i.e. "10 ft") soil vapor probe at a depth about two ft above the water table at each location. The soil vapor probes will be installed following the Suggested Operating Procedure (SOP) for soil gas probe installation described in Appendix B. Probes will be installed in separate boreholes to approximate depths of 10 ft, 5 ft and at sub-slab depth (12 probes total).

SSP SCREEN
~~DAILY FIELD~~ REPORT

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Project Name: ~~FRONTIER~~ VDB 11193
Project Number: TRO 479
Field Personnel: WGR+Z
Recorded By: WGR+Z
Weather: SUNNY WARM

Date: 061817
Page 3 of 3
Primary Activities:

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information					
		PID	CH_4	CO_2	O_2	VAC @ 500ML/MIN
	SSP-1-A	12.9	0.0	0.2	20.6	0.2
	SSP-2-A	7.7	0.0	0.1	20.5	0.14
	SSP-3-A	7.1	0.0	0.1	20.7	0.11
	SSP-4-A	8.3	0.0	0.1	20.7	0.13
	~~SSP-5-C~~					
	SSP-3-E	15.6	0.0	1.3	19.8	0.10
	SSP-E-3	157.3	0.0	0.2	20.5	0.15
	SSP-W.1	18.4	0.0	0.4	20.3	0.12
	SSP-2-B	45.6	0.0	1.5	18.6	0.08
	SSP-4-E	21.5	0.0	0.0	20.8	0.1
	SVP-4-SS					
	FLOW & VAC					
		Vac @ 500ML/MIN				
	SVP-1-SS	0.10				
	SVP-1-5'	0.20				
	SVP-1-10	0.60				
	SVP-2-SS	0.15				
	SVP-2-5	0.30				
	SVP-2-10	0.90				
	SVP-3-SS	~~0.15~~	0.15			
	SVP-3-5	0.5				
	SVP-3-10	0.27				

Daily Field Report

Geosyntec Consultants | Vandenberg Air Force Base | SSV Sampling Form

Date: 06 20 17 Weather: Sol Foggy - AM Personnel: NW, TM, DM

PID # PGM 7320 GEM # 4484 (Pine #) Flow (fpm) 450 Fan Vac (in H_2O) 10"

Sample Time	VOCs PID (ppm)	CH_4(%)	CO_2(%)	O_2(%)	Comments
11:30	8.6	0.00	~~0.2~~ 0.1	20.7	Stack Sample. Post SEALING CRACK.

Page __ of __

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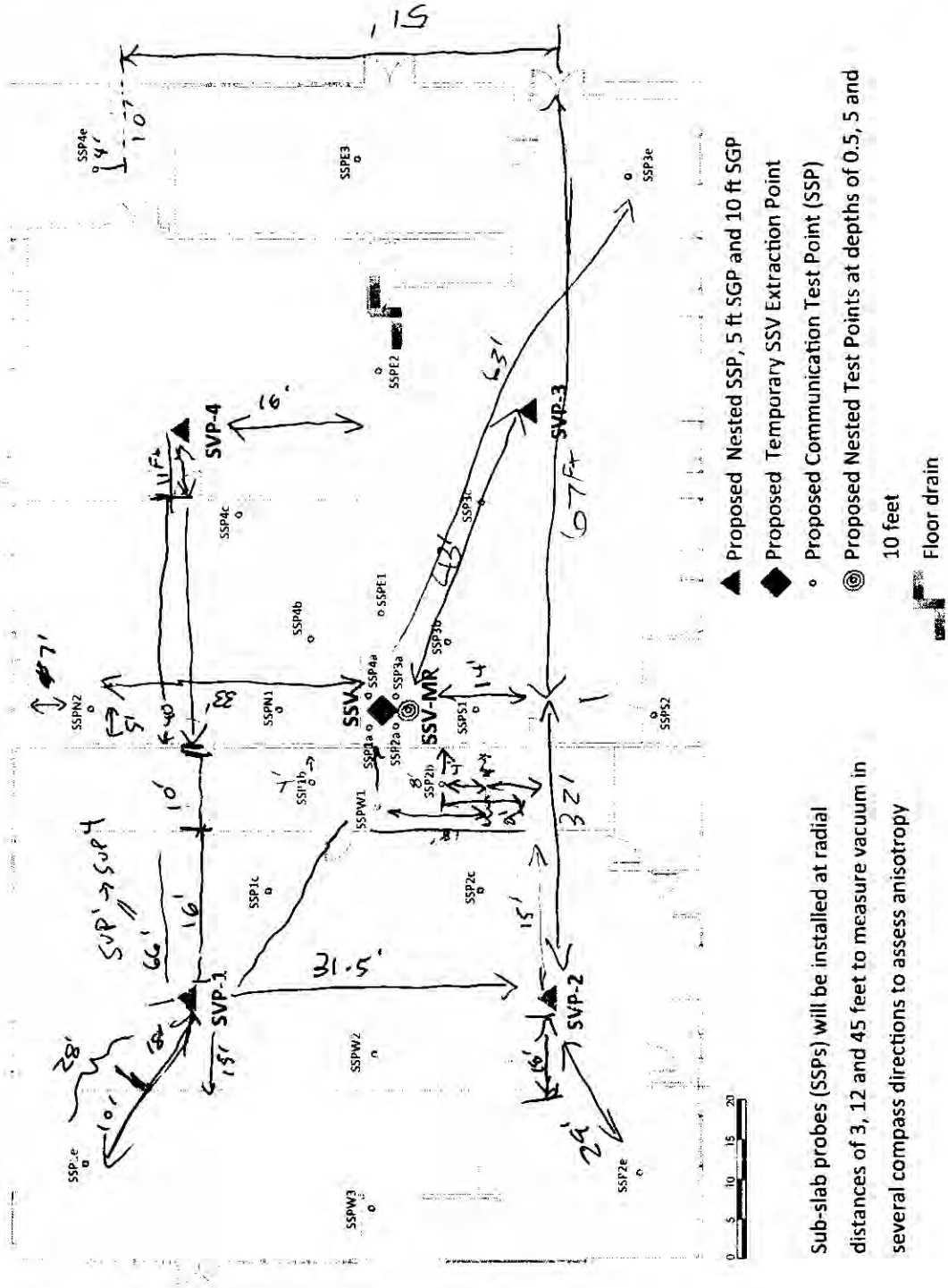


Figure 8. Planned locations for testing instrumentation in Building 11193

SUB-SLAB SAMPLING PROBE MEASUREMENTS

SVP-1-SS

Geosyntec consultants

Sampling Personnel: Tyler Boyd		Recorded By: DF			
Building #: 11193		Date: 06/09/17	Weather: Slight Rain, Mist	Row	Column
Slab Thickness:			Sub-slab Probe No.: SVP-1-SS		

Purging Data

ppbRae 3000 Serial No.: 592906370	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 06/09/17 8:00
~~PhoCheck PID Serial No.~~: GEM 4484	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 06/09/17 8:00

Purge #	Start Time	End Time	Elapsed Time (sec/min)	~~Purge Rate~~ (LPM) (L) Cumulative Volume	He (%) initial	VOCs by MiniRae (specify ppbv ~~ppmv~~)	~~VOCs by PhoCheck~~ (specify ppbv – ppmv) (CH4 / CO2 / O2 (%))	He (bg) % or ppmv
1	9:41	9:41	~~0.5~~ 15	1	10	8	—	0
2	9:43	9:43	~~60 ± 0.5~~ 15	2	—	5.5	~~0.0~~, 1.6, 16.7	—
3	9:47	9:47	15 sec	3	—	5.1	—	—
Additional purge if needed for stabilization	9:49	9:49	15 sec	4	—	—	0.0, 2.4, 16.4	—
Sample of Record								
						Sample ID No.		
Column Sample for HAPSITE								
Row Sample For HAPSITE								

	Start Time	End Time	Elapsed Time (mins)	Sample ID B11193-060917-	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	955	1015	20	SVP-1-SS	1L2778	21290	28.91	4.43

Tracer Gas (Helium)

Min Shroud %	Max Shroud %	Sample (PPM or %)
10	13.5	Ø

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: B11193
Date: 6-13-17 Project Number: TR0626
Site Location: V B11193
Weather: Fair
Field Personnel: H. Davis, D. Hertz
Recorded By: H. Davis

Probe No.: SVP-1-SS (10') ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) 27.89 in. H_2O

⑤ Shut in test prior to pneumatic test completed ___ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	He Tracer Gas Shroud (%) Min	He Tracer Gas Shroud (%) Max	He Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
6-13-17	10:56									12.2	13.5	0.0	5.7

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
6-13-2017	11:30 - 12:21	B11193-061317-SVP-1-SS-10-1	1L1594			27.89	1.51
061417	17:46 19:18	B11193-061417-SVP-1-SS-10-2	1L2724	22329		29.01	0.74
061417	17:46 18		1L2743	21791		29.2	0.92

Comments: B11193-061417-SVP1-SS-10-2 } T-VALVE WAS OPEN TO DG700 FROM 17:40 TO 17:50
B11193-061417-SVP-1-SS-10-2-DUP } MAY BE BIASED LOW IF DG700 LEAKS AIR

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-1-5

Sampling Personnel: DF, BW	Recorded By: DF		
Building #: 11193	Date: 6-9-17	Weather:	Row / Column
Slab Thickness:		~~Sub-slab~~ Probe No.: SVP-1-5	

Purging Data

ppbRae 3000 Serial No.: R8846	Lamp: (10.6) / 11.7 eV	Calibrated @ Time 6-9-17 800
~~PhoCheck~~ PID Serial No.: GEM 2000 4483	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 800

(CH4, CO2, O2 (%))

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv – (ppmv))	~~VOCs by PhoCheck~~ (specify ppbv – ppmv)
1	1047	1047	20 sec	1	57.3	—
2	1050	1050	20 sec	2	58.8	0.0, 15.0, 2.8
3	1054	1054	20 sec	3	49.7	0.0, 15.7, 2.6
Additional purge If needed for stabilization						
Sample of Record						
					Sample ID No.	
Column Sample for HAPSITE						
Row Sample For HAPSITE						

	Start Time	End Time	Elapsed Time	Sample ID B11193-060917-SVP-1-5	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	1059	1119	20 min		3299	20657	29.03	3.35

Tracer Gas (He)

	Min Shroud %	Max Shroud %	Sample (PPM or %)	
	—	—	—	

SUB-SLAB SAMPLING PROBE MEASUREMENTS

SVP-1~~0~~

Geosyntec consultants

Sampling Personnel: DF + BW	Recorded By:		
Building #: 11193	Date: 6-9-17	Weather:	Row / Column
Slab Thickness:		~~Sub-slab~~ Probe No.: SVP-1-~~5~~10	

Purging Data

ppbRae 3000 Serial No.: 592906370 (280416)	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 06-09-17 8:00
~~PhoCheck~~ PID Serial No.: 4494 ~~GEM 2000~~	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 06-09-17 8:00

(CH4, CO2, O2 (%))

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv ~~(ppmv)~~)	~~VOCs by PhoCheck~~ GEM 2000 (specify ~~ppbv~~ ppmv)
1	10:11	10:11	20 sec.	1	51.7	—
2	10:15	10:15	20 sec	2	51.6	0.0, 14.3, 3.8
3	10:20	10:20	20 sec	3	53.4	—
Additional purge If needed for stabilization	10:22	10:22	20 sec	4	—	0.0, 16.9, 2.1
Sample of Record						

	Sample ID No.
Column Sample for HAPSITE	
Row Sample For HAPSITE	

	Start Time	End Time	Elapsed Time	Sample ID B11193-060917-SVP-1-10	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	10:29	10:55	26 mins		1L2408	22047	29.15	2.40

Tracer Gas (He)

Min Shroud %	Max Shroud %	Sample (PPM or %)
11	14.6	Ø

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-2-SS

Sampling Personnel: DF & BW	Recorded By: DF		
Building #: 11193	Date: 6-9-17	Weather:	Row / Column
Slab Thickness:		Sub-slab Probe No.: SVP-2-SS	

Purging Data

ppbRae 3000 Serial No.: 28846	Lamp: (10.6) / 11.7 eV	Calibrated @ Time 6-9-17 8:00
~~PhoCheck~~ PID Serial No.: 4483 (GEM 2000)	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 8:00

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate~~ (LPM) Cumulative Volume (L)	VOCs by MiniRae (specify ppbv ~~(ppmv)~~)	~~VOCs by PhoCheck~~ (specify ppbv ~~(ppmv)~~ ~~(EDF)~~) [CH_4, CO_2, O_2 %]
1	11:47	11:47	25 sec	1	17.8	—
2	11:50	11:50	25 sec	2	15.7	—
3	11:53	11:53	25 sec	3	14.1	0.0, 4.9, 15.9
Additional purge If needed for stabilization	11:57	11:57	25 sec	4	—	0.0, 6.0, 13.4
Sample of Record						
					Sample ID No.	
Column Sample for HAPSITE						
Row Sample For HAPSITE						

	Start Time	End Time	Elapsed Time	Sample ID B11193-060917-SVP-2-SS	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	12:03	12:27	24 mins		1L3017	2704	28.95	2.68

Tracer Gas – water dam used – no leaks

	Min Shroud %	Max Shroud %	Sample (PPM or %)	
	—	—	—	

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: B11193
Date: 6-13-2017 Project Number:
Site Location: VB 11193
Weather: Fair
Field Personnel: H. Dawson, B. Wertz
Recorded By: H. Dawson, B. Wertz

Probe No.: SVP-2-SS ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M:
MDG 2002 Helium detector Serial No.:
Tracer Gas: ☐ Helium ☐ Other

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other
Surface Thickness inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ I Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe (L)

⑤ Shut in test prior to pneumatic test completed, in. H_2O held for seconds.

④ Initial Vacuum (prior to pumping) in. H_2O

⑥ Start of Pneumatic Test:

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
6-13-17	11:09			1							13.2		14.4
61417	16:25			1						8.2	13.7	0.0	11.5

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
6-13-2017	11:52-17:16	B11193-061317-SVP-2-SS-10-1	~~2000~~ IL2313		~~-29.27~~	-29.21	2.87
06 14 17	17:21 14:50	B11193-061417-SVP-2-SS-10-2	IL1692	21684		29.28	1.48

Comments:

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-2-5

Sampling Personnel: DF + BW	Recorded By: DF & BW		
Building #: 11193	Date: 6-9-17	Weather:	Row / Column
Slab Thickness:		~~Sub-slab~~ Probe No.: SVP-2-5	

Purging Data

ppbRae 3000 Serial No.: R8846	Lamp (10.6) / 11.7 eV	Calibrated @ Time 6-9-17 8:00
~~PhoCheck PID~~ GEM 2000 Serial No.: 4483	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 8:00

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ (1) Cumul. Vol	VOCs by MiniRae (specify ppbv - (ppmv))	~~VOCs by PhoCheck (specify ppbv - ppmv)~~ (CH4, CO2, O2) (2)
1	1205	1205	25 sec	1	36.5	—
2	1208	1208	25 sec	2	35.1	0.0, 11.9, 6.4
3	1212	1212	25 sec	3	34.5	—
Additional purge If needed for stabilization	1215	1215	25 sec	4	—	0.0, 12.6, 6.3
Sample of Record						

	Sample ID No.
Column Sample for HAPSITE	
Row Sample For HAPSITE	

	Start Time	End Time	Elapsed Time	Sample ID B11193-060917-SVP-2-5	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	1220	1243	23 min		1L2552	21299	29.14	2.81

Tracer Gas

	Min Shroud %	Max Shroud %	Sample (PPM or %)
	—	—	—

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-2-10

Sampling Personnel: DF & BW		Recorded By: DF & BW		
Building #: 1193	Date: 6-9-17	Weather:	Row	Column
Slab Thickness:		~~Sub-slab~~ Probe No.: SVP-2-10		

Purging Data

ppbRae 3000 Serial No.: R8846	Lamp (10.6) / 11.7 eV	Calibrated @ Time 6-9-17 8:00
~~PhoCheck PID~~ Gem 2000 Serial No.: 4483	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 8:00

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv - (ppmv))	~~VOCs by PhoCheck (specify ppbv - ppmv)~~ [CH_4, CO_2, O_2 (%)]
1	12:22	12:22	25 sec	1	39.4	—
2	12:25	12:25	25 sec	2	37.8	0.0, 12.6, 5.3
3	12:29	12:29	25 sec	3	37.1	—
Additional purge If needed for stabilization	12:33	12:33	25 sec	4	—	0.0, 13.7, 48
Sample of Record						

	Sample ID No.
Column Sample for HAPSITE	
Row Sample For HAPSITE	

	Start Time	End Time	Elapsed Time	Sample ID 1193-060917-SVP-2-10	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	12:40	12:58	18 (min)		1L1914	2520	28.49	2.63

Tracer Gas

	Min Shroud %	Max Shroud %	Sample (PPM or %)	
	—	—	—	

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: B11193
Date: _____ Project Number: TR0626
Site Location: Vandenberg B11193
Weather: Fair
Field Personnel: H. Dawson / B. Wertz
Recorded By: H. Dawson

Probe No.: B11193-SVP-3-SS ☑ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed. ____ in. H_2O held for ___ seconds.

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas He ✓ Shroud (%) Min	Shroud (%) Max	Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
6-13-17	11:21			1									41.00
6-14-17	16:40									10.7	10.9	0.0	31.6

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
6-13-2017	11:52-12:13	B11193-061317-SVP-3-SS-10-1	00000003297		~~27.11~~	-27.21	2.84
06 14 2017	17:21 17:51	B11193-061417-SVP3-SS-10-2	IL 2482	21201		29.26	1.81

Comments:

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-3-SS

Sampling Personnel: DF & BW	Recorded By: DF		
Building #: 11193	Date: 6-9-17	Weather:	Row / Column
Slab Thickness:		Sub-slab Probe No.: SVP-3-SS	
Purging Data			
ppbRae 3000 Serial No.: RB846	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 800	
~~PhoCheck~~ GEM 2000 PID Serial No.: 4483	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 800	

[CH4, CO2, O2 (%)]

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv – ~~ppmv~~)	VOCs by PhoCheck (specify ppbv – ppmv)
1	13:45	13:45	~~20~~ sec	1	42.6	—
2	13:49	13:49	~~20~~ sec	2	37.4	0.0, 2.4, 18.1
3	13:53	13:53	25 sec	3	39.3	0 —
Additional purge If needed for stabilization	13:56	13:56	25 sec	4	—	0.0, 1.9, 18.1
Sample of Record						
					Sample ID No.	
Column Sample for HAPSITE						
Row Sample For HAPSITE						

	Start Time	End Time	Elapsed Time	Sample ID B1193-060917 SVP-3-SS	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	1400	1421	21 min		1L2534	21297	~~29.44~~ 28.63	4.06

Tracer Gas — Waterdam used

Min Shroud %	Max Shroud %	Sample (PPM or %)

SUB-SLAB SAMPLING PROBE MEASUREMENTS

SVP-3-5

Geosyntec consultants

Sampling Personnel: DF & WW		Recorded By: DF	
Building #: 11193	Date: 6/9/17	Weather:	Row / Column
Slab Thickness:		~~Sub-slab Probe~~ No.: SVP-3-5	

Purging Data

ppbRae 3000 Serial No.: RS846	Lamp: (10.6) / 11.7 eV	Calibrated @ Time 6-9-17 8:00
~~PhoCheck PID~~ GEM 2000 Serial No.: 4483	Lamp: 10.6 / 11.7 eV	Calibrated @ Time 6-9-17 8:00

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv ~~ppmv~~)	VOCs by ~~PhoCheck~~ (specify ~~ppbv~~ ppmv) CH4, CO2, O2 (%)
1	1404	1404	25sec	1	161.8	—
2	1408	1408	25sec	2	168.1	—
3	1411	1411	25sec	3	165.6	0.0, 9.9, 7.4
Additional purge If needed for stabilization	1414	1414	25sec	4	—	0.0, 10.9, 7.2
Sample of Record						
					Sample ID No.	
Column Sample for HAPSITE						
Row Sample For HAPSITE						

	Start Time	End Time	Elapsed Time	Sample ID B11193-060917 SVP-3-5	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
SUMMA Sample	1420	1442	22 min		L2432	21534	28.15	2.92

Tracer Gas

	Min Shroud %	Max Shroud %	Sample (PPM or %)	
	—	—	—	

SUB-SLAB SAMPLING PROBE MEASUREMENTS

Geosyntec consultants

SVP-3-10

Sampling Personnel: DF + WW		Recorded By: DF		
Building #: 1193	Date: 6-9-17	Weather:	Row	Column
Slab Thickness:		~~Sub-slab Probe~~ No.: SVP-3-10		

Purging Data

ppbRae 3000 Serial No.: 28846	Lamp: 10.6 / 11.7 eV	Calibrated @ Time	6-9-17 800
PhoCheck PID Serial No.: 4483 (GEN 2000)	Lamp: 10.6 / 11.7 eV	Calibrated @ Time	6-9-17 800

([CH4, CO2, O2 (%)])

Purge #	Start Time	End Time	Elapsed Time	~~Purge Rate (LPM)~~ Cumulative Volume (L)	VOCs by MiniRae (specify ppbv – ppmv)	~~VOCs by PhoCheck (specify ppbv – ppmv)~~
1	1425	1425	25sec	1	162.5	—
2	1427	1427	25sec	2	158.5	—
3	1430	1430	25sec	3	174.0	0.0, 10.5, 6.9
Additional purge If needed for stabilization	1432	1432	25sec	4	—	0.0, 10.4, 7.3
Sample of Record						
					Sample ID No.	
Column Sample for HAPSITE						
Row Sample For HAPSITE						

	Start Time	End Time	Elapsed Time	Sample ID	Summa Canister ID	Flow Controller #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
	1505 (PT)	1535		B1193-060917-SVP-3-10	IL2338	21972		
SUMMA Sample	~~14:37~~		30mins		~~40869~~	~~21535~~	28.86	0.25

Tracer Gas

	Min Shroud %	Max Shroud %	Sample (PPM or %)	
	—	—	—	

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: B11193
Date: 06-13-2017 Project Number: TR0626
Site Location: Vandenberg B11193
Weather: Fair
Field Personnel: H. Dawson / B. Wertz
Recorded By: H. Dawson / B. Wertz

Probe No.: B11193-061317-SVP-4-SS ☐ Sub-slab probe ☐ Soil gas probe
Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☒ Concrete ☐ Grass ☐ Other_____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ I Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑤ Shut in test prior to pneumatic test completed, ____ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
6-13-17	11:30			1		1						~~420~~	428
6-13-17	11:34			1		2							439
6-14-17	17:00									9.9	10.5	0.6	377

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
06-13-2017	11:50 12:24	B11193-061317-SVP-4-SS-10-1	IL2312			-29.27	0.50
06-14-17	17:22 17:49	B11193-061417-SVP-4-SS-10-2	03049	20577		29.14	1.65

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: VDB 1193 | Probe No.: SVP-4-SS | ☑ Sub-slab probe ☐ Soil gas probe

Date: 061017 | Project Number: TR0626 | Mini Rae 2000 Serial No.: 592-906-370 | Lamp: (10.6) / 11.7 eV

Site Location: 1193 | Landtech GEM 2000 Landfill Gas Meter Serial No. M: GM07654

Weather: SUNNY MILD | MDG 2002 Helium detector Serial No.: 041553

Field Personnel: BRET | Tracer Gas: ☑ Helium ☐ Other

Recorded By: WW

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other

Surface Thickness _____ inches/centimeters ☐ Unknown (i.e., asphalt or concrete)

③ 1 Casing Volume: ☐ Sub-slab <0.1 L | Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed, 8 in. Hg held for 60 seconds.

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑥ Start of Pneumatic Test: _____

Start ~~Elapsed~~ Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
11:50	0.5	0.1"

⑦ Field tubing blank reading (ppm$_v$) completed? ☐ Yes ☐ No PID Reading _____ ppm$_v$

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm$_v$, %) (circle one)	VOCs by PID (ppm$_v$)
061017						0				10%	14%	0	~~378.2~~
	13:05					1	0.0	0.1	20.4				378.2
						2							~~446.8~~
						3	0.0	0.0	20.8				444.2

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No **Note:** 1% helium = 10,000 ppm$_v$

⑪ Shut in test prior to sample collection completed? Yes ☑ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
061017	13:17	1193-061017-SVP-4-SS	1L2471	21093		28.92	-2.94
	13:49						

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: VDB 1493
Date: 061017 Project Number: TR0636
Site Location: VDB 11193
Weather: Sunny Windy
Field Personnel: Wright
Recorded By: WW

Probe No.: SVP-4-S ☐ Sub-slab probe ☑ Soil gas probe
Mini Rae 2000 Serial No.: 592906338 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑤ Shut in test prior to pneumatic test completed. 8 in H_2O held for 60 seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☑ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas: Shroud (%) Min	Tracer Gas: Shroud (%) Max	Tracer Gas: Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
061017	2:00	[redacted]	[redacted]	1		1				10.1	1.5	0.0	[redacted]
	1:07			1		2	0.0	1.3	20.5				[redacted]
	1:14			1		3	0.0	4.7	15.9				1360
	1420	[redacted]				4	0.0	13.1	4.0				1154

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
	1430	B11193-061017-SVP-4-S	1L1901			[redacted]	[redacted]
	1453					29.12	3.94

Comments:

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: VPB 11193
Date: 061017 Project Number: TR0626
Site Location: VDB
Weather: SUNNY WINDY (GUSTS > 30K)
Field Personnel: WGRTZ
Recorded By: WEW

Probe No.: SVP-4-10 ☐ Sub-slab probe ☒ Soil gas probe
Mini Rae 2000 Serial No.: 592906356 Lamp: 10.6 / 11.7 eV
Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____
MDG 2002 Helium detector Serial No.: _____
Tracer Gas: ☐ Helium ☐ Other _____

② Surface Type: ☐ Asphalt ☑ Concrete ☐ Grass ☐ Other _____
Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed 5 in. H_2O held for 60 seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	0.28

④ Initial Vacuum (prior to pumping) _____ in. H_2O

⑦ Field tubing blank reading (ppm_v) completed? ☐ Yes ☐ No PID Reading _____ ppm_v

⑧ Shut in test prior to purging completed? Yes ☑ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm_v, %) (circle one)	VOCs by PID (ppm_v)
061017													
	1551			1		1	0	10.8	8.3				1220
	1560			1		2							814
							0	13.2	4.6				942
	BATTERY DIED →				SWITCHED	GEM	0	14.1	4.7				992
				to PURGE 015	316	AFTER CAL							

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm_v

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
~~061017~~	~~1615~~	~~B11193-SVP-~~	~~1L1931~~			~~29.12~~	
061017	1616	B11193-061017-SVP-4-10	1L1931			29.12	2.28
	1642						

Comments:

AIR MONITORING FORM

Geosyntec consultants

Site Name VDB 11193 Project ID TR0479

Sampler Name WSR+Z

Sample Location: Building 11193 Floor Outdoor Air & IA At Location A Room

Sample Type: 6 Liter Summa ✓ Weather Conditions Cool Foggy in AM

Analytical Method (circle one): TO-15 SIM ✓ and TO-15 Scan

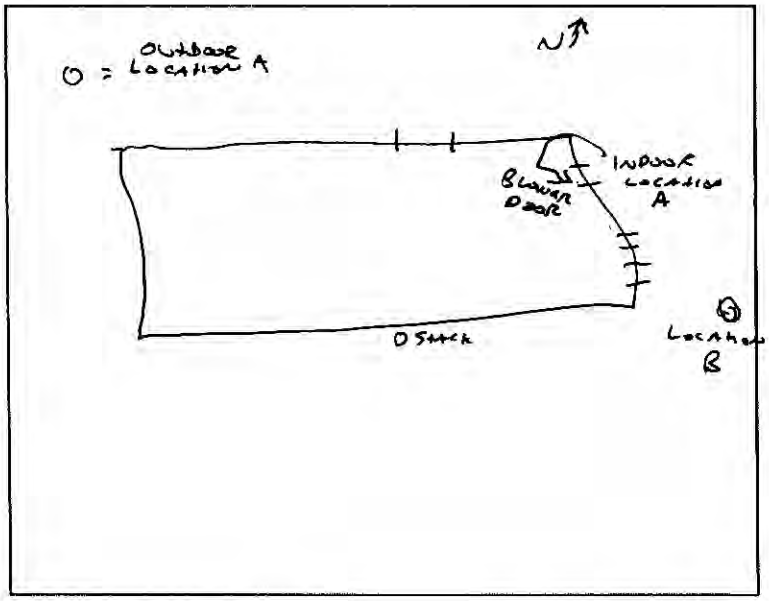
Sample ID	~~Canister ID~~	CANISTER Regulator ID	Start			End		
			Vacuum (in Hg)	Time	Date	Vacuum (in Hg)	Time	Date
B11193-062117-	SSV-OA-A	6L1568	29.~~7~~	07:25	062117			062117
B11193-062117-	SSV-OA-B	01853	29.27	07:25	062117			062117
B11193-062117-	ST-3-IA-A-10	6L1735	29.34	09:05	062117	2.71	09:14	062117
B11193-~~062117~~ 062117	ST-4-IA-A-10	01848	29.42		062117			062117

Room Temperature

PID Reading (ppm)

Other Comments (e.g., PID readings, intermediate vacuum readings)

Sketch of Sample Location (s)



Air Monitoring Form.ai

SSV STACK SAMPLES

SOIL GAS PROBE MEASUREMENTS

Geosyntec consultants

① Project Name: VDB 11193 — Probe No.: SSV STACK ☐ Sub-slab probe ☐ Soil gas probe

Date: 06 21 17 — Project Number: TR0429 — Mini Rae 2000 Serial No.: _____ Lamp: 10.6 / 11.7 eV

Site Location: B11193 — Landtech GEM 2000 Landfill Gas Meter Serial No. M: _____

Weather: [redacted] FOGGY COOL - AM — MDG 2002 Helium detector Serial No.: _____

Field Personnel: IM, DM, WW, PD(ASC) — Tracer Gas: ☐ Helium ☐ Other _____

Recorded By: _____

② Surface Type: ☐ Asphalt ☐ Concrete ☐ Grass ☐ Other_____

Surface Thickness _____ inches/centimeters ☐ Unknown
(i.e., asphalt or concrete)

③ 1 Casing Volume
☐ Sub-slab <0.1 L
Soil gas probe _____ (L)

⑤ Shut in test prior to pneumatic test completed,____ in. H_2O held for ___ seconds.

⑥ Start of Pneumatic Test: _____

Elapsed Time (min.)	Pump Flow Rate (LPM)	Well Head Vacuum in. H_2O
	0.1	
	0.2	
	0.5	

④ Initial Vacuum (prior to pumping) __ _____ in. H_2O

⑦ Field tubing blank reading (ppm$_v$) completed? ☐ Yes ☐ No PID Reading _____ ppm$_v$

⑧ Shut in test prior to purging completed? Yes ☐ No ☐

⑨ Purging

Date	Start Time	End Time	Elapsed Time (min.)	Bag Volume (L)	Purge Rate (LPM)	Cumulative Volume (L)	CH_4 (%)	CO_2 (%)	O_2 (%)	Tracer Gas Shroud (%) Min	Tracer Gas Shroud (%) Max	Tracer Gas Sample (ppm$_v$, %) (circle one)	VOCs by PID (ppm$_v$)

⑩ Helium concentration in field screened samples is less than 5% of minimum concentration in the shroud? ☐ Yes ☐ No
Note: 1% helium = 10,000 ppm$_v$

⑪ Shut in test prior to sample collection completed? Yes ☐ No ☐

⑫ Sample Collection

Date	Time	Sample ID	Summa Canister ID	Flow Controller #	Vacuum Gauge #	Initial Vacuum (in. Hg)	Final Vacuum (in. Hg)
06 21 17	9:05	B1193-062117-SSV-6-59	IL 2610			29.19	1.97
06 21 17	12:10	B11193-062117-SSV-7-65	IL 1926			28.50	2.92
062117	13:35	B11193-062117-SSV-8-65	IL 2450			27.51	2.92

Comments: B1193-062117-SSV-7 COLLECTED AFTER SHOP VAC HOOK UP

DAILY FIELD REPORT

Geosyntec consultants
www.geosyntec.com

Project Name: VDB 11193 Date: 06 21 17 Page 2 of ___
Project Number: ___ Primary Activities: ___
Field Personnel: ___ SSV OPTIMIZATION
Recorded By: ___
Weather: ___

Time	Description of activities - location of work, work performed, equipment & personnel used, incidental information		
	~~PZ~~ LOCATION	PID (PPM)	
08:15	STACK	8.7	FLOW 1200 to 890 DECREASING AS ORIFICE OPENED
	SSP-3-E	15.5	
	SSP-E-3	86.6	
	SSP-E-2	2.7	
	SSP-3-C	6.8	
	SSP-S-2	0.5	
	SVP-2-SS	5.3	
	SSP-2-E	1.4	
	SSP-W-3	0.8	
	SSP-1-E	0.3	
	SVP-1-SS	1.7	
	SSP-1-N2	0.3	
	SSP-4-E	5.8	
	SSV4-SS	135.4	
	SSP4-B	425.9	
10:45	STACK	11.4	FLOW = 650CFM (DM)
			VAC =
18:15	PID DOWN SYSTEM OF AIR BLEED		9.7
	~~SOURCE~~		

Daily Field Report

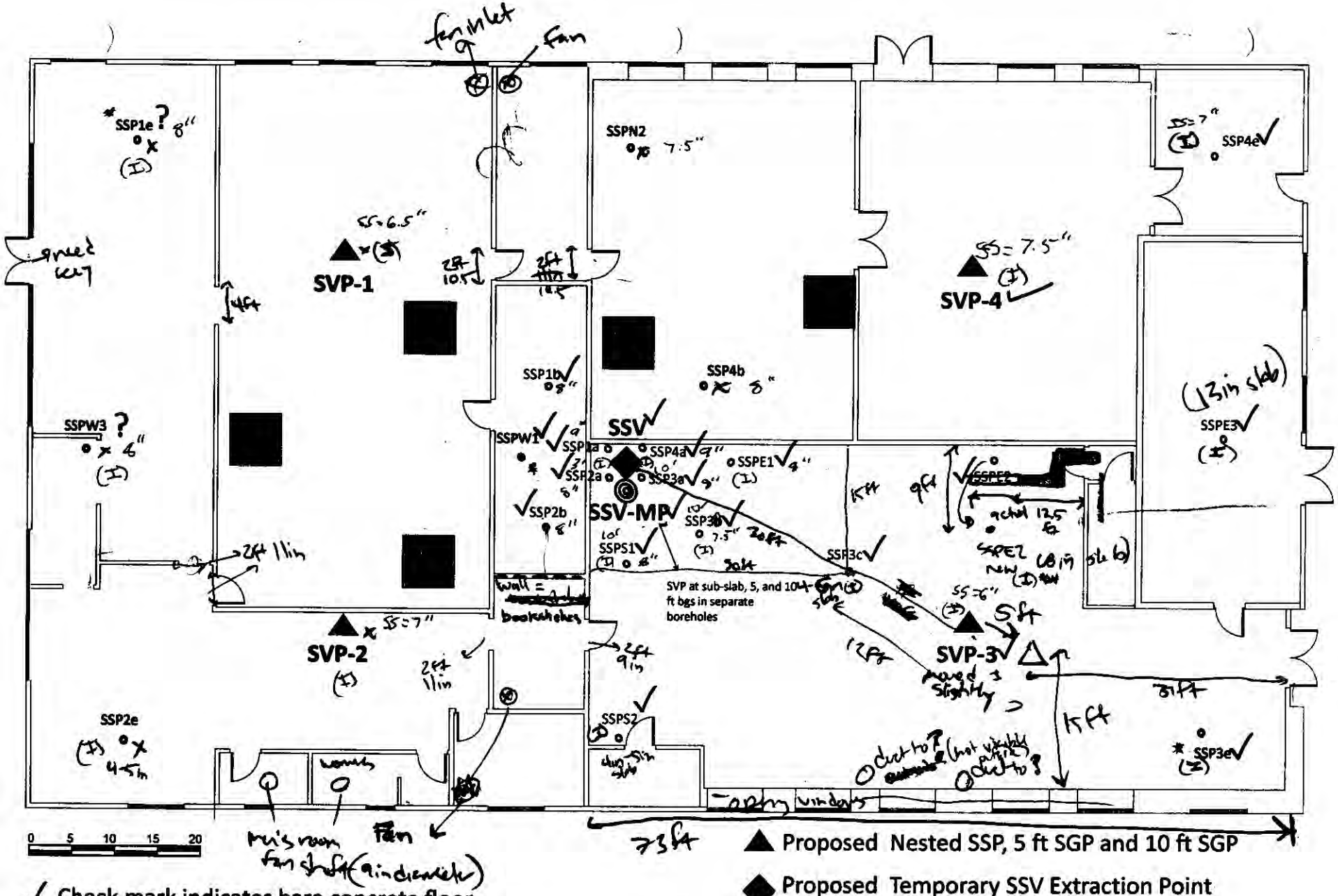
Darius Mali

From: Paul Dahlen <Paul.Dahlen@asu.edu>
Sent: Tuesday, August 1, 2017 1:39 PM
To: Darius Mali
Cc: Yuanming Guo
Subject: data from shutdown

Hi Darius,
Sorry this is so late. If you have any questions, holler.
Our subsequent work was not without many problems, among which two autosamplers failed. I also think the SSD had a pretty significant effect on concentrations: During neg and pos pressurization concentrations were not great and a bit erratic. The flux test definitely showed the floor in that room is a significant source of contaminant.
PD

Date	Time	Activity	Reading	Other
7/13/17	1326	Begin 6L walking composite		
	1412	End 6L walking composite		
	1440	PID SVP1SS	0.0 ppm	
	1442	PID SSPN2	0.0 ppm	
	1444	PID SVP4SS	2.2 ppm	
	1449	PID SVP2SS	0.2 ppm	
	1452	PID SVP3SS	4.3 ppm	
	1455	PID SSPE3	3.3 ppm	
	1523	Sample SVP3SS		Can 1L1543 2.7 ppm final PID
	1532	SSVac	30.5	
		PID SSV	0.3 ppm	
	1544	SSV sample		Can 1L2468
	1600	SSV Flowrate	1310 FPM	

C4.4
Site #4: Building 11193
Figures



✓ Check mark indicates bare concrete floor

? Question mark indicates unknown whether ACM present

Box indicates probe location could be eliminated

Top of Peak of Building = 15ft

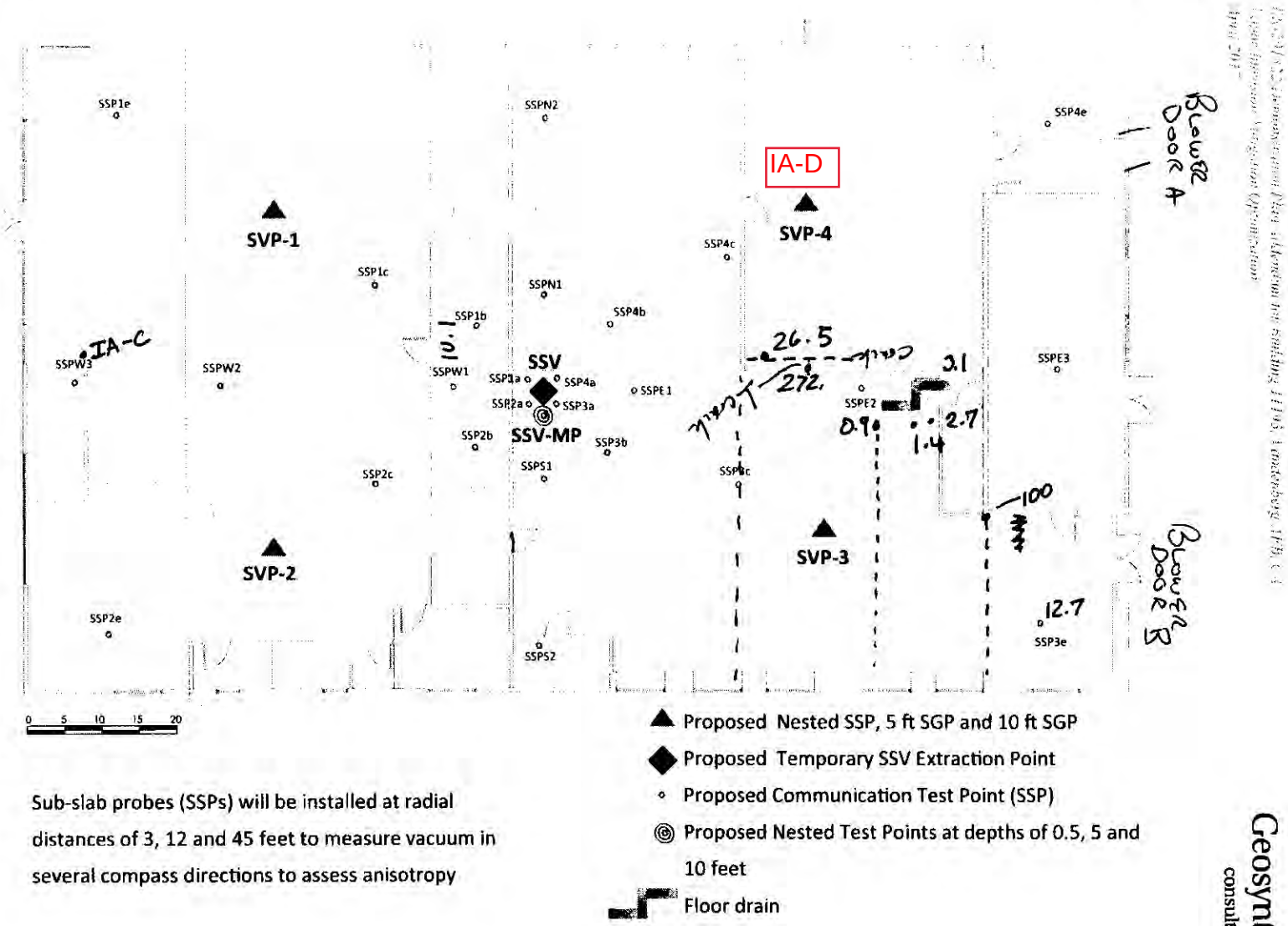
x = needs abatement

I = installed

** = hole to fill

* preferred DG 700 measure point.
= Pressure transducer installed here

H. Dawson 6/13/2017 PID READING @ MAX BLOWER DOOR FAN SPEED ~ -35 Pa ~ 11 200 CFM



Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

Figure 8. Planned locations for testing instrumentation in Building 11193

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SSV FAN TEST
06 16 17
06 18 17

Figure 8. Planned locations for testing instrumentation in Building 11193

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

FAN FLOW ≈ 900 FT/MIN

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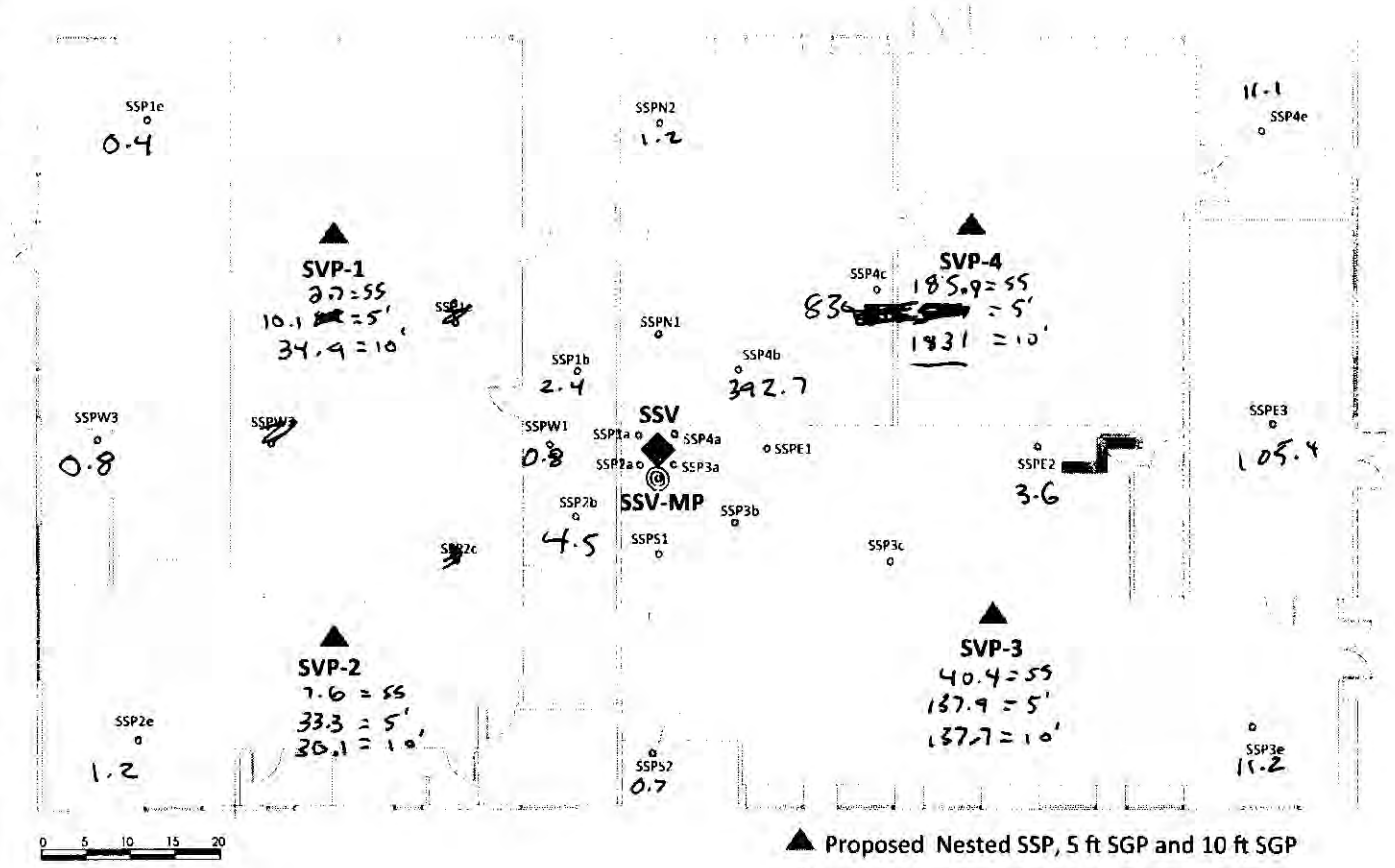
FAN @ 450 CFM
10" H_2O
OVERNIGHT

PID SCREEN
06201 7

Figure 8. Planned locations for testing instrumentation in Building 11193



Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

- Proposed Nested SSP, 5 ft SGP and 10 ft SGP
- Proposed Temporary SSV Extraction Point
- Proposed Communication Test Point (SSP)
- Proposed Nested Test Points at depths of 0.5, 5 and 10 feet
- Floor drain

PID READINGS IN PPM

START 09:25
STOP 11:10

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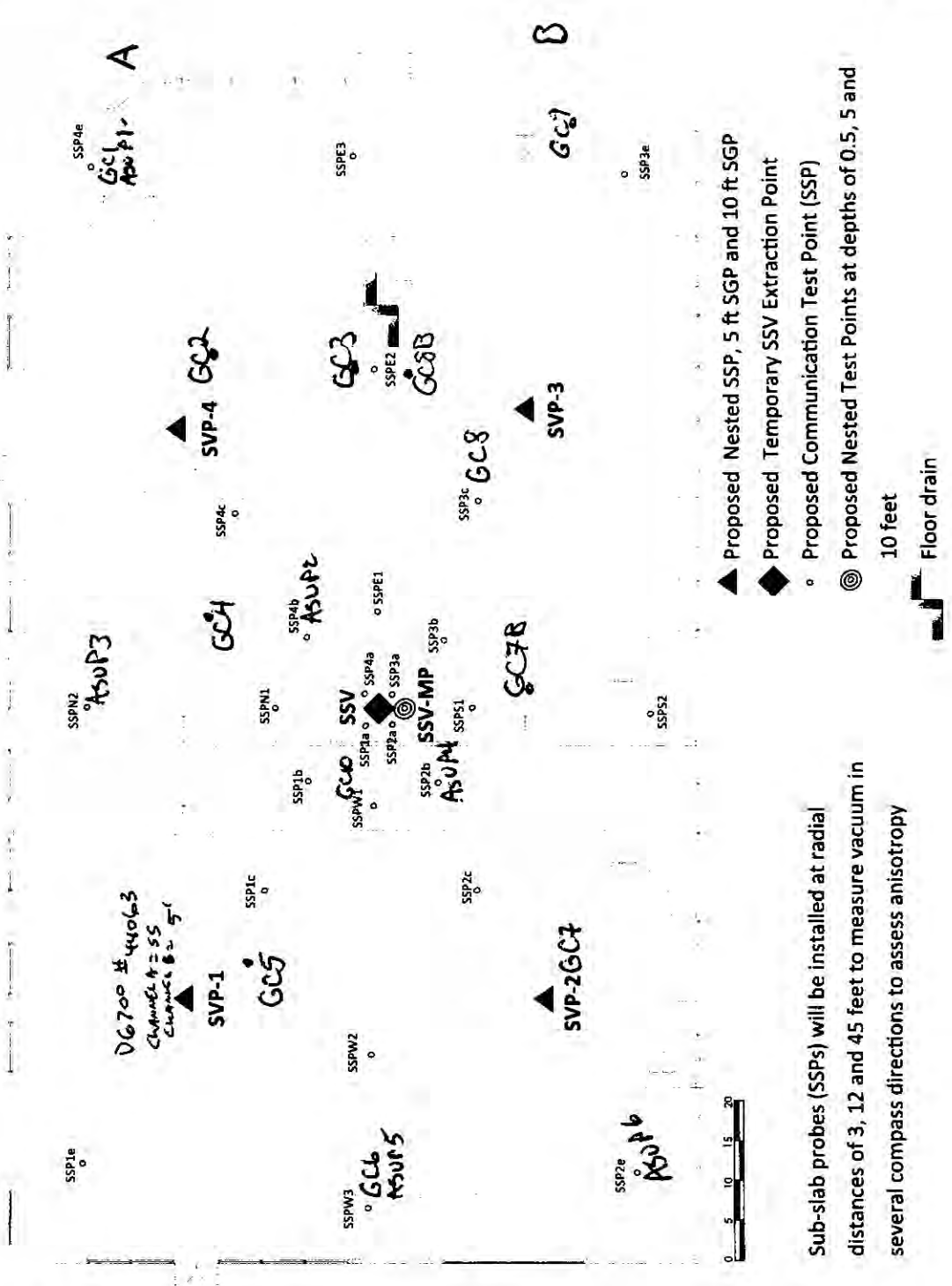


Figure 8. Planned locations for testing instrumentation in Building 11193

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

Figure 8. Planned locations for testing instrumentation in Building 11193

Geosyntec consultants

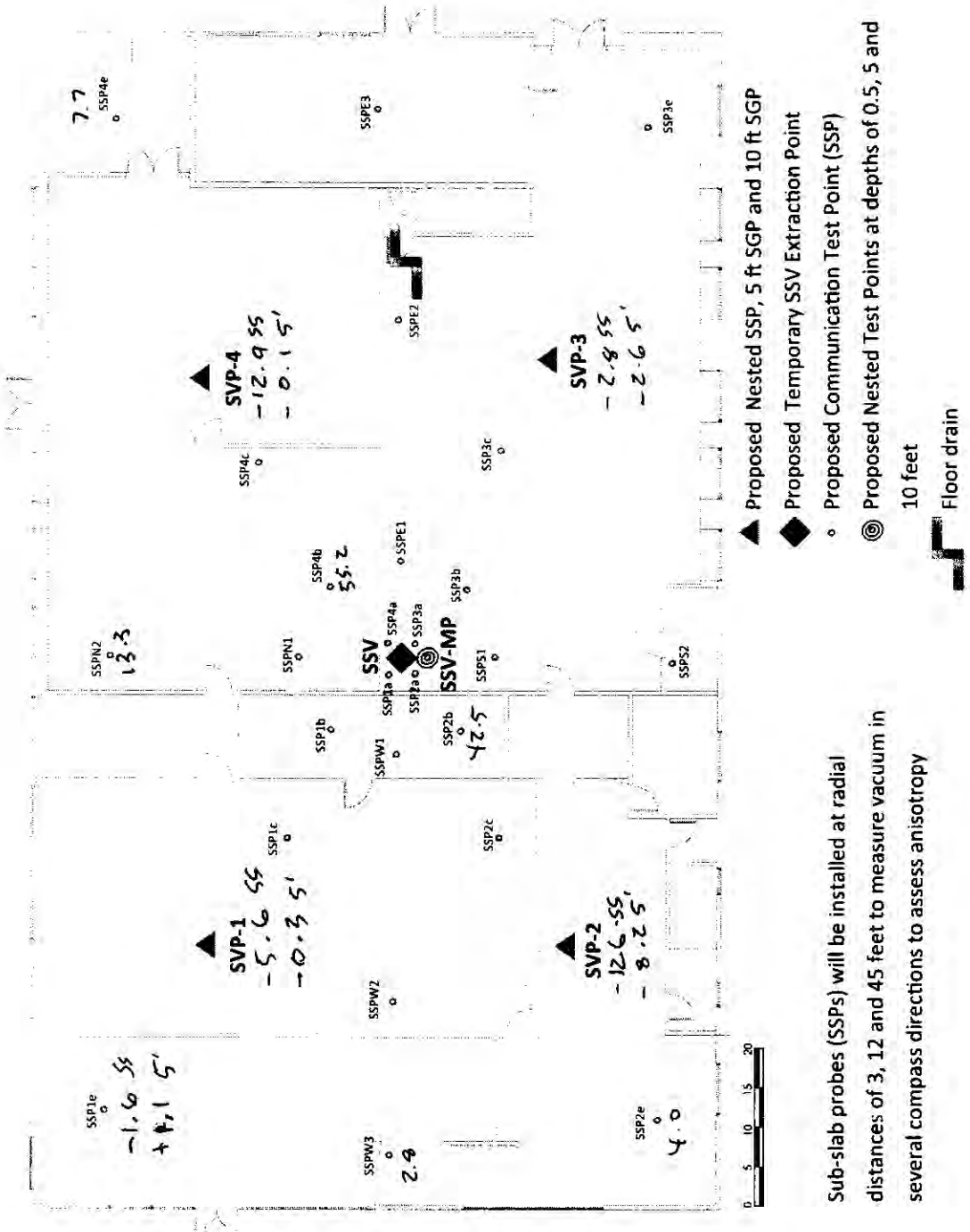


Figure 8. Planned locations for testing instrumentation in Building 11193

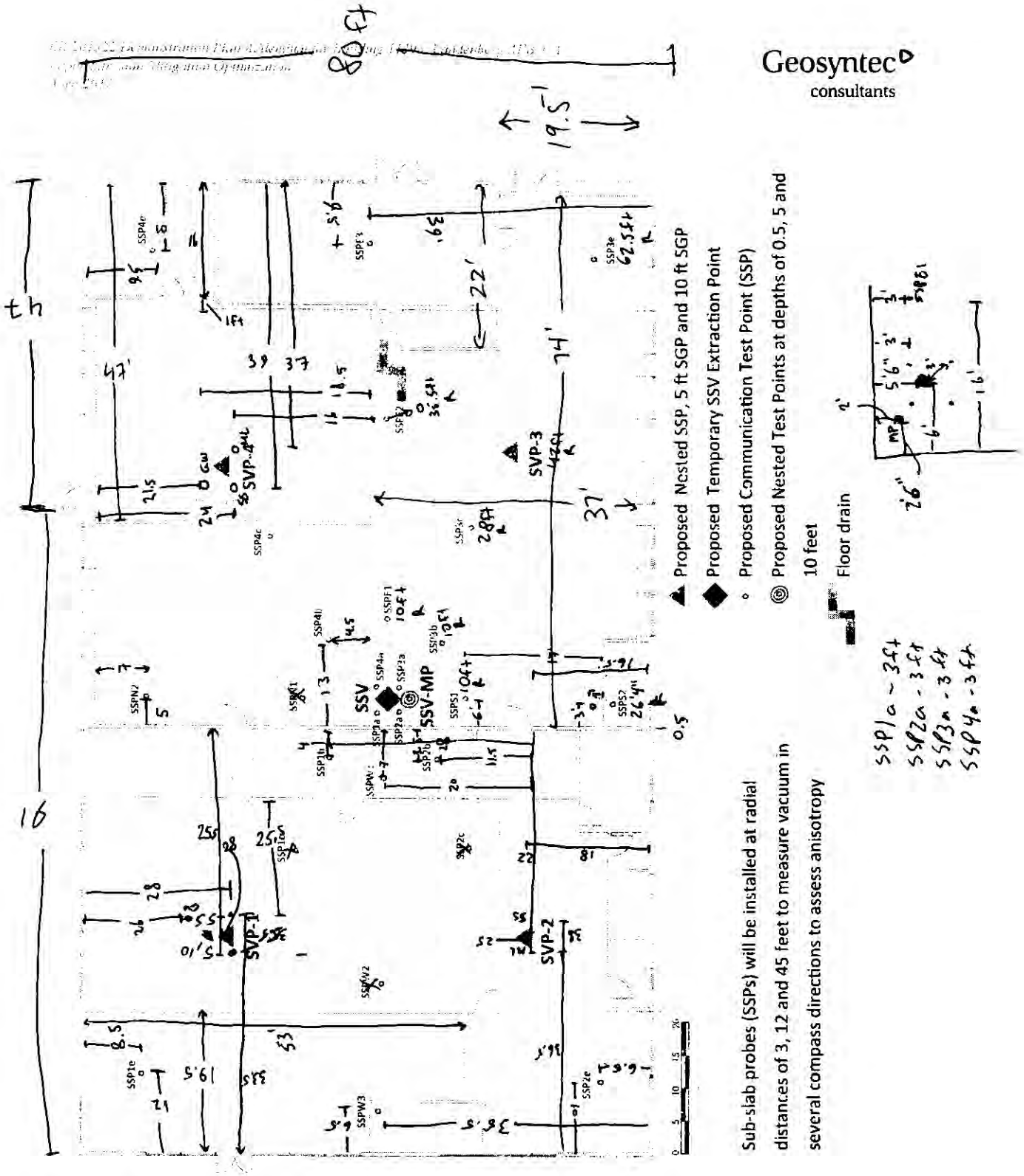


Figure 8. Planned locations for testing instrumentation in Building 11193

STATIC VACUUM) 450 SCFM (50%)
10" H_2O

Cracks

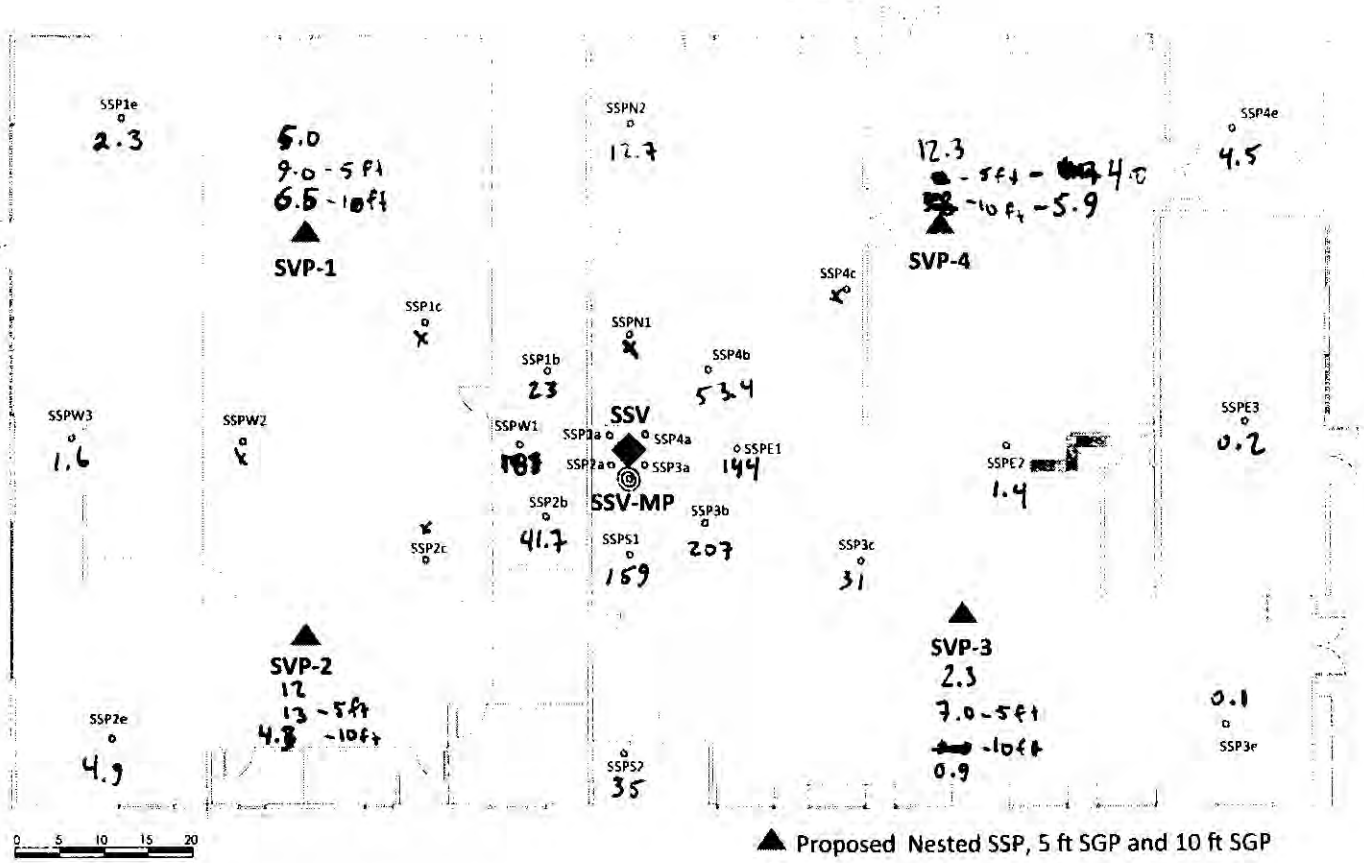


Figure 8. Planned locations for testing instrumentation in Building 11193

▲ Proposed Nested SSP, 5 ft SGP and 10 ft SGP

◆ Proposed Temporary SSV Extraction Point

◦ Proposed Communication Test Point (SSP)

◎ Proposed Nested Test Points at depths of 0.5, 5 and 10 feet

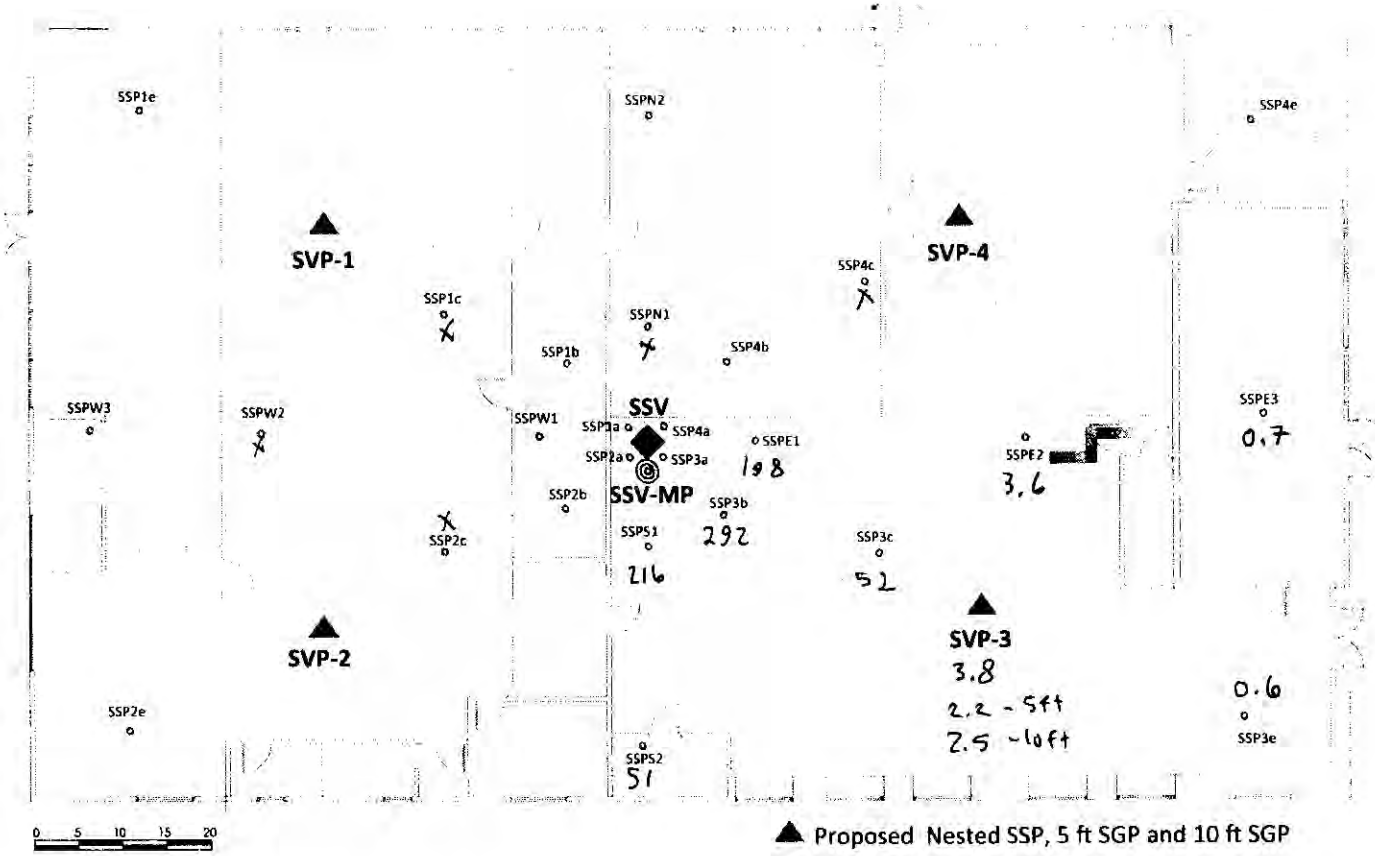
Floor drain

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

SSV-MP - 5ft -10.3
- 10ft -11.1

SSP-1A - ~~0.25~~ in Hg → 0.15
SSP-4A - ~~0.24~~ in Hg → 0.19
SSP-2A - 0.15 in Hg
SSP-3A - 0.14

STATIC VACUUMS ☺ 510ft/min After Crack Sealing
12" H_2O



Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

Figure 8. Planned locations for testing instrumentation in Building 11193

SSV-MP
5ft -8.7
10ft -8.5
SSP1A ~~4.9 mmHg~~ 200Pa + Pa200 = (400 Pa)
SSP2A - 260Pa + 480Pa = (740 Pa)
SSP3A - ~~0.065 H(en) 0.013~~ → 530Pa + 230Pa = (760Pa)
(410Pa)

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Max Flow Stat Vacuum

3 10.3
4 147.8
5 33.9
6 ~~2.8~~ 113.7
7 6.4
8 7.9

Sample location → UW UA

Figure 8. Planned locations for testing instrumentation in Building 11193

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

▲ Proposed Nested SSP, 5 ft SGP and 10 ft SGP
◆ Proposed Temporary SSV Extraction Point
◦ Proposed Communication Test Point (SSP)
◎ Proposed Nested Test Points at depths of 0.5, 5 and 10 feet
Floor drain

SSP1a - 747.5
SSP2a - 1495
SSP3a - 1625
SSP4a - 1137.5
~~SSP4B - 55~~

MP - 5ft - 30.2
10 ft - 21.8

0 → DW UA Sample location

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STATIC VACUUMS Blc ter door/ at -10Pa Building
64 CFM 41" H_2O
SSV
Cracks Sealed

06/21/17
11:45

Figure 8. Planned locations for testing instrumentation in Building 11193

Sub-slab probes (SSPs) will be installed at radial distances of 3, 12 and 45 feet to measure vacuum in several compass directions to assess anisotropy

- ▲ Proposed Nested SSP, 5 ft SGP and 10 ft SGP
- ◆ Proposed Temporary SSV Extraction Point
- ◦ Proposed Communication Test Point (SSP)
- ◎ Proposed Nested Test Points at depths of 0.5, 5 and 10 feet
- Floor drain

Well Head = 2.92 inHg

SSP-1A	0.40 inHg	- 0.01 inHg	= 0.39 inHg
SSP-2A	0.72 inHg	- 0.03 inHg	= 0.69 inHg
SSP-3A	0.73 inHg	- 0.01 inHg	= 0.72 inHg
SSP-4A	0.51 inHg	- 0.01 inHg	= 0.50 inHg

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APPENDIX D. LABORATORY REPORTS OF ANALYSIS

Site #1: Building 205

Former Raritan Arsenal

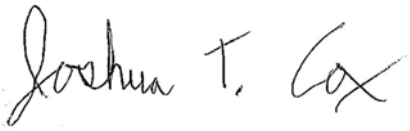
EMLab P&K
A TestAmerica Company

Report for:

Paul Nicholson
Geosyntec Consultants, Inc.
130 Research Lane Suite 2
Guelph, ON N1G5A5 Canada

Regarding: Project: TR0479; ESTCP
EML ID: 1277255

Approved by:



Operations Manager
Joshua Cox

Dates of Analysis:
Radon in Air: 10-20-2014

Project SOPs: Radon in Air (EM-BC-S-1201)

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

Radon Test Report

Geosyntec Consultants, Inc
Paul Nicholson
130 Research Lane Suite 2
Guelph, ON N1G5A5 Canada

EMLab ID#: 1277255
Project ID: TR0479
Date Received: October 15, 2014
Date Analyzed: October 15, 2014
Certification #: NRPP#102969AL
NRPP#103751RT

Methods: Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Short-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

Deployment Information

Start Test: 9/1/2014 10:40 AM
Finish Test: 10/14/2014 9:15 AM
*Test State: NJ
Elevation (ft): 88

Project Description: **ESTCP**

Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
SGT335	IA-205-07	SST	October 15, 2014	LMK	2.0	0.1
SGT337	IA-205-06	SST	October 15, 2014	LMK	1.2	0.1
SGT348	IA-205-02	SST	October 15, 2014	LMK	1.9	0.1
SGT397	IA-205-01	SST	October 15, 2014	LMK	1.7	0.1
SGT430	Dup-02	SST	October 15, 2014	LMK	0.4	0.1
SGI690	OA-205-02	SST	October 15, 2014	LMK	0.3	0.1
SGI710	IA-205-08	SST	October 15, 2014	LMK	2.2	0.1
SGI764	IA-205-09	SST	October 15, 2014	LMK	1.8	0.1
SGI896	Dup-01	SST	October 15, 2014	LMK	1.2	0.1
SGI903	IA-205-05	SST	October 15, 2014	LMK	1.1	0.1
SGQ579	HVAC-02	SST	October 15, 2014	LMK	0.8	0.1
SGQ636	HVAC-03	SST	October 15, 2014	LMK	0.9	0.1

EMLab P&K
A TestAmerica Company

Radon Test Report

Geosyntec Consultants, Inc
Paul Nicholson
130 Research Lane Suite 2
Guelph, ON N1G5A5 Canada

EMLab ID#: 1277255
Project ID: TR0479
Date Received: October 15, 2014
Date Analyzed: October 15, 2014
Certification #: NRPP#102969AL
NRPP#103751RT

Methods: Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Short-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

Deployment Information

Start Test: 9/1/2014 10:40 AM
Finish Test: 10/14/2014 9:15 AM
*Test State: NJ
Elevation (ft): 88

Project Description: **ESTCP**

Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
SGQ641	HVAC-01	SST	October 15, 2014	LMK	1.0	0.1
**SFN832	OA-205-01	SST	October 15, 2014	LMK	4.4	0.2
SGY857	IA-205-03	SST	October 15, 2014	LMK	2.0	0.1
SGY543	IA-205-04	SST	October 15, 2014	LMK	1.2	0.1

*EMLab P&K radon certifications do not extend to the State of New Jersey.

**Electret depleted. Unable to reconcile radon levels for that location. Recommend retest if needed.

Authorized Signature/Date:_____

Certified Radon Analyst

EMLab P&K
A TestAmerica Company

What Do My Test Results Mean?

The concentration of radon is measured in picocuries per liter of air (pCi/L). If your average radon level is less than 4.0 pCi/L, no action is necessary. However, radon levels less than 4.0 pCi/L can still pose some health risk, and in many cases can be reduced. The national average indoor radon level is about 1.3 pCi/L while the average outdoor radon concentration is about 0.4 pCi/L. The higher the radon concentration in the test area, the greater the health risks are to those in the immediate area.

What Do I Do If My Test Results Are Greater than 4.0 pCi/L?

If the test results are 4.0 pCi/L or greater, the EPA recommends that you mitigate to reduce the radon concentrations to an acceptable level. There are simple ways to fix a radon problem that aren't too costly, and even very high concentrations can be reduced to acceptable levels.

What Is the Health Risk Associated with Radon Gas?

Radon is a radioactive gas that comes from the natural breakdown of uranium in the soil. Radon is estimated to cause many thousands of deaths each year from lung cancer, and in fact, it is the second leading cause of lung cancer after smoking. If you smoke, and the test area has high radon levels, your risk of lung cancer is especially high.

Where Can I Get Additional Information on Radon?

For more information, please refer to http://www.epa.gov/radon/index.html

Data Qualifiers

The *Data Qualifiers* identify issues or events that are relevant to your analytical results. A data qualifier includes information about the validity, the source of the data whether calculated, entered or estimated, and the value of an observation. In each case the data qualifiers provide significant information vital to the interpretation of the laboratory data.

eurofins | Air Toxics

10/19/2015
Mr. Paul Nicholson
GeoSyntec Consultants
130 Research Lane
Suite 2
Guelph, Ontario N1G5G3

Project Name: ESTCP
Project #: TR0479
Workorder #: 1510095

Dear Mr. Paul Nicholson

The following report includes the data for the above referenced project for sample(s) received on 10/6/2015 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. WMS are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

eurofins | Air Toxics

WORK ORDER #: 1510095

Work Order Summary

CLIENT:	Mr. Paul Nicholson GeoSyntec Consultants 130 Research Lane Suite 2 Guelph, Ontario N1G5G3	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Research Lane Suite 2 Guelph, Ontario N1G5G3
PHONE:	519-822-2230	**P.O. #**	TR0479
FAX:	519-822-3151	**PROJECT #**	TR0479 ESTCP
DATE RECEIVED:	10/06/2015	**CONTACT:**	Ausha Scott
DATE COMPLETED:	10/19/2015		

FRACTION #	NAME	TEST
01A	HSF-03	Passive S.E. WMS
02A	Lab Blank	Passive S.E. WMS
03A	LCS	Passive S.E. WMS
03AA	LCSD	Passive S.E. WMS

CERTIFIED BY: Heidi Mayo DATE: 10/19/15

Technical Director

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, Inc.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Passive SE by Mod EPA TO-17
GeoSyntec Consultants
Workorder# 1510095

One WMS-SE sample was received on October 06, 2015. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

To calculate ug/m3 concentrations in the Lab Blank, a sampling duration of 4660 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field temperatures

were provided, the rate was adjusted in the same manner as the field samples.

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Definition of Data Qualifying Flags

Nine qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOC BY PASSIVE SAMPLER - GC/MS

Client Sample ID: HSF-03

Lab ID#: 1510095-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloroform	0.050	5.6	0.072	8.1
Trichloroethene	0.050	4.1	2.1	170
Toluene	0.050	3.5	0.051	3.5

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Client Sample ID: HSF-03

Lab ID#: 1510095-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101207sim**	**Date of Collection: 10/1/15 4:35:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 12:22 PM**	
		Date of Extraction: 10/12/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	36	Not Detected	Not Detected
Vinyl Chloride	0.20	36	Not Detected	Not Detected
1,1-Dichloroethene	0.20	31	Not Detected	Not Detected
Acetone	0.20	33	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	6.7	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	13	Not Detected	Not Detected
Hexane	0.20	29	Not Detected	Not Detected
1,1-Dichloroethane	0.050	6.7	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	7.2	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	5.6	Not Detected	Not Detected
Chloroform	0.050	5.6	0.072	8.1
Cyclohexane	0.050	5.4	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	7.2	Not Detected	Not Detected
Carbon Tetrachloride	0.050	6.0	Not Detected	Not Detected
Benzene	0.20	20	Not Detected	Not Detected
1,2-Dichloroethane	0.050	4.9	Not Detected	Not Detected
Heptane	0.050	5.1	Not Detected	Not Detected
Trichloroethene	0.050	4.1	2.1	170
4-Methyl-2-pentanone	0.10	8.6	Not Detected	Not Detected
Toluene	0.050	3.5	0.051	3.5
1,1,2-Trichloroethane	0.050	4.1	Not Detected	Not Detected
Tetrachloroethene	0.050	2.8	Not Detected	Not Detected
Chlorobenzene	0.050	3.0	Not Detected	Not Detected
Ethyl Benzene	0.050	2.6	Not Detected	Not Detected
m,p-Xylene	0.050	2.6	Not Detected	Not Detected
o-Xylene	0.050	2.4	Not Detected	Not Detected
Styrene	0.050	2.4	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	2.4	Not Detected	Not Detected
Propylbenzene	0.050	1.9	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	1.7	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	1.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	1.5	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	1.4	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	1.3	Not Detected	Not Detected
Naphthalene	0.050	2.4	Not Detected	Not Detected

Temperature = 60F , duration time = 4660 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: HSF-03

Lab ID#: 1510095-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101207sim**	**Date of Collection: 10/1/15 4:35:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 12:22 PM**
		Date of Extraction: 10/12/15

Surrogates	%Recovery	Method Limits
Toluene-d8	105	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1510095-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101206sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 11:59 AM**	
		Date of Extraction: 10/12/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	36	Not Detected	Not Detected
Vinyl Chloride	0.20	36	Not Detected	Not Detected
1,1-Dichloroethene	0.20	31	Not Detected	Not Detected
Acetone	0.20	33	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	6.7	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	13	Not Detected	Not Detected
Hexane	0.20	29	Not Detected	Not Detected
1,1-Dichloroethane	0.050	6.7	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	7.2	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	5.6	Not Detected	Not Detected
Chloroform	0.050	5.6	Not Detected	Not Detected
Cyclohexane	0.050	5.4	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	7.2	Not Detected	Not Detected
Carbon Tetrachloride	0.050	6.0	Not Detected	Not Detected
Benzene	0.20	20	Not Detected	Not Detected
1,2-Dichloroethane	0.050	4.9	Not Detected	Not Detected
Heptane	0.050	5.1	Not Detected	Not Detected
Trichloroethene	0.050	4.1	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	8.6	Not Detected	Not Detected
Toluene	0.050	3.5	Not Detected	Not Detected
1,1,2-Trichloroethane	0.050	4.1	Not Detected	Not Detected
Tetrachloroethene	0.050	2.8	Not Detected	Not Detected
Chlorobenzene	0.050	3.0	Not Detected	Not Detected
Ethyl Benzene	0.050	2.6	Not Detected	Not Detected
m,p-Xylene	0.050	2.6	Not Detected	Not Detected
o-Xylene	0.050	2.4	Not Detected	Not Detected
Styrene	0.050	2.4	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	2.4	Not Detected	Not Detected
Propylbenzene	0.050	1.9	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	1.7	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	1.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	1.5	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	1.4	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	1.3	Not Detected	Not Detected
Naphthalene	0.050	2.4	Not Detected	Not Detected

Temperature = 60F , duration time = 4660 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: Lab Blank

Lab ID#: 1510095-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101206sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 11:59 AM**	
		Date of Extraction: 10/12/15	

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130

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Client Sample ID: LCS

Lab ID#: 1510095-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101203sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 10:41 AM**	
		Date of Extraction: 10/12/15	

Compound	%Recovery	Method Limits
Chloromethane	183 Q	50-140
Vinyl Chloride	116	50-140
1,1-Dichloroethene	123	70-130
Acetone	103	70-130
Methyl tert-butyl ether	115	70-130
trans-1,2-Dichloroethene	114	70-130
Hexane	123	70-130
1,1-Dichloroethane	100	70-130
2-Butanone (Methyl Ethyl Ketone)	92	70-130
cis-1,2-Dichloroethene	99	70-130
Chloroform	118	70-130
Cyclohexane	87	70-130
1,1,1-Trichloroethane	96	70-130
Carbon Tetrachloride	106	70-130
Benzene	119	70-130
1,2-Dichloroethane	93	70-130
Heptane	134 Q	70-130
Trichloroethene	106	70-130
4-Methyl-2-pentanone	90	70-130
Toluene	84	70-130
1,1,2-Trichloroethane	100	70-130
Tetrachloroethene	104	70-130
Chlorobenzene	78	70-130
Ethyl Benzene	87	70-130
m,p-Xylene	102	70-130
o-Xylene	91	70-130
Styrene	71	20-100
1,1,2,2-Tetrachloroethane	99	60-130
Propylbenzene	118	70-130
1,3,5-Trimethylbenzene	84	70-130
1,2,4-Trimethylbenzene	88	70-130
1,3-Dichlorobenzene	70	60-130
1,4-Dichlorobenzene	88	60-130
1,2-Dichlorobenzene	70	60-130
Naphthalene	21	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130

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Client Sample ID: LCS

Lab ID#: 1510095-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101203sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 10:41 AM**
		Date of Extraction: 10/12/15

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Client Sample ID: LCSD

Lab ID#: 1510095-03AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101204sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 11:04 AM**	
		Date of Extraction: 10/12/15	

Compound	%Recovery	Method Limits
Chloromethane	195 Q	50-140
Vinyl Chloride	121	50-140
1,1-Dichloroethene	122	70-130
Acetone	106	70-130
Methyl tert-butyl ether	130	70-130
trans-1,2-Dichloroethene	106	70-130
Hexane	128	70-130
1,1-Dichloroethane	101	70-130
2-Butanone (Methyl Ethyl Ketone)	93	70-130
cis-1,2-Dichloroethene	98	70-130
Chloroform	109	70-130
Cyclohexane	100	70-130
1,1,1-Trichloroethane	108	70-130
Carbon Tetrachloride	96	70-130
Benzene	101	70-130
1,2-Dichloroethane	90	70-130
Heptane	113	70-130
Trichloroethene	106	70-130
4-Methyl-2-pentanone	90	70-130
Toluene	84	70-130
1,1,2-Trichloroethane	98	70-130
Tetrachloroethene	102	70-130
Chlorobenzene	80	70-130
Ethyl Benzene	88	70-130
m,p-Xylene	99	70-130
o-Xylene	88	70-130
Styrene	70	20-100
1,1,2,2-Tetrachloroethane	97	60-130
Propylbenzene	115	70-130
1,3,5-Trimethylbenzene	82	70-130
1,2,4-Trimethylbenzene	87	70-130
1,3-Dichlorobenzene	68	60-130
1,4-Dichlorobenzene	87	60-130
1,2-Dichlorobenzene	68	60-130
Naphthalene	21	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130

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Client Sample ID: LCSD

Lab ID#: 1510095-03AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**10101204sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/15 11:04 AM**
		Date of Extraction: 10/12/15

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11/6/2015
Mr. Paul Nicholson
GeoSyntec Consultants
130 Research Lane
Suite 2
Guelph, Ontario N1G5G3

Project Name: ESTCP
Project #: TR0479
Workorder #: 1510557

Dear Mr. Paul Nicholson

The following report includes the data for the above referenced project for sample(s) received on 10/29/2015 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. WMS are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1510557

Work Order Summary

CLIENT:	Mr. Paul Nicholson GeoSyntec Consultants 130 Research Lane Suite 2 Guelph, Ontario N1G5G3	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Research Lane Suite 2 Guelph, Ontario N1G5G3
PHONE:	519-822-2230	**P.O. #**	TR0479
FAX:	519-822-3151	**PROJECT #**	TR0479 ESTCP
DATE RECEIVED:	10/29/2015	**CONTACT:**	Ausha Scott
DATE COMPLETED:	11/06/2015		

FRACTION #	NAME	TEST
01A	HSF-03	Passive S.E. WMS
02A	SF-01	Passive S.E. WMS
03A	SF-02	Passive S.E. WMS
04A	SF-03	Passive S.E. WMS
05A	Lab Blank	Passive S.E. WMS
06A	LCS	Passive S.E. WMS
06AA	LCSD	Passive S.E. WMS

CERTIFIED BY: DATE: 11/06/15

Technical Director

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180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Passive SE by Mod EPA TO-17
GeoSyntec Consultants
Workorder# 1510557

Four WMS-SE samples were received on October 29, 2015. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

To calculate ug/m3 concentrations in the Lab Blank, a sampling duration of 40499 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field

temperatures were provided, the rate was adjusted in the same manner as the field samples.

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page.

Definition of Data Qualifying Flags

Nine qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

C - Estimated concentration due to calculated sampling rate

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOC BY PASSIVE SAMPLER - GC/MS

Client Sample ID: HSF-03

Lab ID#: 1510557-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloroform	0.050	0.65	0.55	7.2
Carbon Tetrachloride	0.050	0.68	0.052	0.71
Trichloroethene	0.050	0.47	14	130
Toluene	0.050	0.40	0.074	0.59
Tetrachloroethene	0.050	0.32	0.27	1.7

Client Sample ID: SF-01

Lab ID#: 1510557-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Toluene	0.050	0.40	0.16	1.3
m,p-Xylene	0.050	0.30	0.12	0.75
1,2,4-Trimethylbenzene	0.050	0.18	0.064	0.22

Client Sample ID: SF-02

Lab ID#: 1510557-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Toluene	0.050	0.40	0.15	1.2
m,p-Xylene	0.050	0.30	0.10	0.61
1,2,4-Trimethylbenzene	0.050	0.18	0.061	0.22

Client Sample ID: SF-03

Lab ID#: 1510557-04A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Toluene	0.050	0.40	0.14	1.1
m,p-Xylene	0.050	0.30	0.080	0.48

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Client Sample ID: HSF-03

Lab ID#: 1510557-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103010sim**	**Date of Collection: 10/26/15 1:53:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 12:28 PM**	
		Date of Extraction: 10/30/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	4.1	Not Detected	Not Detected
Vinyl Chloride	0.20	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.5	Not Detected	Not Detected
Acetone	0.20	3.8	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.77	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.5	Not Detected	Not Detected
Hexane	0.20	3.3	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.77	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.82	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.65	Not Detected	Not Detected
Chloroform	0.050	0.65	0.55	7.2
Cyclohexane	0.050	0.62	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.82	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.68	0.052	0.71
Benzene	0.20	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.56	Not Detected	Not Detected
Heptane	0.050	0.59	Not Detected	Not Detected
Trichloroethene	0.050	0.47	14	130
4-Methyl-2-pentanone	0.10	0.99	Not Detected	Not Detected
Toluene	0.050	0.40	0.074	0.59
1,1,2-Trichloroethane	0.050	0.47	Not Detected	Not Detected
Tetrachloroethene	0.050	0.32	0.27	1.7
Chlorobenzene	0.050	0.34	Not Detected	Not Detected
Ethyl Benzene	0.050	0.29	Not Detected	Not Detected
m,p-Xylene	0.050	0.30	Not Detected	Not Detected
o-Xylene	0.050	0.27	Not Detected	Not Detected
Styrene	0.050	0.27	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.27	Not Detected	Not Detected
Propylbenzene	0.050	0.22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.20	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.15	Not Detected	Not Detected
Naphthalene	0.050	0.28	Not Detected	Not Detected

Temperature = 60.0F , duration time = 40498 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: HSF-03

Lab ID#: 1510557-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103010sim**	**Date of Collection: 10/26/15 1:53:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 12:28 PM**
		Date of Extraction: 10/30/15

Surrogates	%Recovery	Method Limits
Toluene-d8	106	70-130

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Client Sample ID: SF-01

Lab ID#: 1510557-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103011sim**	**Date of Collection: 10/26/15 1:57:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 12:52 PM**	
		Date of Extraction: 10/30/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	4.1	Not Detected	Not Detected
Vinyl Chloride	0.20	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.5	Not Detected	Not Detected
Acetone	0.20	3.8	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.77	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.5	Not Detected	Not Detected
Hexane	0.20	3.3	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.77	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.82	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.65	Not Detected	Not Detected
Chloroform	0.050	0.65	Not Detected	Not Detected
Cyclohexane	0.050	0.62	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.82	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.68	Not Detected	Not Detected
Benzene	0.20	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.56	Not Detected	Not Detected
Heptane	0.050	0.59	Not Detected	Not Detected
Trichloroethene	0.050	0.47	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.99	Not Detected	Not Detected
Toluene	0.050	0.40	0.16	1.3
1,1,2-Trichloroethane	0.050	0.47	Not Detected	Not Detected
Tetrachloroethene	0.050	0.32	Not Detected	Not Detected
Chlorobenzene	0.050	0.34	Not Detected	Not Detected
Ethyl Benzene	0.050	0.29	Not Detected	Not Detected
m,p-Xylene	0.050	0.30	0.12	0.75
o-Xylene	0.050	0.27	Not Detected	Not Detected
Styrene	0.050	0.27	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.27	Not Detected	Not Detected
Propylbenzene	0.050	0.22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.20	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.18	0.064	0.22
1,3-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.15	Not Detected	Not Detected
Naphthalene	0.050	0.28	Not Detected	Not Detected

Temperature = 60.0F , duration time = 40499 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: SF-01

Lab ID#: 1510557-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103011sim**	**Date of Collection: 10/26/15 1:57:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 12:52 PM**
		Date of Extraction: 10/30/15

Surrogates	%Recovery	Method Limits
Toluene-d8	105	70-130

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Client Sample ID: SF-02

Lab ID#: 1510557-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103012sim**	**Date of Collection: 10/26/15 2:02:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 01:16 PM**	
		Date of Extraction: 10/30/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	4.1	Not Detected	Not Detected
Vinyl Chloride	0.20	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.5	Not Detected	Not Detected
Acetone	0.20	3.8	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.77	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.5	Not Detected	Not Detected
Hexane	0.20	3.3	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.77	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.82	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.65	Not Detected	Not Detected
Chloroform	0.050	0.65	Not Detected	Not Detected
Cyclohexane	0.050	0.62	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.82	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.68	Not Detected	Not Detected
Benzene	0.20	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.56	Not Detected	Not Detected
Heptane	0.050	0.59	Not Detected	Not Detected
Trichloroethene	0.050	0.47	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.99	Not Detected	Not Detected
Toluene	0.050	0.40	0.15	1.2
1,1,2-Trichloroethane	0.050	0.47	Not Detected	Not Detected
Tetrachloroethene	0.050	0.32	Not Detected	Not Detected
Chlorobenzene	0.050	0.34	Not Detected	Not Detected
Ethyl Benzene	0.050	0.29	Not Detected	Not Detected
m,p-Xylene	0.050	0.30	0.10	0.61
o-Xylene	0.050	0.27	Not Detected	Not Detected
Styrene	0.050	0.27	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.27	Not Detected	Not Detected
Propylbenzene	0.050	0.22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.20	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.18	0.061	0.22
1,3-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.15	Not Detected	Not Detected
Naphthalene	0.050	0.28	Not Detected	Not Detected

Temperature = 60.0F , duration time = 40497 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

eurofins | Air Toxics

Client Sample ID: SF-02

Lab ID#: 1510557-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103012sim**	**Date of Collection: 10/26/15 2:02:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 01:16 PM**
		Date of Extraction: 10/30/15

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130

eurofins | Air Toxics

Client Sample ID: SF-03

Lab ID#: 1510557-04A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103013sim**	**Date of Collection: 10/26/15 2:05:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 01:40 PM**	
		Date of Extraction: 10/30/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	4.1	Not Detected	Not Detected
Vinyl Chloride	0.20	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.5	Not Detected	Not Detected
Acetone	0.20	3.8	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.77	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.5	Not Detected	Not Detected
Hexane	0.20	3.3	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.77	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.82	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.65	Not Detected	Not Detected
Chloroform	0.050	0.65	Not Detected	Not Detected
Cyclohexane	0.050	0.62	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.82	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.68	Not Detected	Not Detected
Benzene	0.20	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.56	Not Detected	Not Detected
Heptane	0.050	0.59	Not Detected	Not Detected
Trichloroethene	0.050	0.47	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.99	Not Detected	Not Detected
Toluene	0.050	0.40	0.14	1.1
1,1,2-Trichloroethane	0.050	0.47	Not Detected	Not Detected
Tetrachloroethene	0.050	0.32	Not Detected	Not Detected
Chlorobenzene	0.050	0.34	Not Detected	Not Detected
Ethyl Benzene	0.050	0.29	Not Detected	Not Detected
m,p-Xylene	0.050	0.30	0.080	0.48
o-Xylene	0.050	0.27	Not Detected	Not Detected
Styrene	0.050	0.27	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.27	Not Detected	Not Detected
Propylbenzene	0.050	0.22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.20	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.15	Not Detected	Not Detected
Naphthalene	0.050	0.28	Not Detected	Not Detected

Temperature = 60.0F , duration time = 40494 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

eurofins | Air Toxics

Client Sample ID: SF-03

Lab ID#: 1510557-04A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103013sim**	**Date of Collection: 10/26/15 2:05:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 01:40 PM**
		Date of Extraction: 10/30/15

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1510557-05A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103007sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 11:15 AM**	
		Date of Extraction: 10/30/15	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	4.1	Not Detected	Not Detected
Vinyl Chloride	0.20	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.5	Not Detected	Not Detected
Acetone	0.20	3.8	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.77	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.5	Not Detected	Not Detected
Hexane	0.20	3.3	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.77	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.82	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.65	Not Detected	Not Detected
Chloroform	0.050	0.65	Not Detected	Not Detected
Cyclohexane	0.050	0.62	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.82	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.68	Not Detected	Not Detected
Benzene	0.20	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.56	Not Detected	Not Detected
Heptane	0.050	0.59	Not Detected	Not Detected
Trichloroethene	0.050	0.47	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.99	Not Detected	Not Detected
Toluene	0.050	0.40	Not Detected	Not Detected
1,1,2-Trichloroethane	0.050	0.47	Not Detected	Not Detected
Tetrachloroethene	0.050	0.32	Not Detected	Not Detected
Chlorobenzene	0.050	0.34	Not Detected	Not Detected
Ethyl Benzene	0.050	0.29	Not Detected	Not Detected
m,p-Xylene	0.050	0.30	Not Detected	Not Detected
o-Xylene	0.050	0.27	Not Detected	Not Detected
Styrene	0.050	0.27	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.27	Not Detected	Not Detected
Propylbenzene	0.050	0.22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.20	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.17	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.15	Not Detected	Not Detected
Naphthalene	0.050	0.28	Not Detected	Not Detected

Temperature = 60.0F , duration time = 40499 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1510557-05A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103007sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 11:15 AM**	
		Date of Extraction: 10/30/15	

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1510557-06A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103004sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 09:24 AM**	
		Date of Extraction: 10/30/15	

Compound	%Recovery	Method Limits
Chloromethane	164 Q	50-140
Vinyl Chloride	124	50-140
1,1-Dichloroethene	102	70-130
Acetone	95	70-130
Methyl tert-butyl ether	94	70-130
trans-1,2-Dichloroethene	87	70-130
Hexane	80	70-130
1,1-Dichloroethane	96	70-130
2-Butanone (Methyl Ethyl Ketone)	93	70-130
cis-1,2-Dichloroethene	89	70-130
Chloroform	94	70-130
Cyclohexane	97	70-130
1,1,1-Trichloroethane	91	70-130
Carbon Tetrachloride	94	70-130
Benzene	98	70-130
1,2-Dichloroethane	95	70-130
Heptane	98	70-130
Trichloroethene	88	70-130
4-Methyl-2-pentanone	86	70-130
Toluene	81	70-130
1,1,2-Trichloroethane	87	70-130
Tetrachloroethene	82	70-130
Chlorobenzene	70	70-130
Ethyl Benzene	83	70-130
m,p-Xylene	83	70-130
o-Xylene	82	70-130
Styrene	55	20-100
1,1,2,2-Tetrachloroethane	71	60-130
Propylbenzene	76	70-130
1,3,5-Trimethylbenzene	95	70-130
1,2,4-Trimethylbenzene	83	70-130
1,3-Dichlorobenzene	65	60-130
1,4-Dichlorobenzene	62	60-130
1,2-Dichlorobenzene	57 Q	60-130
Naphthalene	21	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1510557-06A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103004sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 09:24 AM**
		Date of Extraction: 10/30/15

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1510557-06AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103005sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 09:48 AM**	
		Date of Extraction: 10/30/15	

Compound	%Recovery	Method Limits
Chloromethane	154 Q	50-140
Vinyl Chloride	127	50-140
1,1-Dichloroethene	108	70-130
Acetone	99	70-130
Methyl tert-butyl ether	96	70-130
trans-1,2-Dichloroethene	86	70-130
Hexane	93	70-130
1,1-Dichloroethane	95	70-130
2-Butanone (Methyl Ethyl Ketone)	92	70-130
cis-1,2-Dichloroethene	90	70-130
Chloroform	106	70-130
Cyclohexane	95	70-130
1,1,1-Trichloroethane	93	70-130
Carbon Tetrachloride	91	70-130
Benzene	98	70-130
1,2-Dichloroethane	112	70-130
Heptane	110	70-130
Trichloroethene	91	70-130
4-Methyl-2-pentanone	88	70-130
Toluene	84	70-130
1,1,2-Trichloroethane	89	70-130
Tetrachloroethene	83	70-130
Chlorobenzene	72	70-130
Ethyl Benzene	86	70-130
m,p-Xylene	85	70-130
o-Xylene	85	70-130
Styrene	56	20-100
1,1,2,2-Tetrachloroethane	76	60-130
Propylbenzene	81	70-130
1,3,5-Trimethylbenzene	96	70-130
1,2,4-Trimethylbenzene	85	70-130
1,3-Dichlorobenzene	67	60-130
1,4-Dichlorobenzene	66	60-130
1,2-Dichlorobenzene	59 Q	60-130
Naphthalene	20	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1510557-06AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c103005sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 10/30/15 09:48 AM**
		Date of Extraction: 10/30/15

Radon Test Report

Geosyntec Consultants, Inc.
Paul Nicholson
130 Research Lane Suite 2
Guelph, ON N1G563 Canada

EMLab ID#: 1432472
Project ID: TR0479
Date Received: September 30, 2015
Date Analyzed: September 30, 2015
Certification #: NRPP#102969AL
NRPP#103751RT

Methods: Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Short-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

Deployment Information

Start Test: 8/28/2015 6:17 PM
Finish Test: 9/28/2015 10:00 AM
Test State: **NJ** *
Elevation (ft): 88

Project Description: ESTCP

Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
SIE430	OA-01	SST	September 30, 2015	TEG	4.5	0.2
SIE383	SF-02	SST	September 30, 2015	TEG	1.2	0.1
SIE349	DUP-02	SST	September 30, 2015	TEG	0.8	0.1
SIE382	OA-02	SST	September 30, 2015	TEG	6.3	0.3
SIE527	IA-07	SST	September 30, 2015	TEG	3.0	0.2
SGY543	IA-09	SST	September 30, 2015	TEG	3.3	0.2
SGT467	IA-05	SST	September 30, 2015	TEG	1.4	0.1
SGT475	IA-06	SST	September 30, 2015	TEG	1.3	0.1
SGT443	IA-04	SST	September 30, 2015	TEG	1.5	0.1
SGT406	IA-03	SST	September 30, 2015	TEG	2.4	0.2
SGT403	IA-08	SST	September 30, 2015	TEG	3.4	0.2
SGI758	SF-01	SST	September 30, 2015	TEG	1.2	0.1

Radon Test Report

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Deployment Information

Start Test: 8/28/2015 6:17 PM
Finish Test: 9/28/2015 10:00 AM
Test State: **NJ** *
Elevation (ft): 88

Project Description: ESTCP

Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
SGI751	SF-03	SST	September 30, 2015	TEG	1.4	0.1
SGI688	DUP-03	SST	September 30, 2015	TEG	1.3	0.1
SFO781	IA-01	SST	September 30, 2015	TEG	0.9	0.1
SFO748	IA-02	SST	September 30, 2015	TEG	1.6	0.1
SFN855	DUP-01	SST	September 30, 2015	TEG	1.4	0.1

***EMLab P&K radon certifications do not extend to the State of New Jersey**

Authorized Signature/Date:_____

Certified Radon Analyst

EMLab P&K
A TestAmerica Company

What Do My Test Results Mean?

The concentration of radon is measured in picocuries per liter of air (pCi/L). If your average radon level is less than 4.0 pCi/L, no action is necessary. However, radon levels less than 4.0 pCi/L can still pose some health risk, and in many cases can be reduced. The national average indoor radon level is about 1.3 pCi/L while the average outdoor radon concentration is about 0.4 pCi/L. The higher the radon concentration in the test area, the greater the health risks are to those in the immediate area.

What Do I Do If My Test Results Are Greater than 4.0 pCi/L?

If the test results are 4.0 pCi/L or greater, the EPA recommends that you mitigate to reduce the radon concentrations to an acceptable level. There are simple ways to fix a radon problem that aren't too costly, and even very high concentrations can be reduced to acceptable levels.

What Is the Health Risk Associated with Radon Gas?

Radon is a radioactive gas that comes from the natural breakdown of uranium in the soil. Radon is estimated to cause many thousands of deaths each year from lung cancer, and in fact, it is the second leading cause of lung cancer after smoking. If you smoke, and the test area has high radon levels, your risk of lung cancer is especially high.

Where Can I Get Additional Information on Radon?

For more information, please refer to http://www.epa.gov/radon/index.html

Data Qualifiers

The *Data Qualifiers* identify issues or events that are relevant to your analytical results. A data qualifier includes information about the validity, the source of the data whether calculated, entered or estimated, and the value of an observation. In each case the data qualifiers provide significant information vital to the interpretation of the laboratory data.

Radon Analysis (EPA Method GS: Grab Sample/Scintillation Cell counting)

For Geosyntec **Client Project Number: Tr0479 ESTCP**

Project Name: Sample Dates: 8/16/15

Samples Collected by: Darius Mali Sample containers: Tedlar bags

Site: Edison, NJ Assumed Site Pressure **1.00** atm

Analysts: Doug Hammond based on an elevation of 39 ft

Phone: 310-490-7896 Time Zone adjustment: add to decay time

email: dhammond@usc.edu **3** hours Collect (EDT)

Run (PDT)

	Summary	Collection		Analysis				Lab Duplicates		
		Date	time	Date	time	Vol run	Conc.	±1 sig	mean	±1sdom	Notes
			(EDT)		(PDT)	(cc)	pCi/L	pCi/L	pCi/L	pCi/L	
Received 8/22/15											
1	Yellow East Side B205	8/16/15	13:05	8/22/15	18:53	120	2.28	0.14			
2	Purple B205	8/16/15	12:30	8/22/15	18:45	120	0.87	0.10			
3	Green East Side B205	8/16/15	12:46	8/22/15	18:49	120	1.11	0.11			
4	UP01 B200	8/16/15	14:06	8/24/15	7:42	40	108	5	124	8	
	Lab Dupe	8/16/15	8:05	8/24/15	7:43	40	128	6			
	Lab Dupe	8/16/15	8:05	8/25/15	7:48	40	135	7			

Uncertainty given in pCi/liter is based on counting statistics for low activity samples. For high activity samples uncertainty is ±5%.

The Lower Limit of Detection for Rn (95% confidence level as recommended by EPA 402-R-95-012, Oct. 97) is 0.14 pCi/liter.

Results are reported based on standardization with NIST-traceable radon sources.

These results are for application of naturally-occurring radon as a tracer of soil vapor intrusion, but are not intended for evaluation of radon hazards.

Results corrected to in situ pressure as noted above

Raw Data, Calculation factors, and Analytical Details

		Collection		Analysis													count
	Sample ID	Date	Time	Date	Time	Count in	He	Air/He	Vol run	Press	obs	sig	Decay T	Decay	Concentration		stats
			(EDT)		(PDT)	cell/ch	eff	eff	(cc)	factor	dpm	dpm	(hours)	factor	dpm/liter	pCi/liter	pCi/liter ±1 sig	Notes
Received 8/22/15																		
1	Yellow East Side B205	8/16/15	13:05	8/22/15	18:53	83/33	0.806	0.97	120	1.00	0.15	0.01	152.8	3.172	5.07	2.28	0.14	
2	Purple B205	8/16/15	12:30	8/22/15	18:45	82/32	0.733	0.97	120	1.00	0.05	0.01	153.3	3.183	1.94	0.87	0.10	
3	Green East Side B205	8/16/15	12:46	8/22/15	18:49	81/31	0.818	0.97	120	1.00	0.07	0.01	153.1	3.178	2.47	1.11	0.11	
4	UP01 B200	8/16/15	14:06	8/24/15	7:42	74/34	0.885	0.99	40	1.00	2.03	0.07	188.6	4.157	241	108	4	
	Lab Dupe	8/16/15	8:05	8/24/15	7:43	Z17/11	0.798	0.99	40	1.00	2.07	0.07	194.6	4.351	285	128	4	
	Lab Dupe	8/16/15	8:05	8/25/15	7:48	Z17/11	0.819	0.99	40	1.00	1.86	0.06	218.7	5.219	299	135	4	

Decay correctiions based on Rn decay constant of 0.1813 per day Radon Conc = {(0.4504)(1000)(obs dpm)(decay factor)(Press factor)}/{(cc used)(He eff)(Air/He)}

Conversion from dpm based on 0.4504 pCi/dpm (in pCi/liter)

Blanks are negligible.

Definitions:

Cell/ch:	Counting cell and channel used	sig dpm	uncertainty (± 1 sig) in dpm based on counting statistics
He eff:	Cell and counter efficiency using helium matrix	Decay T:	time elapsed from sampling to analysis
Air/He:	Correction for matrix counting gas density	Decay factor:	Correction factor for decay from collection to analysis
Sample vol:	Volume analyzed (cc)	dpm/liter:	Radon concentration in disintigrations per minute per liter of sample
Press factor:	Correction to in situ pressure based on collection altitude	piC/liter:	Radon concentration in picoCuries per liter
obs dpm:	observed radon activity (disintigrations per minute) when analyzed	count stats:	uncertainty in observed radon based on counting statistics

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

Job Number: 200-23612-1

SDG Number: 200-23612

Job Description: ESTCP

For:
Geosyntec Consultants, Inc.
130 Research Lane
Suite 2
Guelph, Ontario N1G5G3

Attention: Mr. Paul Nicholson

Approved for release.
Don C Dawicki
Manager of Project Management
8/14/2014 1:58 PM

Don C Dawicki, Manager of Project Management
30 Community Drive, South Burlington, VT, 05403
(802)660-1990
don.dawicki@testamericainc.com
08/14/2014

The test results in this report relate only to sample(s) as received by the laboratory. These test results were derived under a quality system that adheres to the requirements of NELAC. Pursuant to NELAC, this report may not be produced in full without written approval from the laboratory

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CASE NARRATIVE

Client: Geosyntec Consultants, Inc.

Project: ESTCP

Report Number: 200-23612-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

The samples were received on 08/12/2014; the samples arrived in good condition.

The container label for the following sample(s) did not match the information listed on the Chain-of-Custody (COC): 205-VP3a (200-23612-2), 205-VP3a-DUP (200-23612-3), 205-VP3b (200-23612-1), 205-VP3c (200-23612-4), 205-VP3c-DUP (200-23612-5). The container labels do not list a sample time. Logged in per sample end time on COC.

Insufficient sample volume was provided for the following sample for the EPA 3C analysis: 205-VP3c-DUP (200-23612-5). The tedlar was received with no volume remaining due to a rupture in the bag.

FIXED GASES

Samples 205-VP3b, 205-VP3a, 205-VP3a-DUP, 205-VP3c, CALGAS1000 and CALGAS2000 were analyzed for Fixed Gases in accordance with EPA Method 3C. The samples were analyzed on 08/12/2014.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

AIR - GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Instrument ID: CH0001.i Analysis Batch Number: 72381

Lab Sample ID: IC 200-72381/4 Client Sample ID:

Date Analyzed: 05/19/14 14:07 Lab File ID: 3cic1051914B.d-avg GC Column: CTR-1 ID: 3.175(mm)

COMPOUND NAME	RETENTION TIME	MANUAL INTEGRATION		
		REASON	ANALYST	DATE
Oxygen	3.81	Baseline Event	lyonsb	05/20/14 10:49
Methane	6.58	Baseline Event	lyonsb	05/19/14 15:04

Lab Sample ID: IC 200-72381/5 Client Sample ID:

Date Analyzed: 05/19/14 14:39 Lab File ID: 3cic2051914A.d-avg GC Column: CTR-1 ID: 3.175(mm)

COMPOUND NAME	RETENTION TIME	MANUAL INTEGRATION		
		REASON	ANALYST	DATE
Methane	6.52	Baseline Event	lyonsb	05/20/14 11:19
Carbon monoxide	7.04	Baseline Event	lyonsb	05/20/14 11:19

Lab Sample ID: IC 200-72381/9 Client Sample ID:

Date Analyzed: 05/19/14 18:37 Lab File ID: 3cic10051914A.d-avg GC Column: CTR-1 ID: 3.175(mm)

COMPOUND NAME	RETENTION TIME	MANUAL INTEGRATION		
		REASON	ANALYST	DATE
Carbon monoxide	7.02	Baseline Event	lyonsb	05/20/14 10:19

SAMPLE SUMMARY

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
200-23612-1	205-VP3b	Air	08/10/2014 0905	08/12/2014 1034
200-23612-2	205-VP3a	Air	08/10/2014 0910	08/12/2014 1034
200-23612-2DU	205-VP3a	Air	08/10/2014 0910	08/12/2014 1034
200-23612-3	205-VP3a-DUP	Air	08/10/2014 0915	08/12/2014 1034
200-23612-4	205-VP3c	Air	08/10/2014 0920	08/12/2014 1034
200-23612-6	CALGAS1000	Air	08/10/2014 0930	08/12/2014 1034
200-23612-7	CALGAS2000	Air	08/10/2014 0935	08/12/2014 1034

EXECUTIVE SUMMARY - Detections

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Lab Sample ID / Analyte	Client Sample ID	Result	Qualifier	Reporting Limit	Units	Method
200-23612-1	**205-VP3B**					
Carbon dioxide		0.51		0.050	% v/v	EPA 3C
Nitrogen		75		0.50	% v/v	EPA 3C
Oxygen		21		0.050	% v/v	EPA 3C
200-23612-2	**205-VP3A**					
Carbon dioxide		0.47		0.050	% v/v	EPA 3C
Nitrogen		75		0.50	% v/v	EPA 3C
Oxygen		21		0.050	% v/v	EPA 3C
200-23612-3	**205-VP3A-DUP**					
Carbon dioxide		0.61		0.050	% v/v	EPA 3C
Nitrogen		75		0.50	% v/v	EPA 3C
Oxygen		21		0.050	% v/v	EPA 3C
200-23612-4	**205-VP3C**					
Carbon dioxide		0.22		0.050	% v/v	EPA 3C
Nitrogen		75		0.50	% v/v	EPA 3C
Oxygen		21		0.050	% v/v	EPA 3C
200-23612-6	**CALGAS1000**					
Carbon dioxide		0.12		0.050	% v/v	EPA 3C
Nitrogen		95		0.50	% v/v	EPA 3C
Oxygen		0.42		0.050	% v/v	EPA 3C
200-23612-7	**CALGAS2000**					
Carbon dioxide		0.21		0.050	% v/v	EPA 3C
Nitrogen		95		0.50	% v/v	EPA 3C
Oxygen		0.35		0.050	% v/v	EPA 3C

METHOD SUMMARY

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Description	Lab Location	Method	Preparation Method
Matrix: Air			
Fixed Gases from Stationary Sources	TAL BUR	EPA EPA 3C	
Collection via Tedlar Bag			Tedlar Bag

Lab References:

TAL BUR = TestAmerica Burlington

Method References:

EPA = US Environmental Protection Agency

METHOD / ANALYST SUMMARY

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Method	Analyst	Analyst ID
EPA EPA 3C	Lyons, Benjamin P	BPL

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **205-VP3b**

Lab Sample ID: 200-23612-1
Client Matrix: Air

Date Sampled: 08/10/2014 0905
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-1a.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1531			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.51		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	75		0.50	0.50
Oxygen	21		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **205-VP3a**

Lab Sample ID: 200-23612-2
Client Matrix: Air

Date Sampled: 08/10/2014 0910
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-2001.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1702			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.47		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	75		0.50	0.50
Oxygen	21		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **205-VP3a-DUP**

Lab Sample ID: 200-23612-3
Client Matrix: Air

Date Sampled: 08/10/2014 0915
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-3001.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1838			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.61		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	75		0.50	0.50
Oxygen	21		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **205-VP3c**

Lab Sample ID: 200-23612-4
Client Matrix: Air

Date Sampled: 08/10/2014 0920
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-4001.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1925			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.22		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	75		0.50	0.50
Oxygen	21		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **CALGAS1000**

Lab Sample ID: 200-23612-6
Client Matrix: Air

Date Sampled: 08/10/2014 0930
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-6001.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 2100			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.12		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	95		0.50	0.50
Oxygen	0.42		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Client Sample ID: **CALGAS2000**

Lab Sample ID: 200-23612-7
Client Matrix: Air

Date Sampled: 08/10/2014 0935
Date Received: 08/12/2014 1034

EPA 3C Fixed Gases from Stationary Sources

Analysis Method:	EPA 3C	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
	N/A	Prep Batch:	N/A	Lab File ID:	200-23612-a-7001.d-avg
Dilution:	1.0			Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 2148			Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL

Analyte	Result (% v/v)	Qualifier	RL	RL
Carbon dioxide	0.21		0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	95		0.50	0.50
Oxygen	0.35		0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Method Blank - Batch: 200-75942

Method: EPA 3C
Preparation: N/A

Lab Sample ID:	MB 200-75942/3	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
Client Matrix:	Air	Prep Batch:	N/A	Lab File ID:	mb081114001.d-avg
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1457	Units:	% v/v	Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL
Leach Date:	N/A				

Analyte	Result	Qual	RL	RL
Carbon dioxide	0.050	U	0.050	0.050
Methane	0.040	U	0.040	0.040
Nitrogen	0.50	U	0.50	0.50
Oxygen	0.050	U	0.050	0.050
Carbon monoxide	1.0	U	1.0	1.0

Lab Control Sample - Batch: 200-75942

Method: EPA 3C
Preparation: N/A

Lab Sample ID:	LCS 200-75942/2	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
Client Matrix:	Air	Prep Batch:	N/A	Lab File ID:	3clcs81114a.d-avg
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1242	Units:	% v/v	Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Carbon dioxide	5.00	5.08	102	70 - 130	
Methane	4.00	3.66	91	70 - 130	
Nitrogen	5.00	4.81	96	70 - 130	
Oxygen	5.00	4.73	95	70 - 130	
Carbon monoxide	5.00	5.41	108	70 - 130	

Duplicate - Batch: 200-75942

Method: EPA 3C
Preparation: N/A

Lab Sample ID:	200-23612-2	Analysis Batch:	200-75942	Instrument ID:	CH0001.i
Client Matrix:	Air	Prep Batch:	N/A	Lab File ID:	200-23612-a-2002.d-avg
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2 mL
Analysis Date:	08/12/2014 1718	Units:	% v/v	Final Weight/Volume:	2 mL
Prep Date:	N/A			Injection Volume:	2 mL
Leach Date:	N/A				

Analyte	Sample Result/Qual		Result	RPD	Limit	Qual
Carbon dioxide	0.47		0.468	0.6	5	
Methane	0.040	U	0.040	NC	5	U
Nitrogen	75		74.8	0.4	5	
Oxygen	21		20.9	0.4	5	
Carbon monoxide	1.0	U	1.0	NC	5	U

DATA REPORTING QUALIFIERS

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

Lab Section	Qualifier	Description
Air - GC VOA		
	U	Indicates the analyte was analyzed for but not detected.

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
Sdg Number: 200-23612

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
Air - GC VOA					
Analysis Batch:200-75942					
LCS 200-75942/2	Lab Control Sample	T	Air	EPA 3C	
MB 200-75942/3	Method Blank	T	Air	EPA 3C	
200-23612-1	205-VP3b	T	Air	EPA 3C	
200-23612-2	205-VP3a	T	Air	EPA 3C	
200-23612-2DU	Duplicate	T	Air	EPA 3C	
200-23612-3	205-VP3a-DUP	T	Air	EPA 3C	
200-23612-4	205-VP3c	T	Air	EPA 3C	
200-23612-6	CALGAS1000	T	Air	EPA 3C	
200-23612-7	CALGAS2000	T	Air	EPA 3C	

Report Basis
T = Total

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
SDG: 200-23612

Laboratory Chronicle

Lab ID: 200-23612-1 **Client ID:** 205-VP3b

Sample Date/Time: 08/10/2014 09:05 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-1		200-75942		08/12/2014 15:31	1	TAL BUR	BPL

Lab ID: 200-23612-2 **Client ID:** 205-VP3a

Sample Date/Time: 08/10/2014 09:10 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-2		200-75942		08/12/2014 17:02	1	TAL BUR	BPL

Lab ID: 200-23612-2 **Client ID:** 205-VP3a

Sample Date/Time: 08/10/2014 09:10 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-2 DU		200-75942		08/12/2014 17:18	1	TAL BUR	BPL

Lab ID: 200-23612-3 **Client ID:** 205-VP3a-DUP

Sample Date/Time: 08/10/2014 09:15 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-3		200-75942		08/12/2014 18:38	1	TAL BUR	BPL

Lab ID: 200-23612-4 **Client ID:** 205-VP3c

Sample Date/Time: 08/10/2014 09:20 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-4		200-75942		08/12/2014 19:25	1	TAL BUR	BPL

Lab ID: 200-23612-6 **Client ID:** CALGAS1000

Sample Date/Time: 08/10/2014 09:30 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-6		200-75942		08/12/2014 21:00	1	TAL BUR	BPL

Lab ID: 200-23612-7 **Client ID:** CALGAS2000

Sample Date/Time: 08/10/2014 09:35 Received Date/Time: 08/12/2014 10:34

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	200-23612-A-7		200-75942		08/12/2014 21:48	1	TAL BUR	BPL

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
SDG: 200-23612

Laboratory Chronicle

Lab ID: MB **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	MB 200-75942/3		200-75942		08/12/2014 14:57	1	TAL BUR	BPL

Lab ID: LCS **Client ID:** N/A

Sample Date/Time: N/A Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
A:EPA 3C	LCS 200-75942/2		200-75942		08/12/2014 12:42	1	TAL BUR	BPL

Lab References:
TAL BUR = TestAmerica Burlington

Certification Summary

Client: Geosyntec Consultants, Inc.
Project/Site: ESTCP

TestAmerica Job ID: 200-23612-1
SDG: 200-23612

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Burlington	Connecticut	State Program	1	PH-0751
TestAmerica Burlington	DE Haz. Subst. Cleanup Act (HSCA)	State Program	3	NA
TestAmerica Burlington	Florida	NELAP	4	E87467
TestAmerica Burlington	L-A-B	DoD ELAP		L2336
TestAmerica Burlington	Maine	State Program	1	VT00008
TestAmerica Burlington	Minnesota	NELAP	5	050-999-436
TestAmerica Burlington	New Hampshire	NELAP	1	2006
TestAmerica Burlington	New Jersey	NELAP	2	VT972
TestAmerica Burlington	New York	NELAP	2	10391
TestAmerica Burlington	Pennsylvania	NELAP	3	68-00489
TestAmerica Burlington	Rhode Island	State Program	1	LAO00298
TestAmerica Burlington	US Fish & Wildlife	Federal		LE-058448-0
TestAmerica Burlington	USDA	Federal		P330-11-00093
TestAmerica Burlington	Vermont	State Program	1	VT-4000
TestAmerica Burlington	Virginia	NELAP	3	460209

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

Method EPA 3C

Fixed Gases from Stationary Sources by Method EPA - 3C

FORM III
AIR - GC VOA LAB CONTROL SAMPLE RECOVERY

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Matrix: Air Level: Low Lab File ID: 3clcs81114a.d-avg

Lab ID: LCS 200-75942/2 Client ID:

COMPOUND	SPIKE ADDED (% v/v)	LCS CONCENTRATION (% v/v)	LCS % REC	QC LIMITS REC	#
Carbon dioxide	5.00	5.08	102	70-130	
Methane	4.00	3.66	91	70-130	
Nitrogen	5.00	4.81	96	70-130	
Oxygen	5.00	4.73	95	70-130	
Carbon monoxide	5.00	5.41	108	70-130	

Column to be used to flag recovery and RPD values

FORM III EPA 3C

FORM IV
AIR - GC VOA METHOD BLANK SUMMARY

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Lab File ID: mb081114001.d-avg Lab Sample ID: MB 200-75942/3

Matrix: Air Heated Purge:(Y/N) N

Instrument ID: CH0001.i Date Analyzed: 08/12/2014 14:57

GC Column: CTR-1 ID: 3.175(mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES:

CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
	LCS 200-75942/2	3clcs81114a.d-avg	08/12/2014 12:42
205-VP3b	200-23612-1	200-23612-a-1a.d-avg	08/12/2014 15:31
205-VP3a	200-23612-2	200-23612-a-2001.d-avg	08/12/2014 17:02
205-VP3a DU	200-23612-2 DU	200-23612-a-2002.d-avg	08/12/2014 17:18
205-VP3a-DUP	200-23612-3	200-23612-a-3001.d-avg	08/12/2014 18:38
205-VP3c	200-23612-4	200-23612-a-4001.d-avg	08/12/2014 19:25
CALGAS1000	200-23612-6	200-23612-a-6001.d-avg	08/12/2014 21:00
CALGAS2000	200-23612-7	200-23612-a-7001.d-avg	08/12/2014 21:48

FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: 205-VP3b Lab Sample ID: 200-23612-1

Matrix: Air Lab File ID: 200-23612-a-1a.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:05

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 15:31

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.51		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	75		0.50	0.50
7782-44-7	Oxygen	21		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-1a.d
Lims ID: 200-23612-A-1 Lab Sample ID: 200-23612-1
Client ID: 205-VP3b
Sample Type: Client
Inject. Date: 12-Aug-2014 15:31:13 ALS Bottle#: 0 Worklist Smp#: 11
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-1
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 12-Aug-2014 16:51:38

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.727	1.722	0.005	17214	0.5152	
2 Oxygen	3.812	3.824	-0.012	720164	20.7	
3 Nitrogen	4.670	4.719	-0.049	2807230	74.8	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-1b.d
Lims ID: 200-23612-A-1 Lab Sample ID: 200-23612-1
Client ID: 205-VP3b
Sample Type: Client
Inject. Date: 12-Aug-2014 15:47:06 ALS Bottle#: 0 Worklist Smp#: 12
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-1
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.717	1.722	-0.005	16943	0.5071	
2 Oxygen	3.784	3.824	-0.040	724506	20.9	
3 Nitrogen	4.627	4.719	-0.092	2817575	75.1	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-1b-75924-ai_3c

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	17214	16943	17078.5	1.59
Oxygen	720164	724506	722335	0.6
Nitrogen	2807230	2817575	2812402.5	0.37
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.52	0.51	0.51	1.59
Oxygen	20.74	20.86	20.8	0.6
Nitrogen	74.78	75.05	74.91	0.37
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

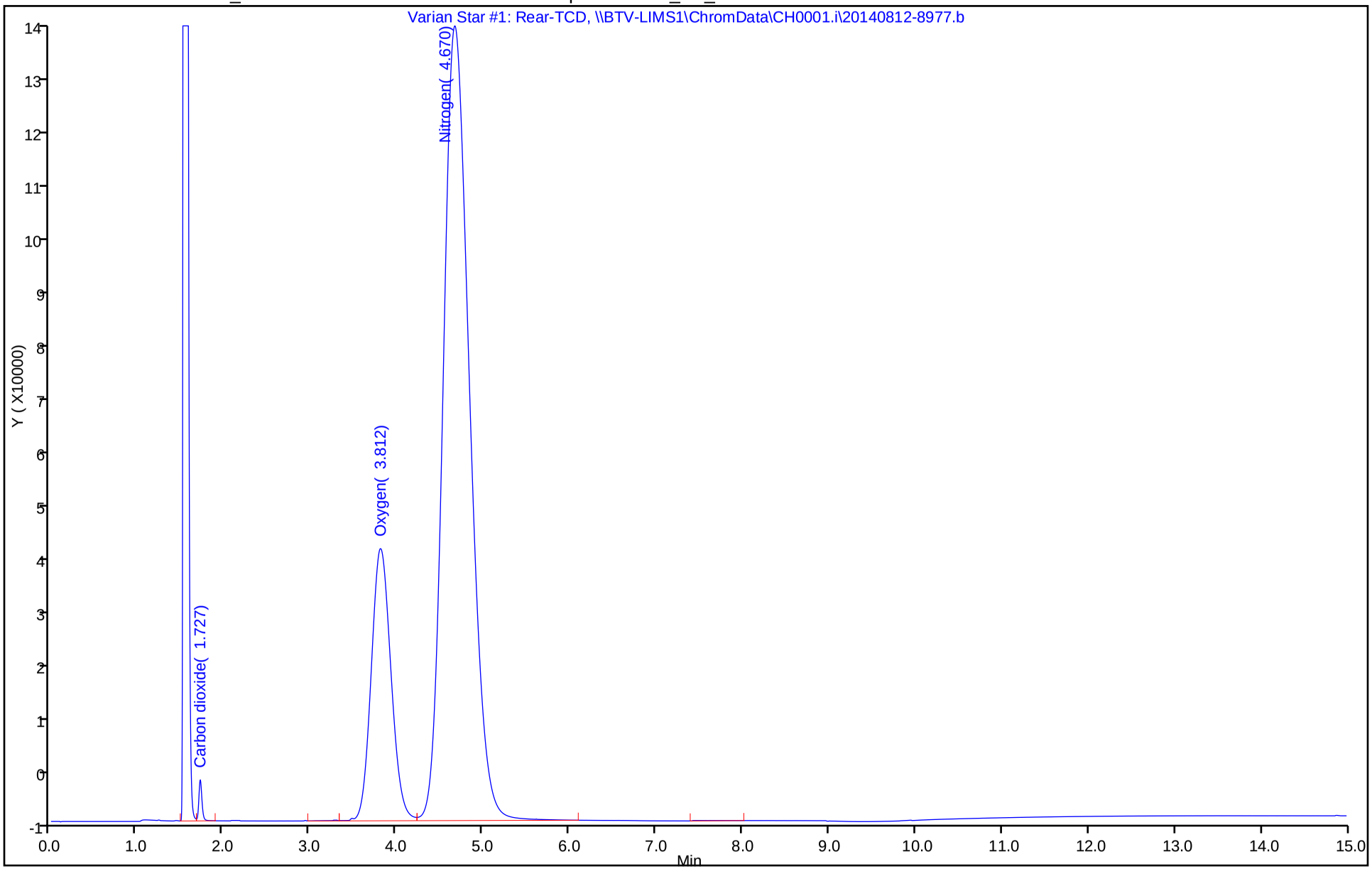
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:41:11 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-1a.d

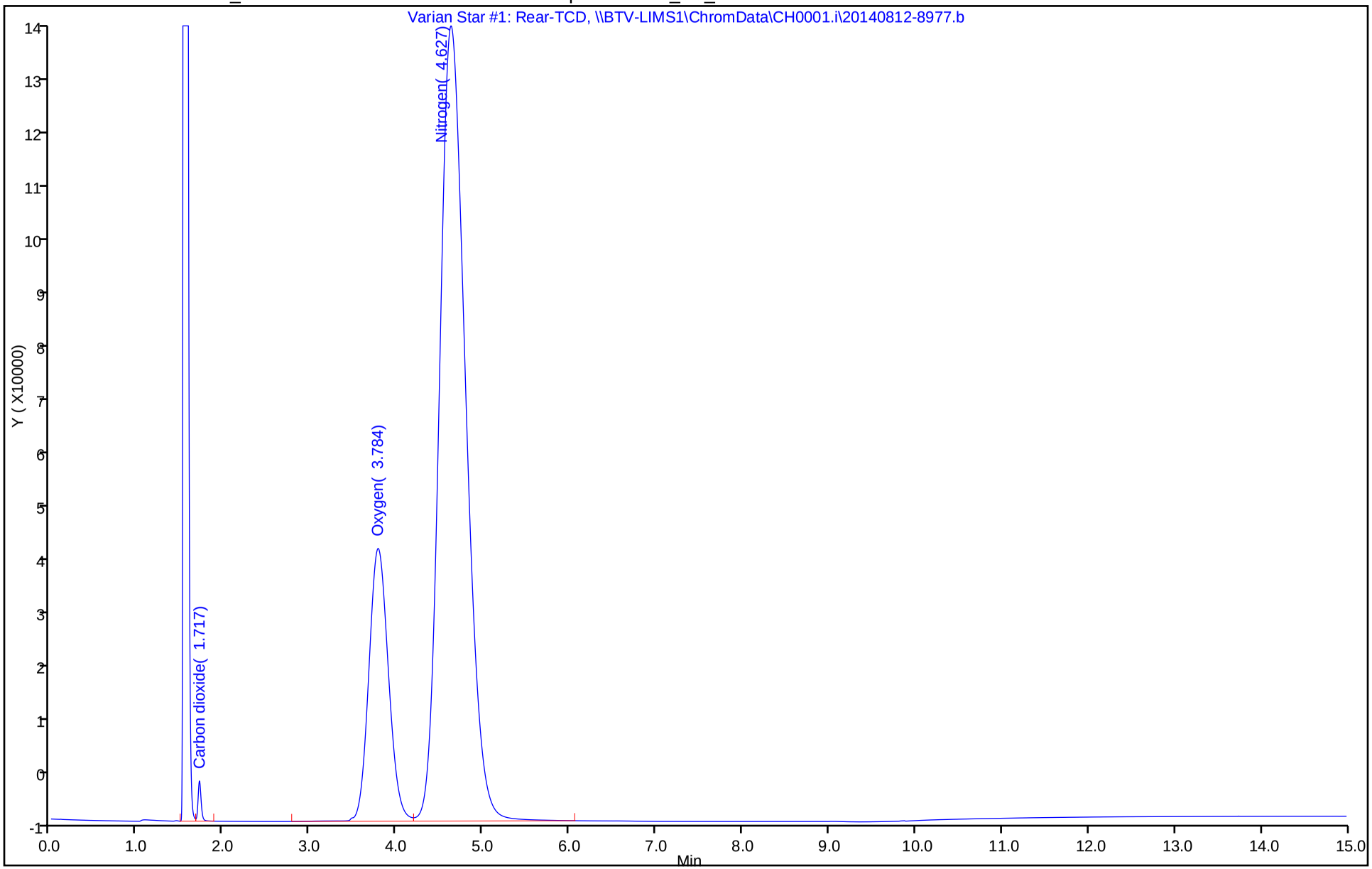
Injection Date:	12-Aug-2014 15:31:13	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-1	Lab Sample ID:	200-23612-1	Worklist Smp#:	11
Client ID:	205-VP3b				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:41:11 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-1b.d				
Injection Date:	12-Aug-2014 15:47:06	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-1	Lab Sample ID:	200-23612-1	Worklist Smp#:	12
Client ID:	205-VP3b				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: 205-VP3a Lab Sample ID: 200-23612-2

Matrix: Air Lab File ID: 200-23612-a-2001.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:10

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 17:02

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.47		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	75		0.50	0.50
7782-44-7	Oxygen	21		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2001.d
Lims ID: 200-23612-A-2 Lab Sample ID: 200-23612-2
Client ID: 205-VP3a
Sample Type: Client
Inject. Date: 12-Aug-2014 17:02:15 ALS Bottle#: 0 Worklist Smp#: 21
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-2
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:16 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.727	1.722	0.005	15659	0.4686	
2 Oxygen	3.818	3.824	-0.006	723149	20.8	
3 Nitrogen	4.682	4.719	-0.037	2799013	74.6	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2.d
Lims ID: 200-23612-A-2 Lab Sample ID: 200-23612-2
Client ID: 205-VP3a
Sample Type: Client
Inject. Date: 12-Aug-2014 16:18:51 ALS Bottle#: 0 Worklist Smp#: 14
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-2
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:16 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 12-Aug-2014 16:52:15

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.722	-0.002	15781	0.4723	
2 Oxygen	3.795	3.824	-0.029	731063	21.1	
3 Nitrogen	4.642	4.719	-0.077	2838697	75.6	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-2-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	15659	15781	15720	0.78
Oxygen	723149	731063	727106	1.09
Nitrogen	2799013	2838697	2818855	1.41
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

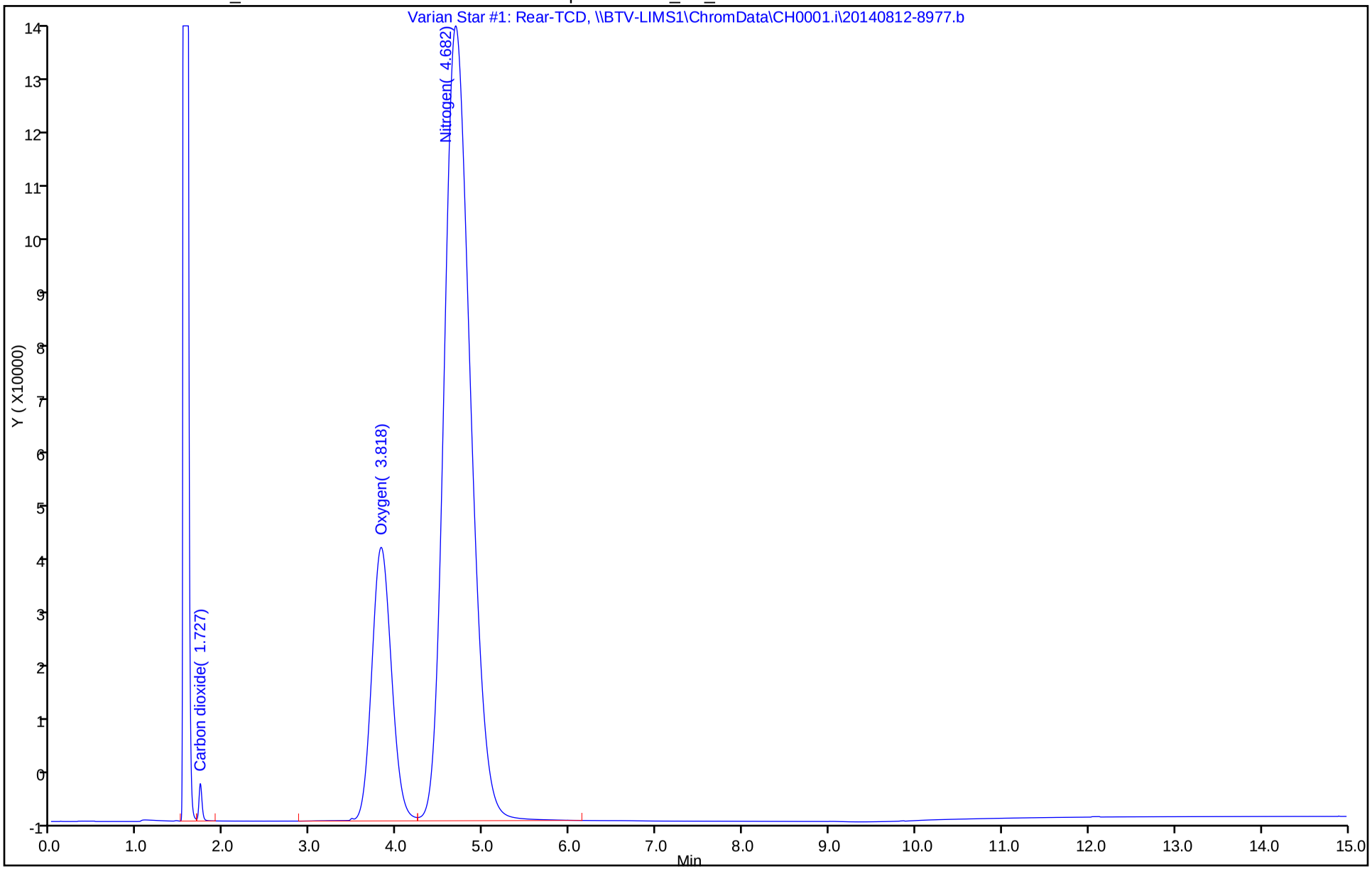
Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.47	0.47	0.47	0.78
Oxygen	20.82	21.05	20.94	1.09
Nitrogen	74.56	75.62	75.09	1.41
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:56:05 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

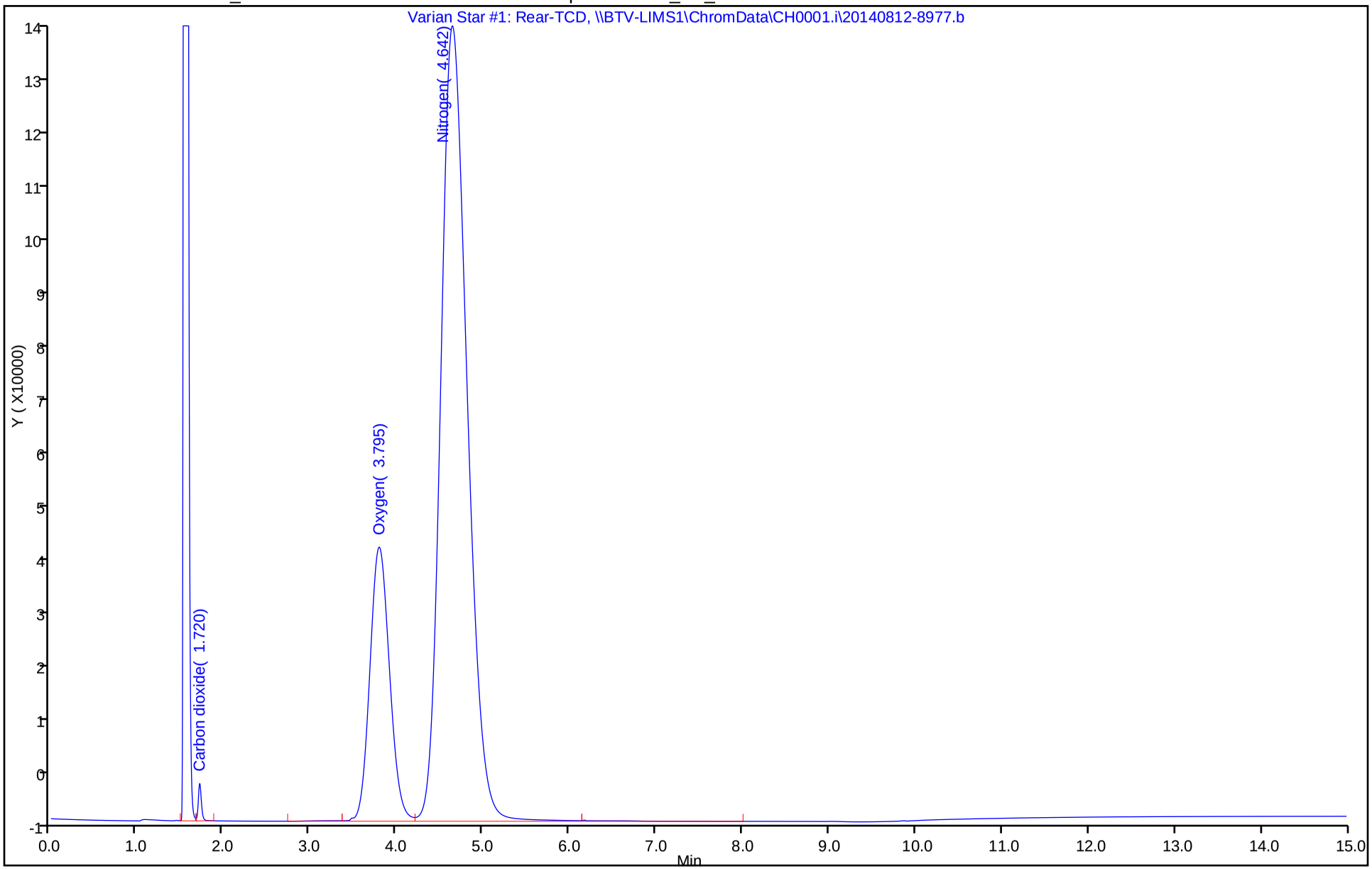
Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2001.d				
Injection Date:	12-Aug-2014 17:02:15	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-2	Lab Sample ID:	200-23612-2	Worklist Smp#:	21
Client ID:	205-VP3a				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:56:03 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2.d				
Injection Date:	12-Aug-2014 16:18:51	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-2	Lab Sample ID:	200-23612-2	Worklist Smp#:	14
Client ID:	205-VP3a				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: 205-VP3a-DUP Lab Sample ID: 200-23612-3

Matrix: Air Lab File ID: 200-23612-a-3001.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:15

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 18:38

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.61		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	75		0.50	0.50
7782-44-7	Oxygen	21		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-3001.d
Lims ID: 200-23612-A-3 Lab Sample ID: 200-23612-3
Client ID: 205-VP3a-DUP
Sample Type: Client
Inject. Date: 12-Aug-2014 18:38:13 ALS Bottle#: 0 Worklist Smp#: 17
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-3
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.717	1.722	-0.005	20197	0.6045	
2 Oxygen	3.785	3.824	-0.039	717041	20.6	
3 Nitrogen	4.628	4.719	-0.091	2802006	74.6	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-3.d
Lims ID: 200-23612-A-3 Lab Sample ID: 200-23612-3
Client ID: 205-VP3a-DUP
Sample Type: Client
Inject. Date: 12-Aug-2014 18:22:22 ALS Bottle#: 0 Worklist Smp#: 16
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-3
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.722	-0.002	20313	0.6079	
2 Oxygen	3.795	3.824	-0.029	719669	20.7	
3 Nitrogen	4.642	4.719	-0.077	2812006	74.9	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-3-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	20197	20313	20255	0.57
Oxygen	717041	719669	718355	0.37
Nitrogen	2802006	2812006	2807006	0.36
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

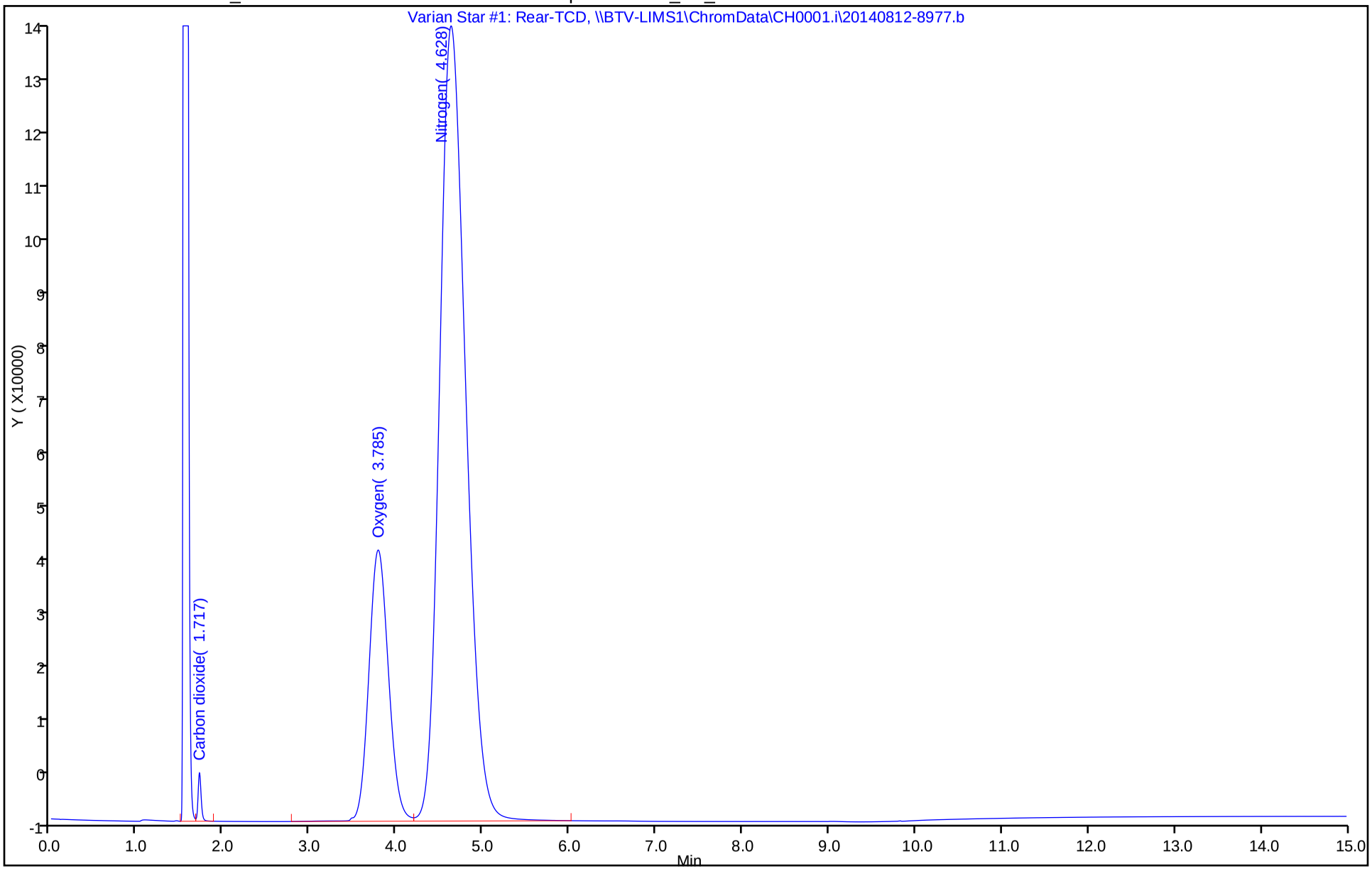
Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.6	0.61	0.61	0.57
Oxygen	20.65	20.72	20.69	0.37
Nitrogen	74.64	74.9	74.77	0.36
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:41:09 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

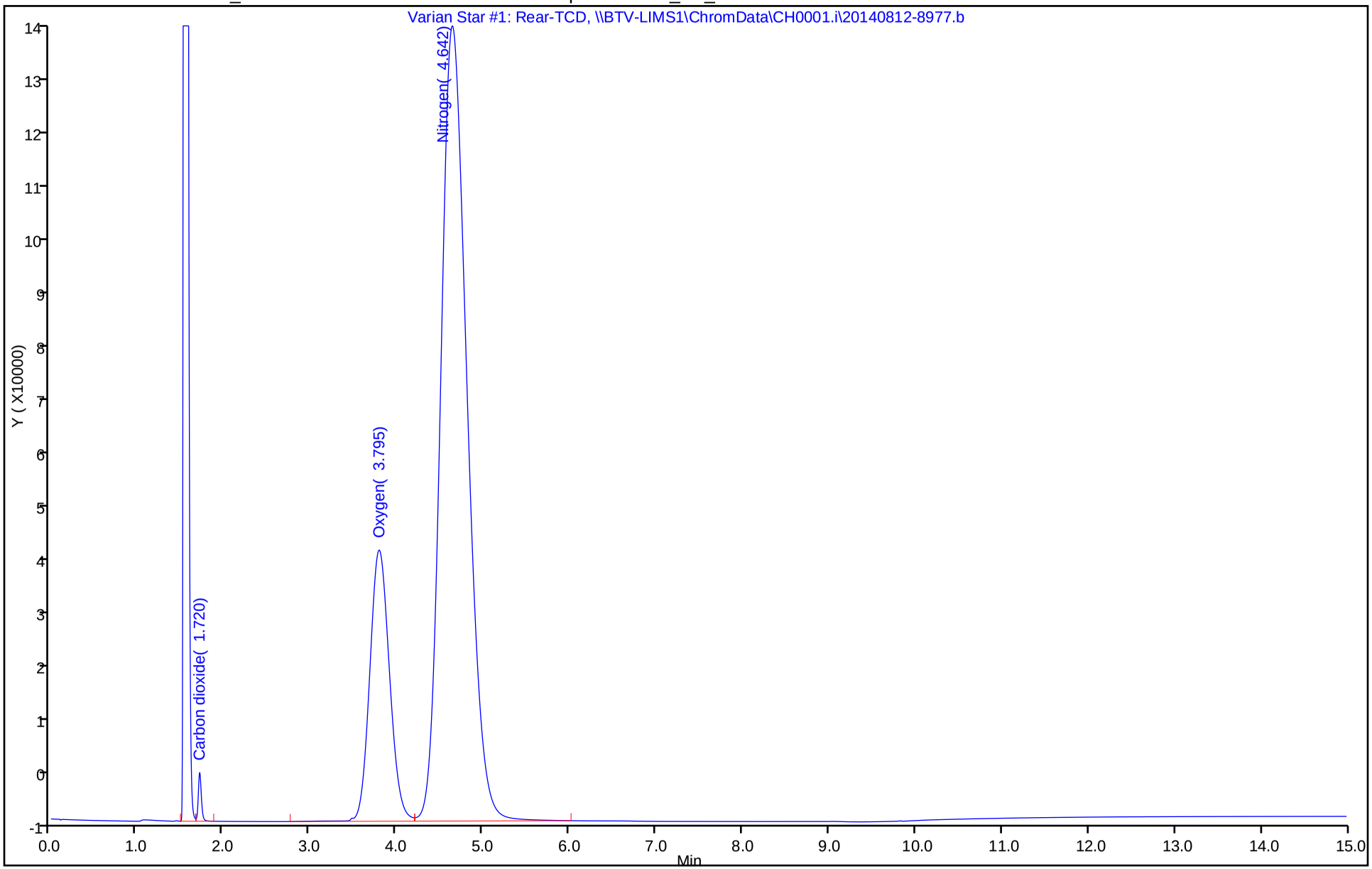
Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-3001.d				
Injection Date:	12-Aug-2014 18:38:13	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-3	Lab Sample ID:	200-23612-3	Worklist Smp#:	17
Client ID:	205-VP3a-DUP				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:41:08 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-3.d				
Injection Date:	12-Aug-2014 18:22:22	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-3	Lab Sample ID:	200-23612-3	Worklist Smp#:	16
Client ID:	205-VP3a-DUP				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: 205-VP3c Lab Sample ID: 200-23612-4

Matrix: Air Lab File ID: 200-23612-a-4001.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:20

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 19:25

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.22		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	75		0.50	0.50
7782-44-7	Oxygen	21		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-4001.d
Lims ID: 200-23612-A-4 Lab Sample ID: 200-23612-4
Client ID: 205-VP3c
Sample Type: Client
Inject. Date: 12-Aug-2014 19:25:47 ALS Bottle#: 0 Worklist Smp#: 22
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-4
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 13-Aug-2014 09:38:22

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.717	1.722	-0.005	7403	0.2216	
2 Oxygen	3.785	3.824	-0.039	732861	21.1	
3 Nitrogen	4.628	4.719	-0.091	2804862	74.7	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-4.d
Lims ID: 200-23612-A-4 Lab Sample ID: 200-23612-4
Client ID: 205-VP3c
Sample Type: Client
Inject. Date: 12-Aug-2014 19:09:56 ALS Bottle#: 0 Worklist Smp#: 19
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-4
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.722	-0.002	7424	0.2222	
2 Oxygen	3.797	3.824	-0.027	737143	21.2	
3 Nitrogen	4.645	4.719	-0.074	2828688	75.3	

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-4001-75924-ai_
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-4-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	7403	7424	7413.5	0.28
Oxygen	732861	737143	735002	0.58
Nitrogen	2804862	2828688	2816775	0.85
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

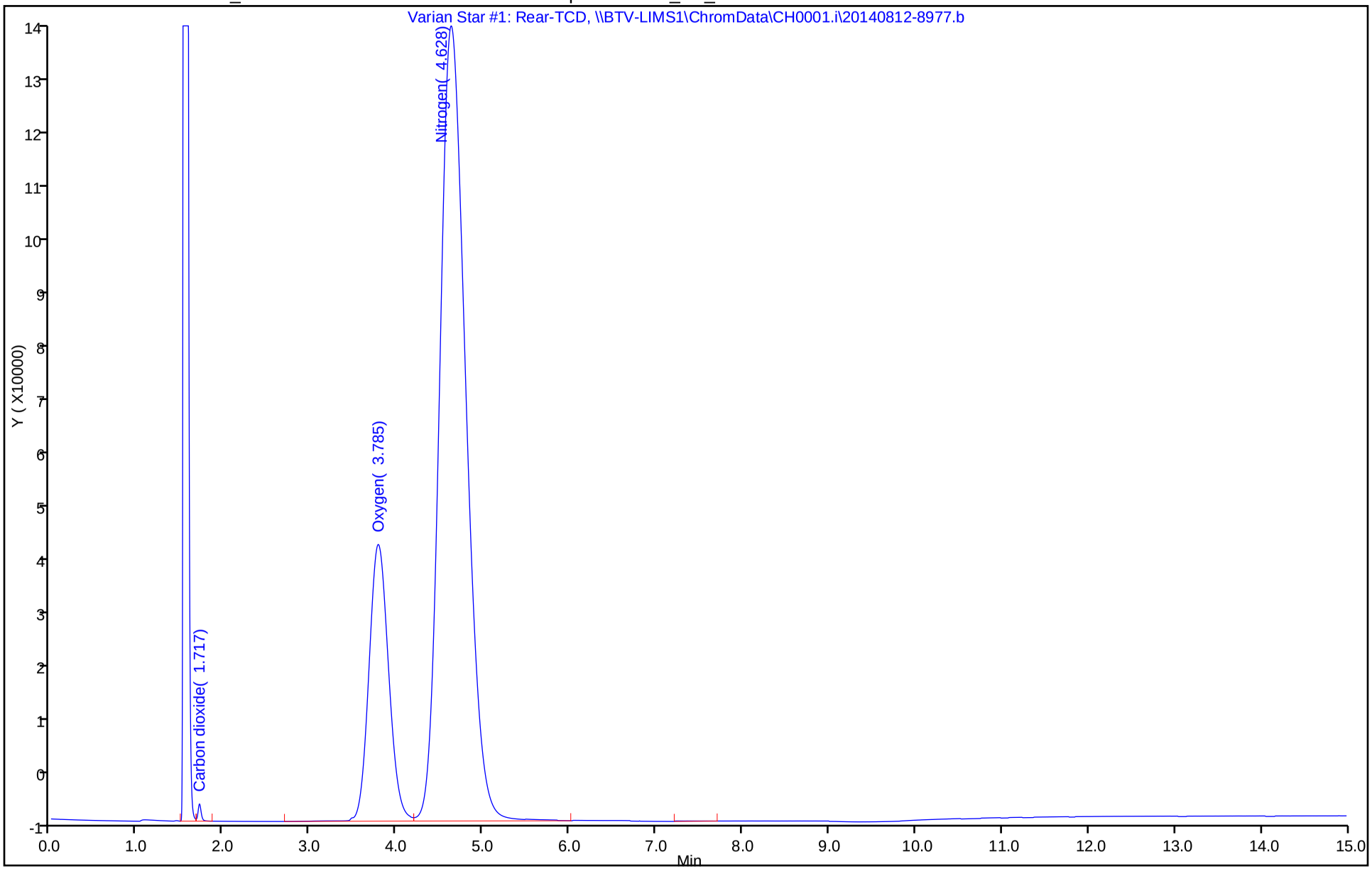
Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.22	0.22	0.22	0.28
Oxygen	21.1	21.23	21.17	0.58
Nitrogen	74.71	75.35	75.03	0.85
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:41:08 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

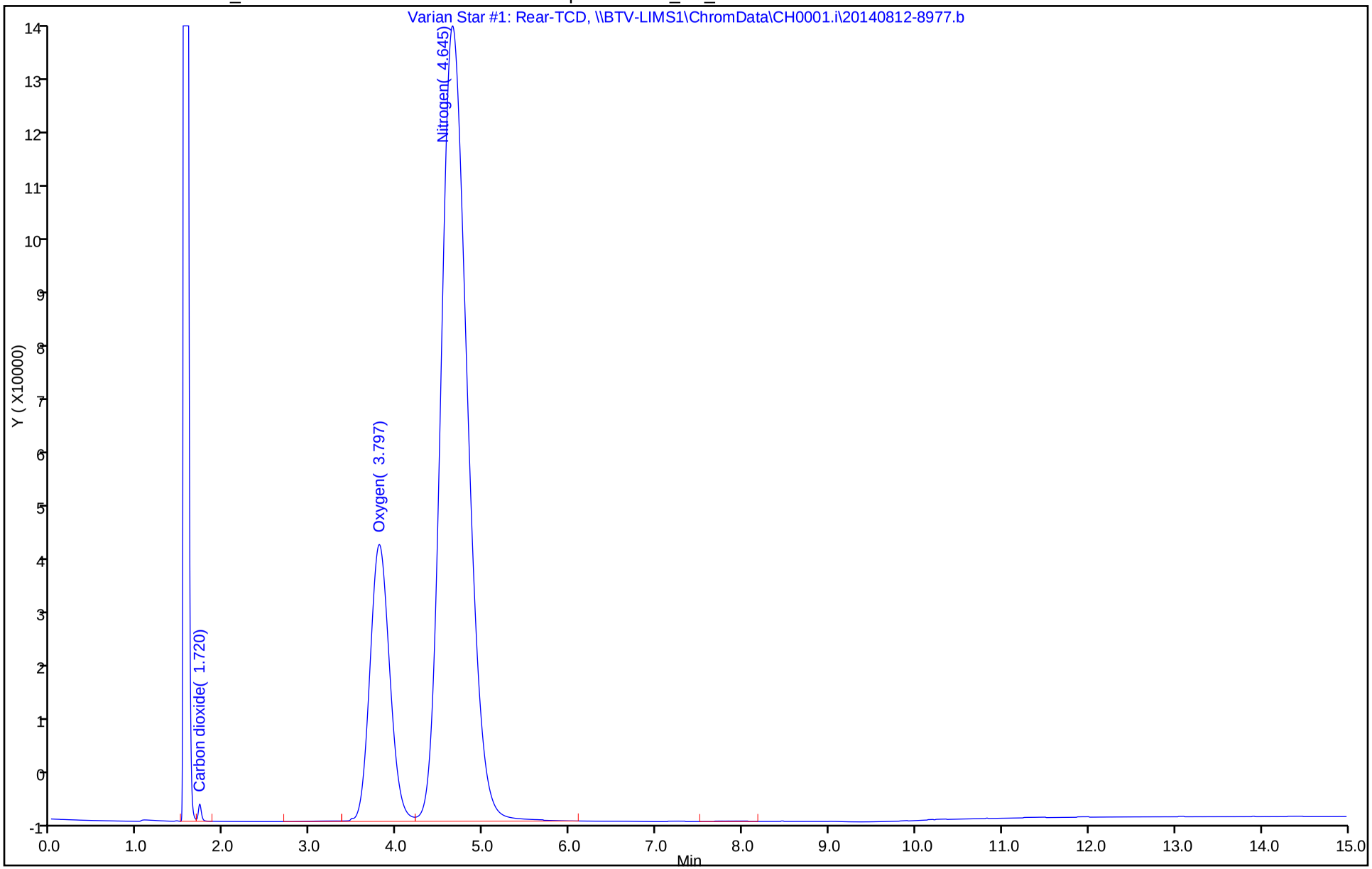
Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-4001.d				
Injection Date:	12-Aug-2014 19:25:47	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-4	Lab Sample ID:	200-23612-4	Worklist Smp#:	22
Client ID:	205-VP3c				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:41:08 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-4.d				
Injection Date:	12-Aug-2014 19:09:56	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-4	Lab Sample ID:	200-23612-4	Worklist Smp#:	19
Client ID:	205-VP3c				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: CALGAS1000 Lab Sample ID: 200-23612-6

Matrix: Air Lab File ID: 200-23612-a-6001.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:30

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 21:00

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.12		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	95		0.50	0.50
7782-44-7	Oxygen	0.42		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-6001.d
Lims ID: 200-23612-A-6 Lab Sample ID: 200-23612-6
Client ID: CALGAS1000
Sample Type: Client
Inject. Date: 12-Aug-2014 21:00:57 ALS Bottle#: 0 Worklist Smp#: 25
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-6
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.717	1.722	-0.005	3918	0.1173	
2 Oxygen	3.797	3.824	-0.027	14923	0.4297	
3 Nitrogen	4.617	4.719	-0.102	3589081	95.6	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-6.d
Lims ID: 200-23612-A-6 Lab Sample ID: 200-23612-6
Client ID: CALGAS1000
Sample Type: Client
Inject. Date: 12-Aug-2014 20:45:04 ALS Bottle#: 0 Worklist Smp#: 24
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-6
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.722	-0.002	3896	0.1166	
2 Oxygen	3.805	3.824	-0.019	14278	0.4112	
3 Nitrogen	4.622	4.719	-0.097	3548053	94.5	

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-6001-75924-ai_
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-6-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	3918	3896	3907	0.56
Oxygen	14923	14278	14600.5	4.42
Nitrogen	3589081	3548053	3568567	1.15
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

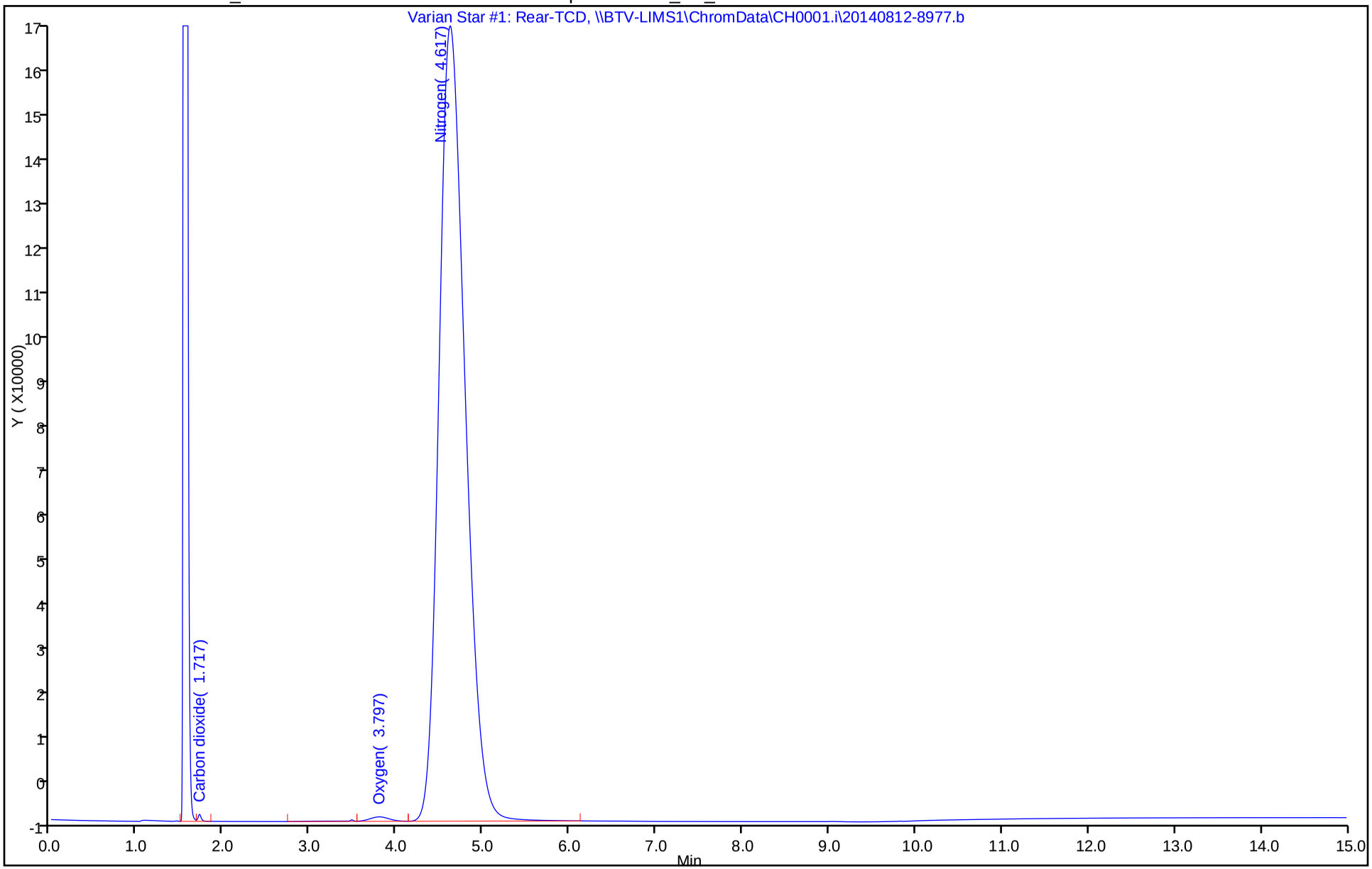
Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.12	0.12	0.12	0.56
Oxygen	0.43	0.41	0.42	4.42
Nitrogen	95.6	94.51	95.06	1.15
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:41:07 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

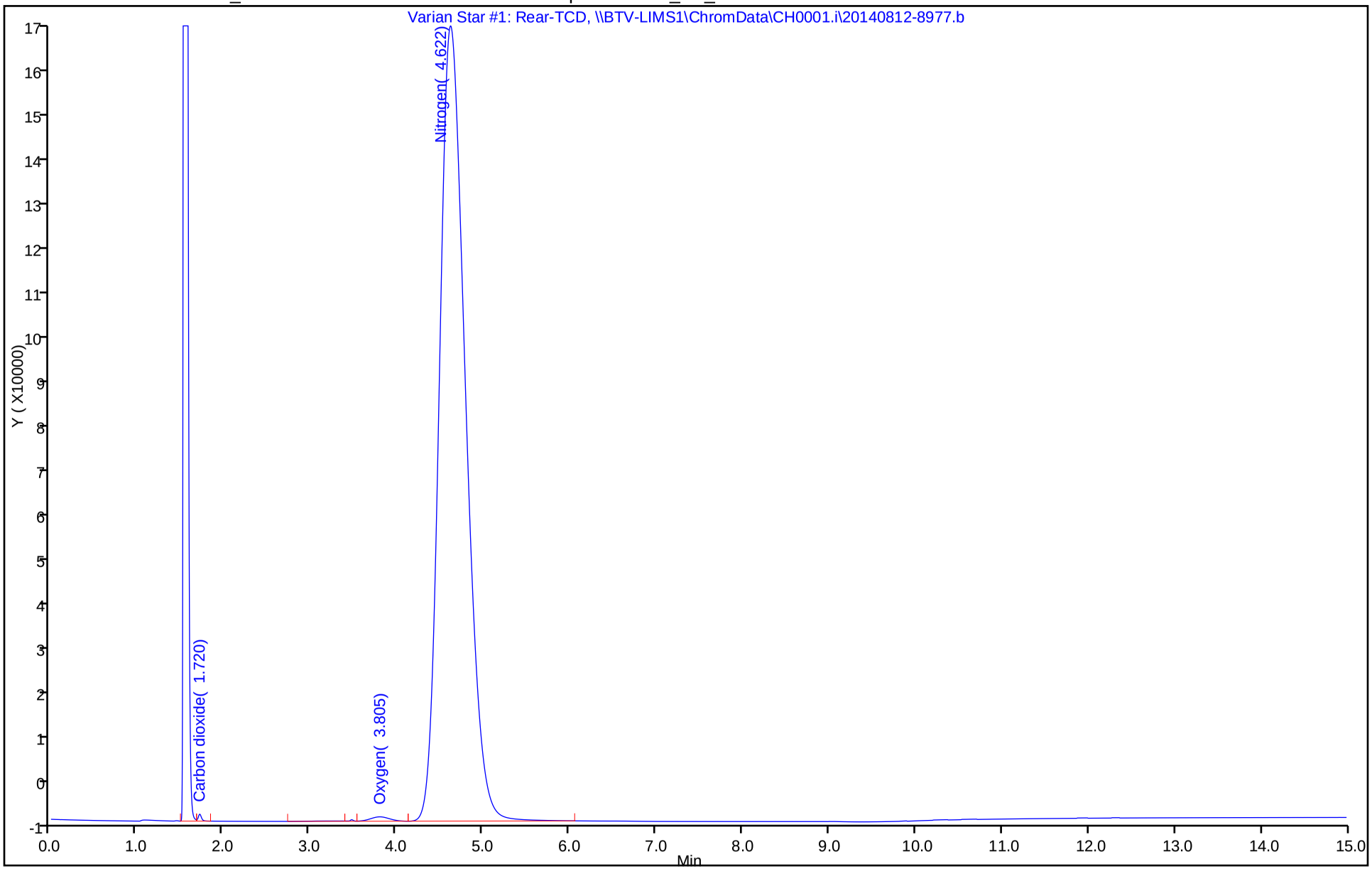
Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-6001.d				
Injection Date:	12-Aug-2014 21:00:57	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-6	Lab Sample ID:	200-23612-6	Worklist Smp#:	25
Client ID:	CALGAS1000				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:41:06 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-6.d				
Injection Date:	12-Aug-2014 20:45:04	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-6	Lab Sample ID:	200-23612-6	Worklist Smp#:	24
Client ID:	CALGAS1000				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: CALGAS2000 Lab Sample ID: 200-23612-7

Matrix: Air Lab File ID: 200-23612-a-7001.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:35

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 21:48

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.21		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	95		0.50	0.50
7782-44-7	Oxygen	0.35		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-7001.d
Lims ID: 200-23612-A-7 Lab Sample ID: 200-23612-7
Client ID: CALGAS2000
Sample Type: Client
Inject. Date: 12-Aug-2014 21:48:31 ALS Bottle#: 0 Worklist Smp#: 29
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-7
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.719	1.722	-0.003	6946	0.2079	
2 Oxygen	3.800	3.824	-0.024	12312	0.3545	
3 Nitrogen	4.619	4.719	-0.100	3561793	94.9	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-7.d
Lims ID: 200-23612-A-7 Lab Sample ID: 200-23612-7
Client ID: CALGAS2000
Sample Type: Client
Inject. Date: 12-Aug-2014 21:32:40 ALS Bottle#: 0 Worklist Smp#: 28
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-7
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 09:41:03 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.717	1.722	-0.005	6913	0.2069	
2 Oxygen	3.794	3.824	-0.030	12180	0.3507	
3 Nitrogen	4.612	4.719	-0.107	3563259	94.9	

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-7001-75924-ai_
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-7-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	6946	6913	6929.5	0.48
Oxygen	12312	12180	12246	1.08
Nitrogen	3561793	3563259	3562526	0.04
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.21	0.21	0.21	0.48
Oxygen	0.35	0.35	0.35	1.08
Nitrogen	94.88	94.92	94.9	0.04
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

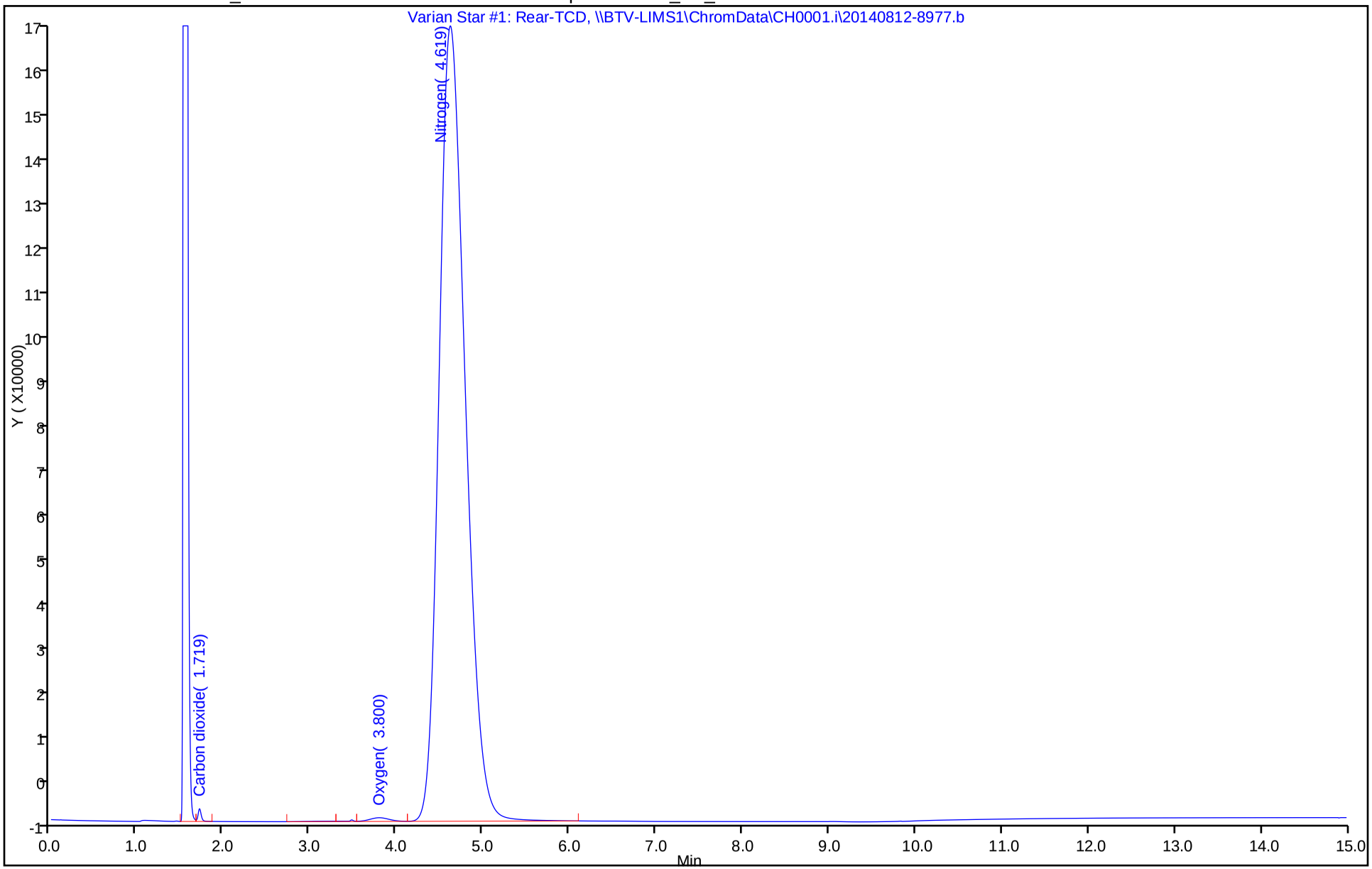
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 09:41:05 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-7001.d

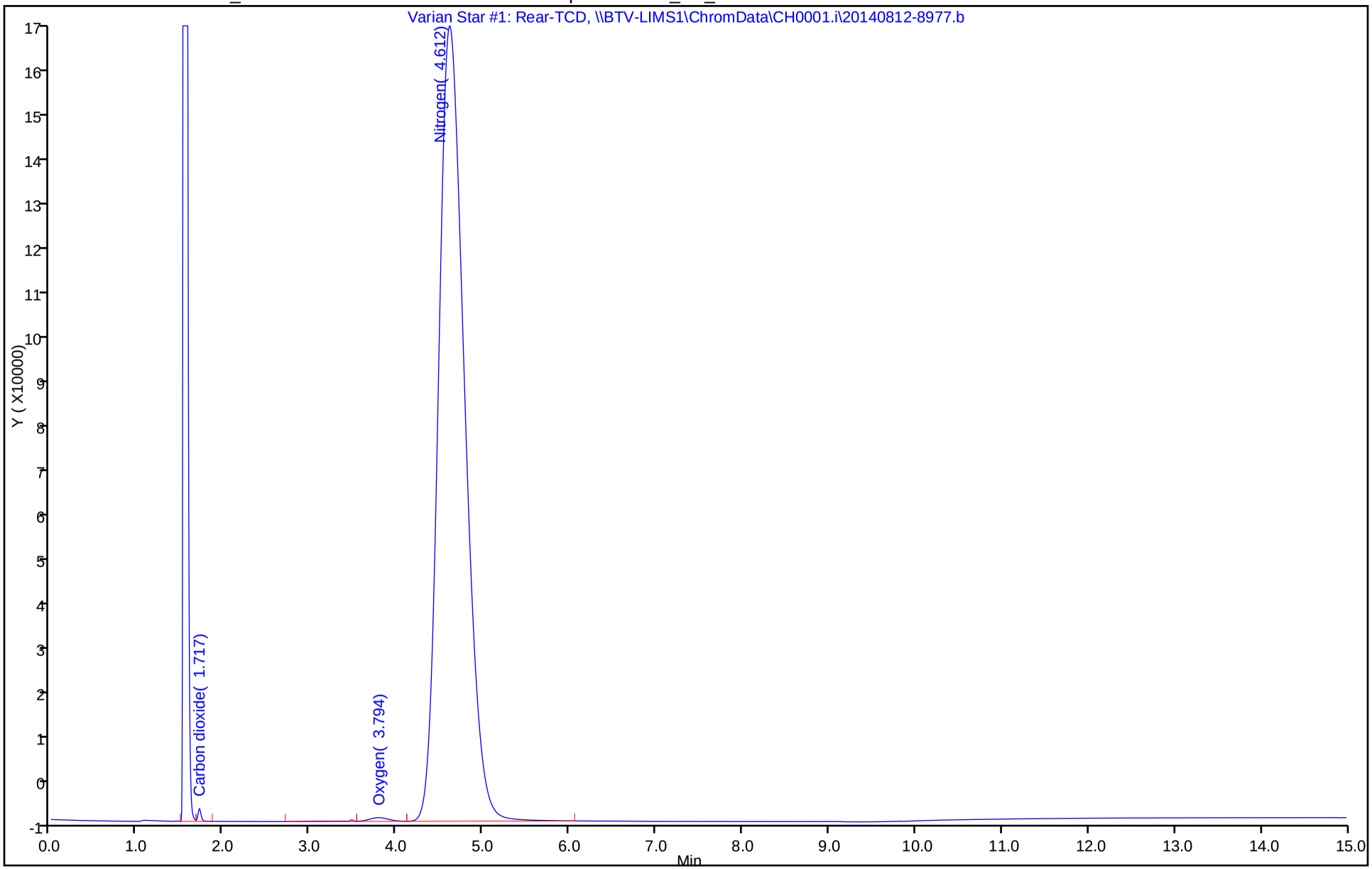
Injection Date:	12-Aug-2014 21:48:31	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-7	Lab Sample ID:	200-23612-7	Worklist Smp#:	29
Client ID:	CALGAS2000				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 09:41:04 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-7.d				
Injection Date:	12-Aug-2014 21:32:40	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-7	Lab Sample ID:	200-23612-7	Worklist Smp#:	28
Client ID:	CALGAS2000				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM VI
AIR - GC VOA INITIAL CALIBRATION DATA
EXTERNAL STANDARD RETENTION TIME SUMMARY

Lab Name: TestAmerica Burlington Job No.: 200-23612-1 Analy Batch No.: 72381

SDG No.: 200-23612

Instrument ID: CH0001.i GC Column: CTR-1 ID: 3.175(mm) Heated Purge: (Y/N) N

Calibration Start Date: 05/19/2014 11:18 Calibration End Date: 05/20/2014 10:29 Calibration ID: 26890

Calibration Files:

LEVEL:	LAB SAMPLE ID:	LAB FILE ID:
Level 1	IC 200-72381/4	3cic1051914B.d-avg
Level 2	IC 200-72381/9	3cic10051914A.d-avg
Level 3	IC 200-72381/5	3cic2051914A.d-avg
Level 4	IC 200-72381/6	3cic3051914B.d-avg
Level 5	ICIS 200-72381/1	3cicis051914B.d-avg
Level 6	IC 200-72381/10	3cic09051914A.d-avg
Level 7	IC 200-72381/7	3cic5051914B.d-avg
Level 8	IC 200-72381/3	3cic8051914B.d-avg
Level 9	IC 200-72381/2	3cic6051914B.d-avg
Level 10	IC 200-72381/8	3cic7051914B.d-avg

ANALYTE	LVL 1	LVL 2	LVL 3	LVL 4	LVL 5	LVL 6	LVL 7	LVL 8	LVL 9	LVL 10	RT WINDOW	AVG RT
Carbon dioxide	1.722		1.722	1.718	1.722				1.690		1.472 - 1.972	1.715
Oxygen	3.814		3.829	3.815	3.825		3.800				3.575 - 4.075	3.817
Nitrogen			4.717	4.698	4.717		4.647			4.630	4.467 - 4.967	4.682
Methane	6.579		6.524	6.503	6.531			6.426			6.281 - 6.781	6.513
Carbon monoxide		7.024	7.036	7.020	7.062	7.086					6.812 - 7.312	7.046

FORM VI
AIR - GC VOA INITIAL CALIBRATION DATA
EXTERNAL STANDARD CURVE EVALUATION

Lab Name: TestAmerica Burlington Job No.: 200-23612-1 Analy Batch No.: 72381

SDG No.: 200-23612

Instrument ID: CH0001.i GC Column: CTR-1 ID: 3.175(mm) Heated Purge: (Y/N) N

Calibration Start Date: 05/19/2014 11:18 Calibration End Date: 05/20/2014 10:29 Calibration ID: 26890

Calibration Files:

LEVEL:	LAB SAMPLE ID:	LAB FILE ID:
Level 1	IC 200-72381/4	3cic1051914B.d-avg
Level 2	IC 200-72381/9	3cic10051914A.d-avg
Level 3	IC 200-72381/5	3cic2051914A.d-avg
Level 4	IC 200-72381/6	3cic3051914B.d-avg
Level 5	ICIS 200-72381/1	3cicis051914B.d-avg
Level 6	IC 200-72381/10	3cic09051914A.d-avg
Level 7	IC 200-72381/7	3cic5051914B.d-avg
Level 8	IC 200-72381/3	3cic8051914B.d-avg
Level 9	IC 200-72381/2	3cic6051914B.d-avg
Level 10	IC 200-72381/8	3cic7051914B.d-avg

ANALYTE	CF				CURVE TYPE	COEFFICIENT			#	MIN CF	%RSD	#	MAX %RSD	R^2 OR COD	#	MIN R^2 OR COD
	LVL 1 LVL 5 LVL 9	LVL 2 LVL 6 LVL 10	LVL 3 LVL 7	LVL 4 LVL 8		B	M1	M2								
Carbon dioxide	33340 33742 32442		35161	32311	Ave		33413.4918				3.1		20.0			
Oxygen	43840 32792		34615 31304	32146	Ave		34726.7810				13.0		20.0			
Nitrogen	36096	35833	42923 36559	37114	Ave		37541.2509				7.2		20.0			
Methane	37638 27589		30244	25700 31327	Ave		30353.6191				14.0		20.0			
Carbon monoxide	37860	28505 33901	37230	36755	Ave		35076.1545				10.0		20.0			

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
AIR - GC VOA INITIAL CALIBRATION DATA
EXTERNAL STANDARD RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Burlington Job No.: 200-23612-1 Analy Batch No.: 72381

SDG No.: 200-23612

Instrument ID: CH0001.i GC Column: CTR-1 ID: 3.175(mm) Heated Purge: (Y/N) N

Calibration Start Date: 05/19/2014 11:18 Calibration End Date: 05/20/2014 10:29 Calibration ID: 26890

Calibration Files:

LEVEL:	LAB SAMPLE ID:	LAB FILE ID:
Level 1	IC 200-72381/4	3cic1051914B.d-avg
Level 2	IC 200-72381/9	3cic10051914A.d-avg
Level 3	IC 200-72381/5	3cic2051914A.d-avg
Level 4	IC 200-72381/6	3cic3051914B.d-avg
Level 5	ICIS 200-72381/1	3cicis051914B.d-avg
Level 6	IC 200-72381/10	3cic09051914A.d-avg
Level 7	IC 200-72381/7	3cic5051914B.d-avg
Level 8	IC 200-72381/3	3cic8051914B.d-avg
Level 9	IC 200-72381/2	3cic6051914B.d-avg
Level 10	IC 200-72381/8	3cic7051914B.d-avg

ANALYTE	CURVE TYPE	RESPONSE					CONCENTRATION (% V/V)				
		LVL 1 LVL 6	LVL 2 LVL 7	LVL 3 LVL 8	LVL 4 LVL 9	LVL 5 LVL 10	LVL 1 LVL 6	LVL 2 LVL 7	LVL 3 LVL 8	LVL 4 LVL 9	LVL 5 LVL 10
Carbon dioxide	Ave	1667		17581	80778 3244211	168709	0.0500		0.500	2.50 100	5.00
Oxygen	Ave	2192	688684	17308	80364	163961	0.0500	22.0	0.500	2.50	5.00
Nitrogen	Ave		2851579	21462	92785	180480 3583277		78.0	0.500	2.50	5.00 100
Methane	Ave	1506		12098 3101376	51400	110357	0.0400		0.400 99.0	2.00	4.00
Carbon monoxide	Ave	339009	2851	18615	91888	189300	10.0	0.100	0.500	2.50	5.00

Curve Type Legend:

Ave = Average

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicis051914B.d
Lims ID: ICIS
Client ID:
Sample Type: ICIS Calib Level: 2
Inject. Date: 19-May-2014 11:18:03 ALS Bottle#: 0 Worklist Smp#: 2
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CICIS051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:44 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 14:20:49

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.722	0.000	168924	5.00	5.06	
2 Oxygen	3.825	3.825	0.000	164033	5.00	4.72	
3 Nitrogen	4.717	4.717	0.000	180532	5.00	4.81	
4 Methane	6.531	6.531	0.000	109933	4.00	3.62	
5 Carbon monoxide	7.062	7.062	0.000	189696	5.00	5.41	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicis051914C.d
Lims ID: ICIS
Client ID:
Sample Type: ICIS Calib Level: 3
Inject. Date: 19-May-2014 11:34:57 ALS Bottle#: 0 Worklist Smp#: 3
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CICIS051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:45 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 15:07:34

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.722	0.000	168494	5.00	5.04	
2 Oxygen	3.825	3.825	0.000	163889	5.00	4.72	
3 Nitrogen	4.721	4.721	0.000	180427	5.00	4.81	
4 Methane	6.532	6.532	0.000	110780	4.00	3.65	
5 Carbon monoxide	7.064	7.064	0.000	188904	5.00	5.39	

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cicis051914b-72292-ai_3c_
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cicis051914c-72292-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	168924	168494	168709	0.25
Oxygen	164033	163889	163961	0.09
Nitrogen	180532	180427	180479.5	0.06
Methane	109933	110780	110356.5	0.77
Carbon monoxide	189696	188904	189300	0.42

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	5.06	5.04	5.05	0.25
Oxygen	4.72	4.72	4.72	0.09
Nitrogen	4.81	4.81	4.81	0.06
Methane	3.62	3.65	3.64	0.77
Carbon monoxide	5.41	5.39	5.4	0.42

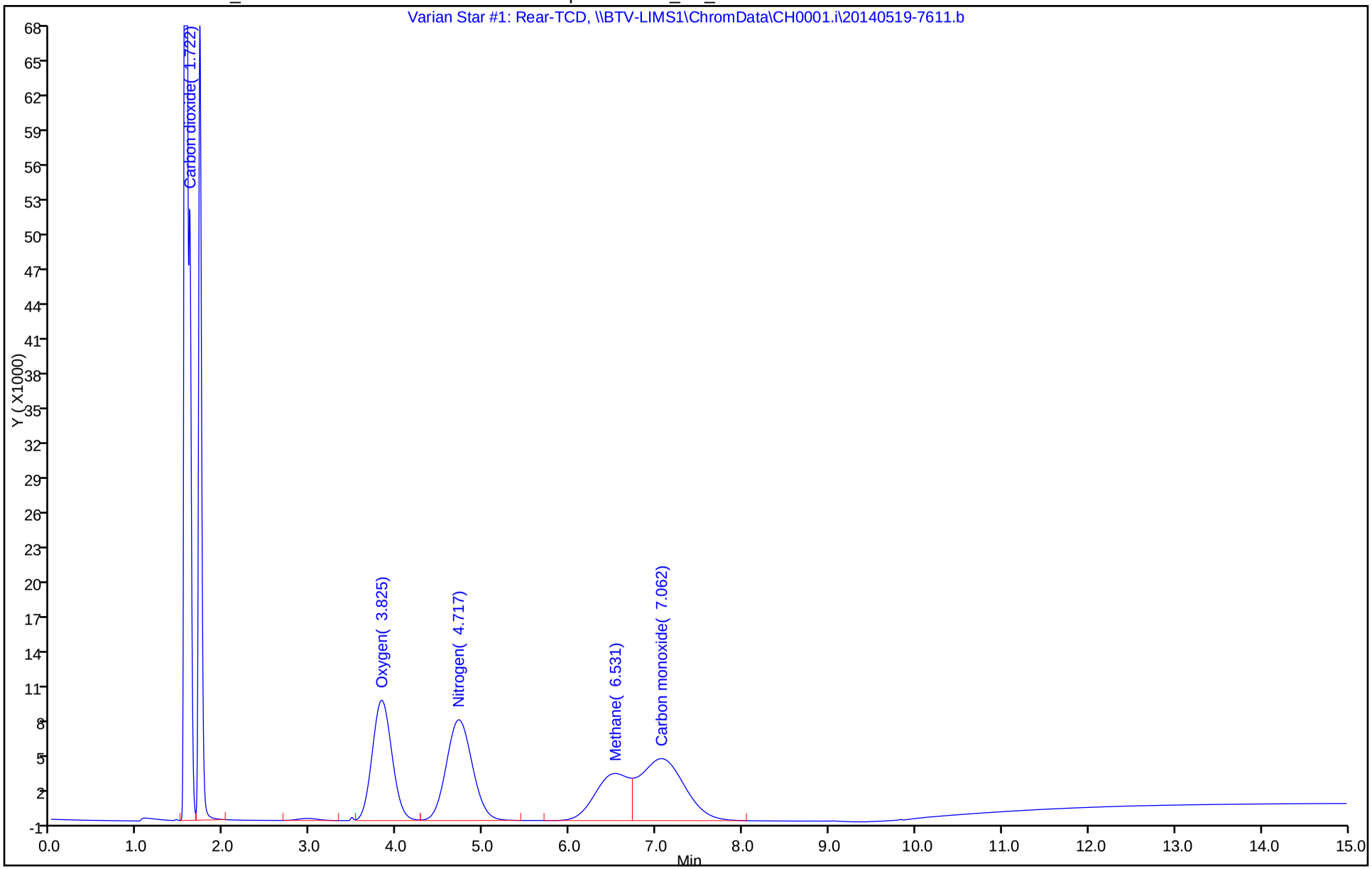
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:45 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicis051914B.d

Injection Date:	19-May-2014 11:18:03	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	ICIS			Worklist Smp#:	2
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

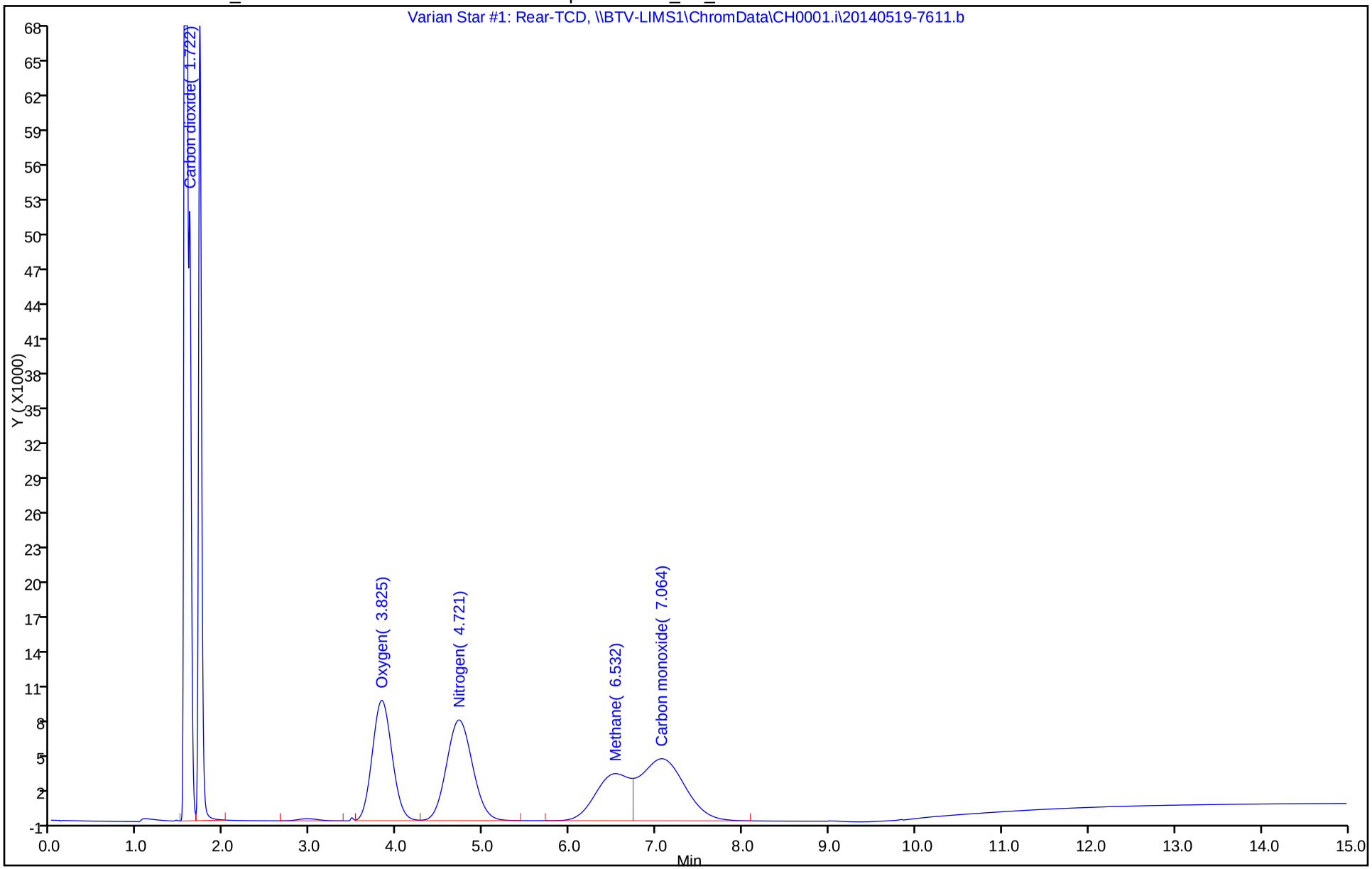


Report Date: 20-May-2014 13:27:45 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicis051914C.d

Injection Date:	19-May-2014 11:34:57	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	ICIS			Worklist Smp#:	3
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic6051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 5
Inject. Date: 19-May-2014 12:08:55 ALS Bottle#: 0 Worklist Smp#: 5
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC6051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:43 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.690	1.690	0.000	3241358	100.0	97.0	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic6051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 6
Inject. Date: 19-May-2014 12:25:53 ALS Bottle#: 0 Worklist Smp#: 6
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC6051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:44 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.690	1.690	0.000	3247063	100.0	97.2	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic6051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	3241358	3247063	3244210.5	0.18

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	97.01	97.18	97.09	0.18

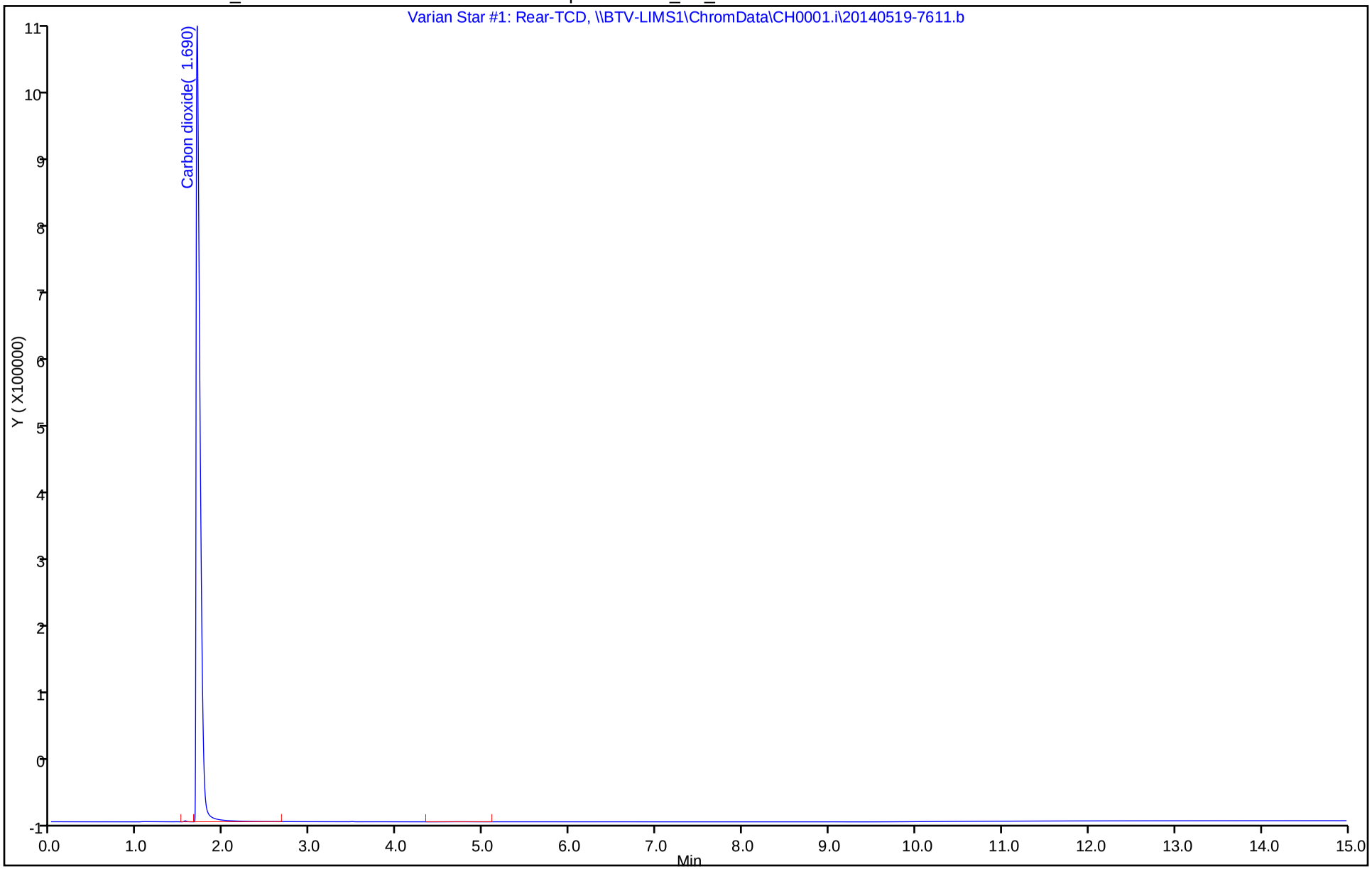
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:44 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic6051914B.d

Injection Date:	19-May-2014 12:08:55	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	5
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

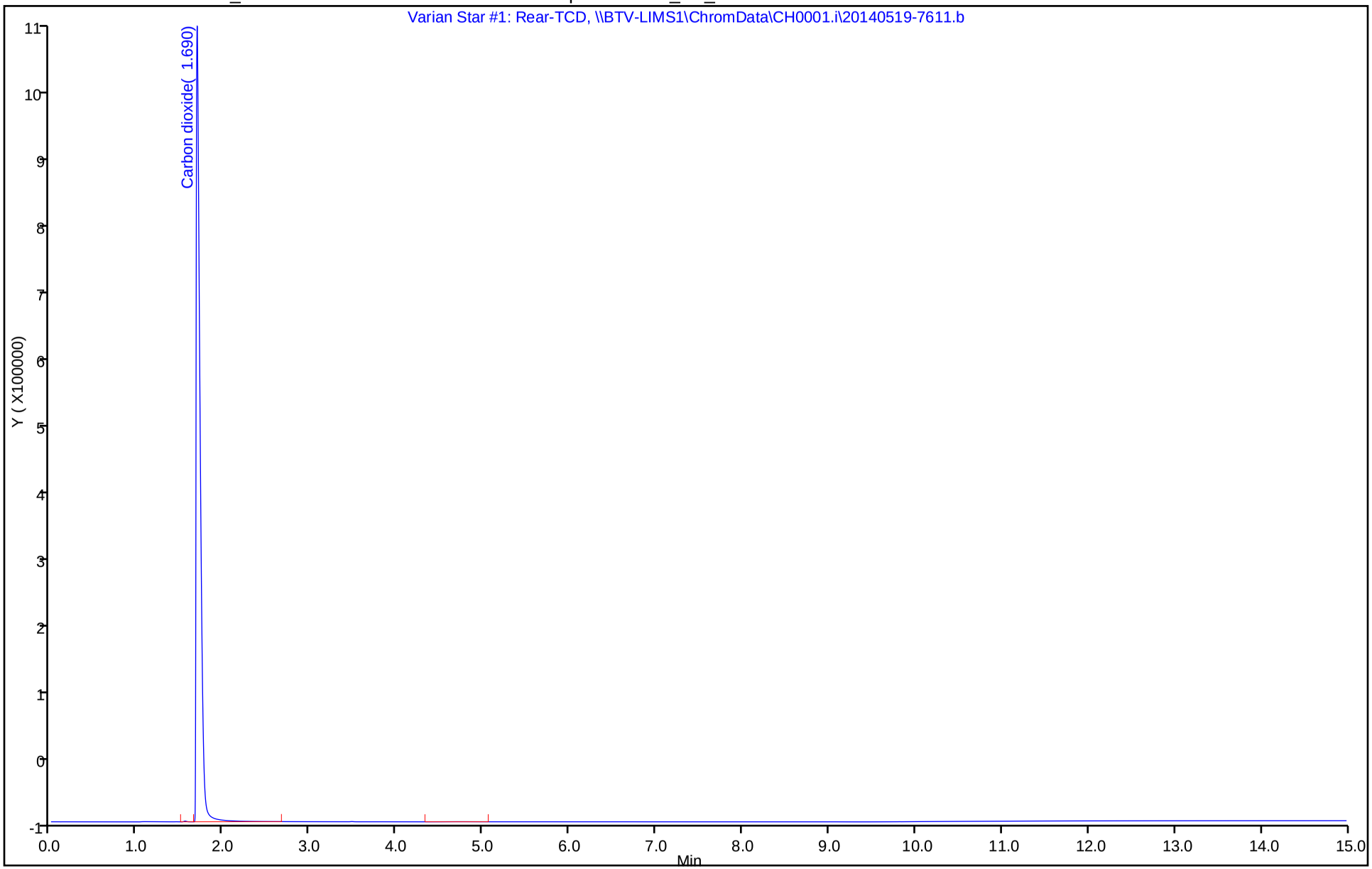


Report Date: 20-May-2014 13:27:44 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic6051914C.d

Injection Date:	19-May-2014 12:25:53	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	6
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic8051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 8
Inject. Date: 19-May-2014 13:13:14 ALS Bottle#: 0 Worklist Smp#: 8
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC8051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:42 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
4 Methane	6.426	6.532	-0.106	3100680	99.0	102.2	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic8051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 9
Inject. Date: 19-May-2014 13:30:56 ALS Bottle#: 0 Worklist Smp#: 9
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC8051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:43 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 14:53:34

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
4 Methane	6.429	6.532	-0.103	3102072	99.0	102.2	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic8051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Methane	3100680	3102072	3101376	0.04

Analyte	Conc1	Conc2	Avg Conc	RPD
Methane	102.15	102.2	102.17	0.04

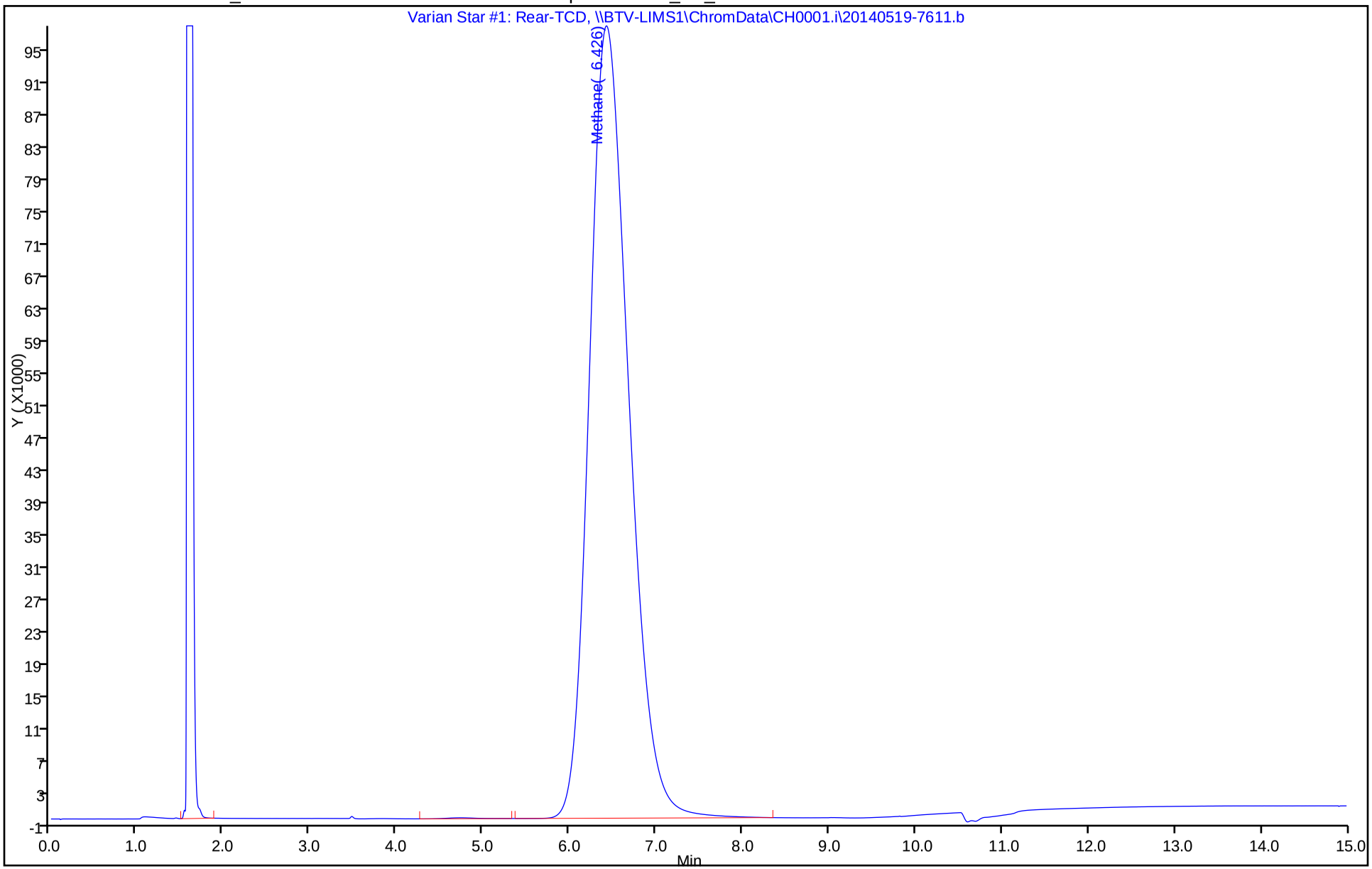
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:43 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic8051914B.d

Injection Date:	19-May-2014 13:13:14	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	8
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

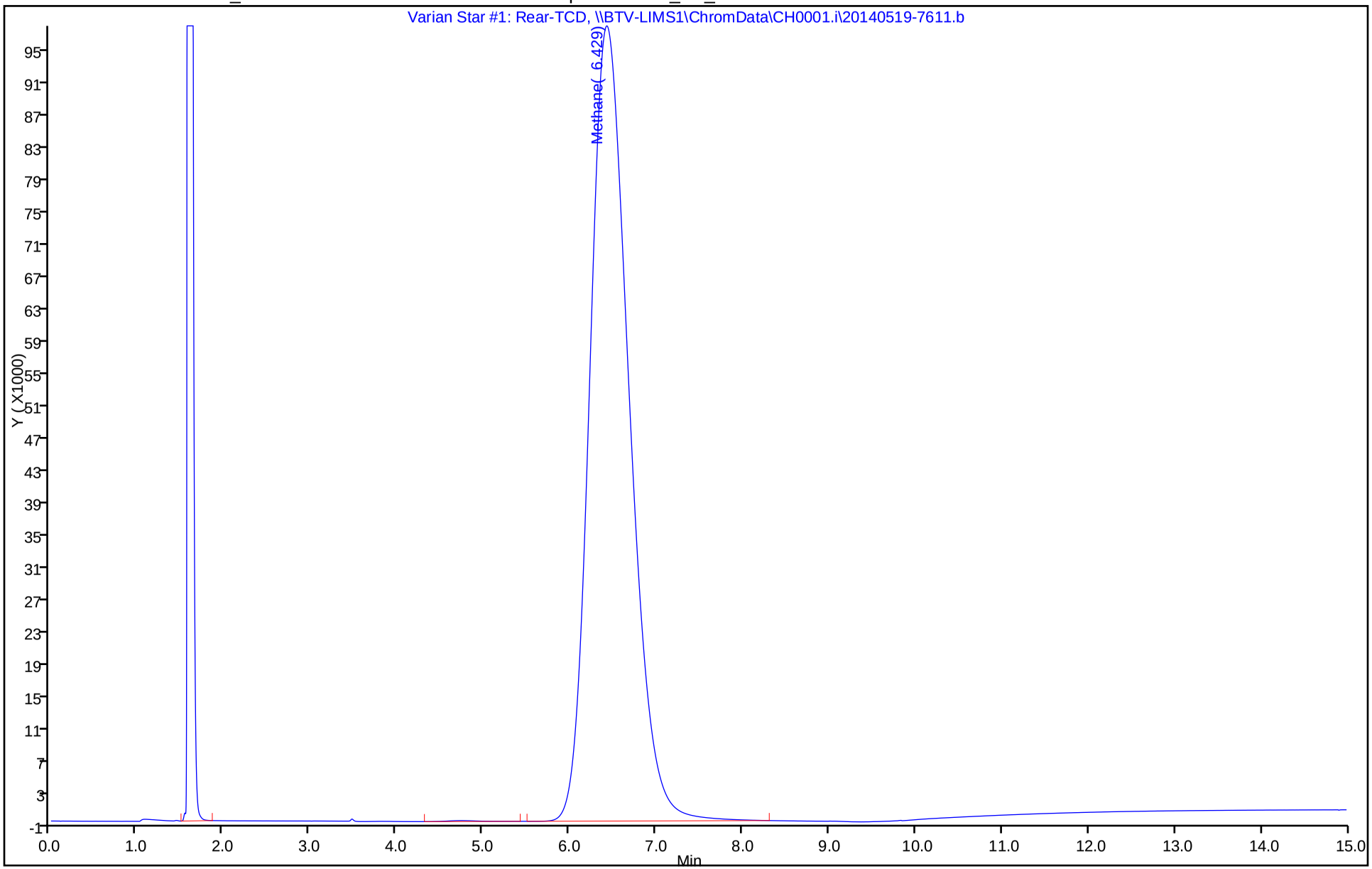


Report Date: 20-May-2014 13:27:43 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic8051914C.d

Injection Date:	19-May-2014 13:30:56	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	9
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 11
Inject. Date: 19-May-2014 14:07:26 ALS Bottle#: 0 Worklist Smp#: 11
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC1051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:40 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 14:53:59

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.690	0.032	1668	0.0500	0.0499	
2 Oxygen	3.814	3.825	-0.011	2174	0.0500	0.0626	M
4 Methane	6.579	6.532	0.047	1486	0.0400	0.0490	M

QC Flag Legend

Review Flags
M - Manually Integrated

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 12
Inject. Date: 19-May-2014 14:23:19 ALS Bottle#: 0 Worklist Smp#: 12
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC1051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:41 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 14:54:47

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.725	1.690	0.035	1666	0.0500	0.0499	
2 Oxygen	3.829	3.825	0.004	2210	0.0500	0.0636	M
4 Methane	6.597	6.532	0.065	1525	0.0400	0.0502	M

QC Flag Legend

Review Flags
M - Manually Integrated

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic1051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	1668	1666	1667	0.12
Oxygen	2174	2210	2192	1.64
Nitrogen	0	0	0	0
Methane	1486	1525	1505.5	2.59
Carbon monoxide	0	0	0	0

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.05	0.05	0.05	0.12
Oxygen	0.06	0.06	0.06	1.64
Nitrogen	0	0	0	0
Methane	0.05	0.05	0.05	2.59
Carbon monoxide	0	0	0	0

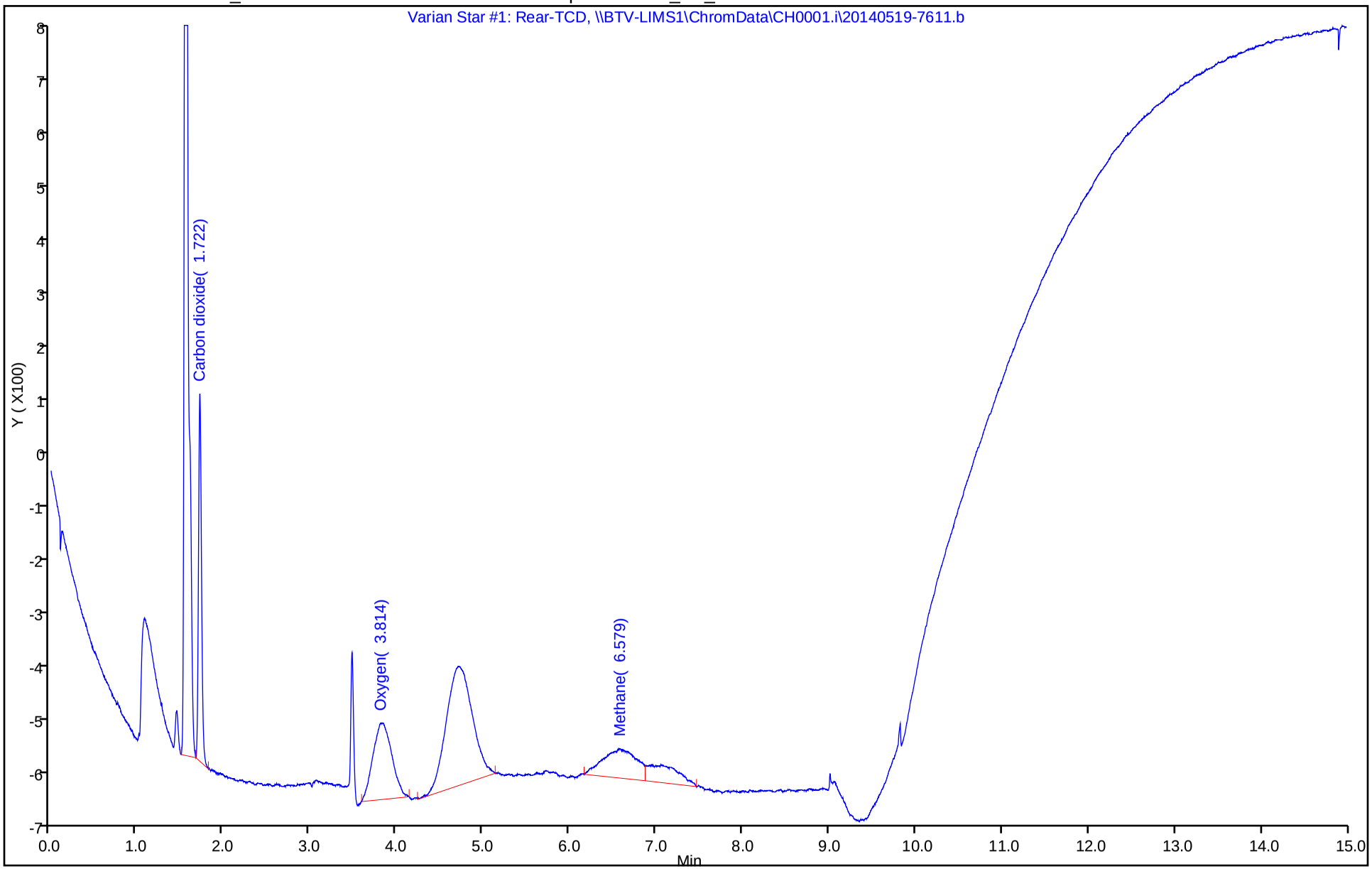
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:40 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914B.d

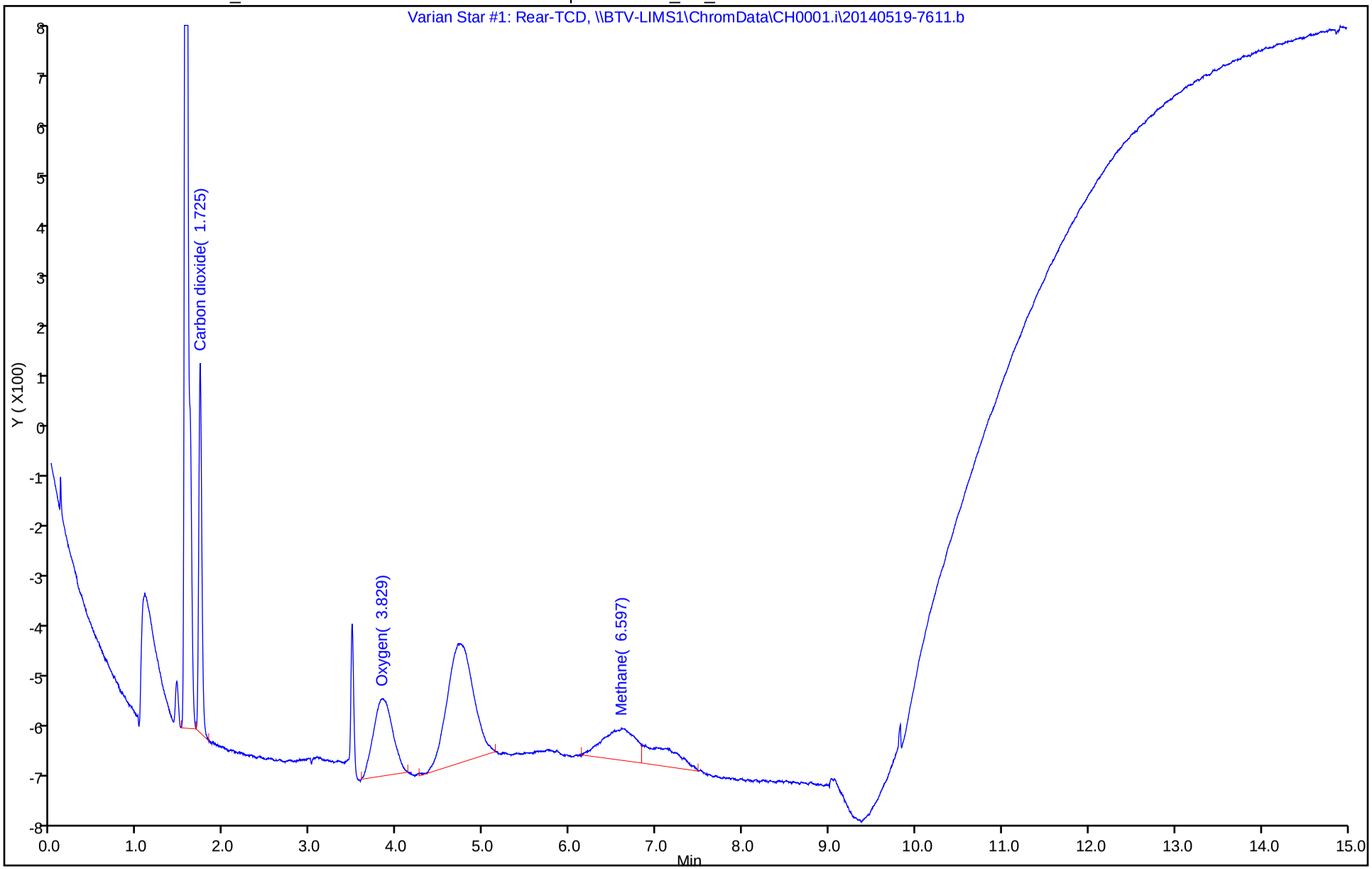
Injection Date:	19-May-2014 14:07:26	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	11
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 20-May-2014 13:27:41 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914C.d				
Injection Date:	19-May-2014 14:23:19	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	12
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Manual Integration/User Assign Peak Report

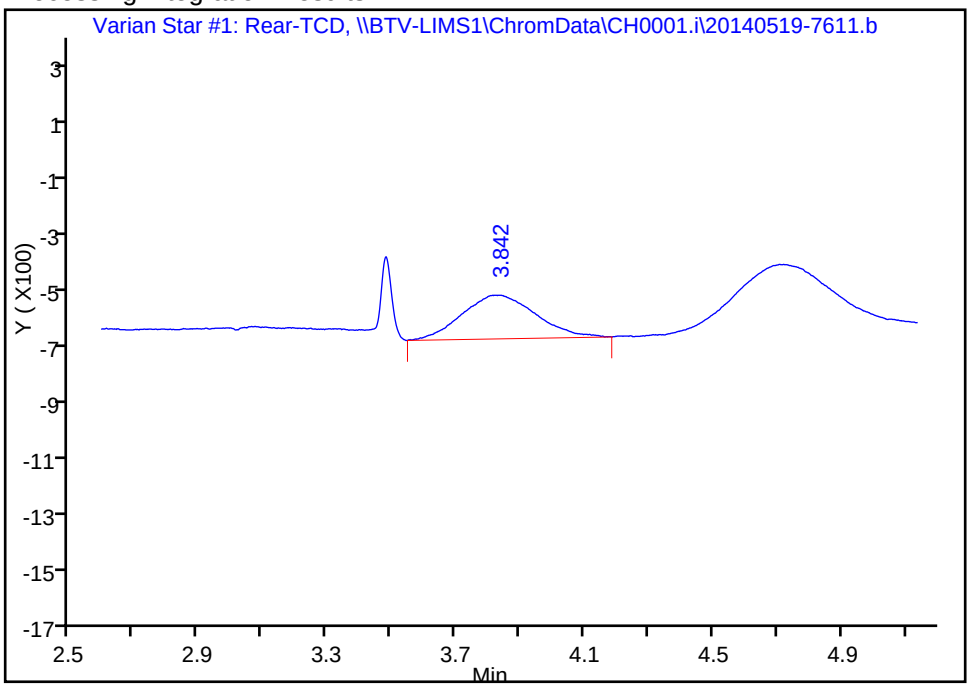
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914B.d
Injection Date: 19-May-2014 14:07:26 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 11
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

2 Oxygen, CAS: 7782-44-7

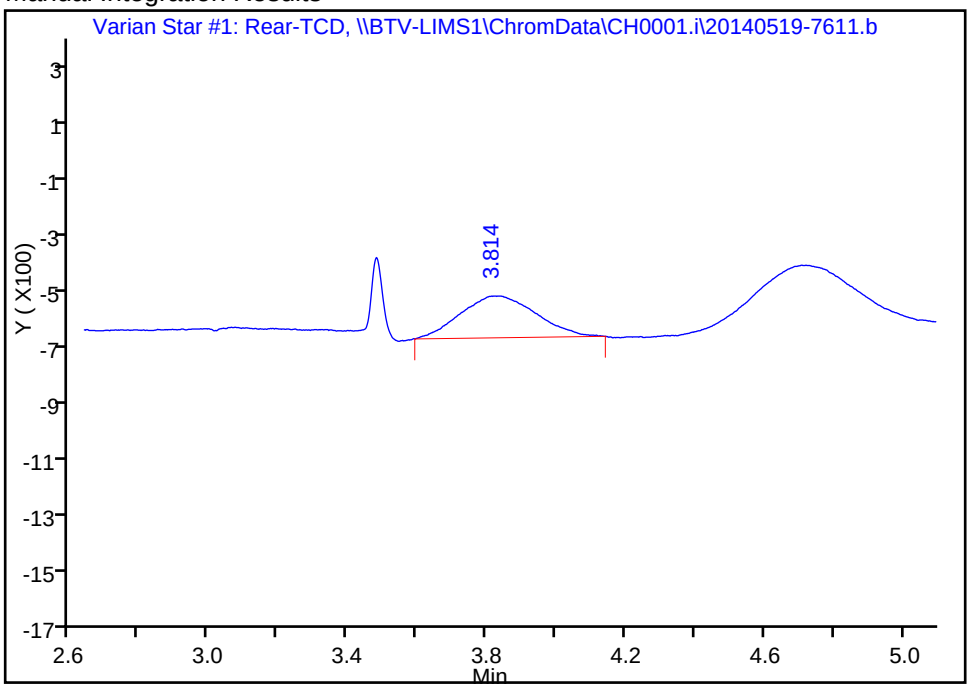
Processing Integration Results

RT: 3.84
Response: 2403
Amount: 0.059909



Manual Integration Results

RT: 3.81
Response: 2174
Amount: 0.062603



Reviewer: lyonsb, 20-May-2014 10:49:14
Audit Action: Manually Integrated
Audit Reason: Baseline Event

Manual Integration/User Assign Peak Report

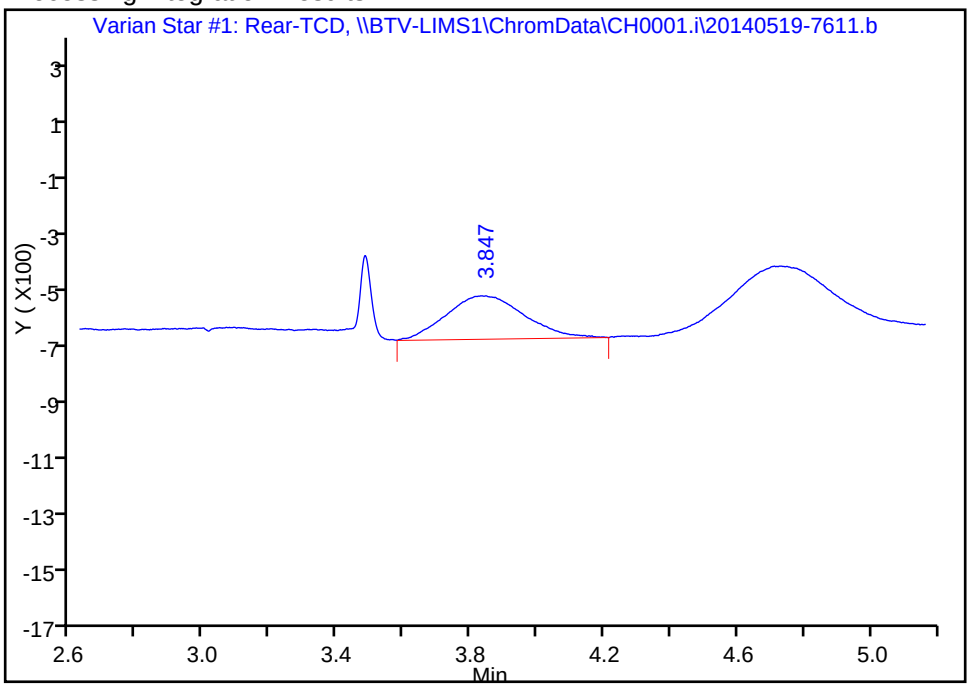
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914C.d
Injection Date: 19-May-2014 14:23:19 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 12
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

2 Oxygen, CAS: 7782-44-7

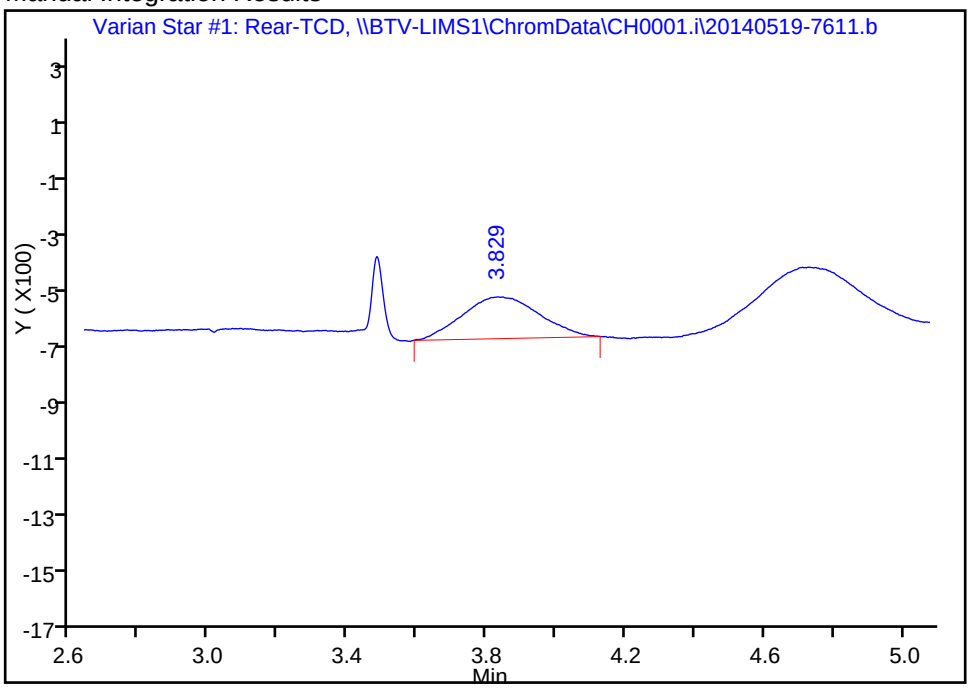
Processing Integration Results

RT: 3.85
Response: 2430
Amount: 0.061238



Manual Integration Results

RT: 3.83
Response: 2210
Amount: 0.063640



Reviewer: lyonsb, 20-May-2014 10:50:07
Audit Action: Manually Integrated
Audit Reason: Baseline Event

Manual Integration/User Assign Peak Report

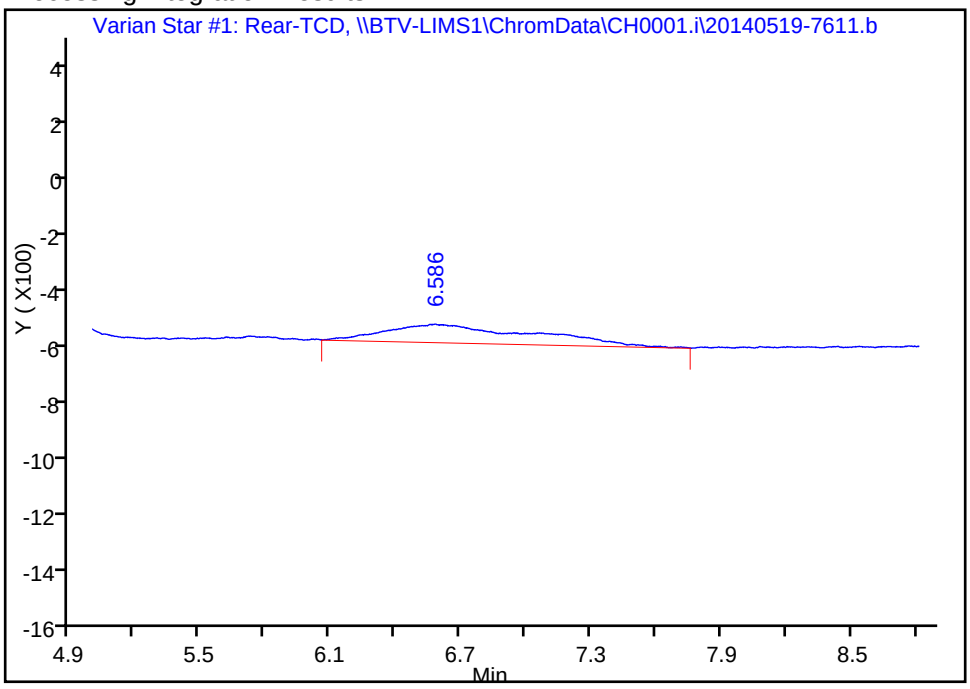
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914B.d
Injection Date: 19-May-2014 14:07:26 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 11
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

4 Methane, CAS: 74-82-8

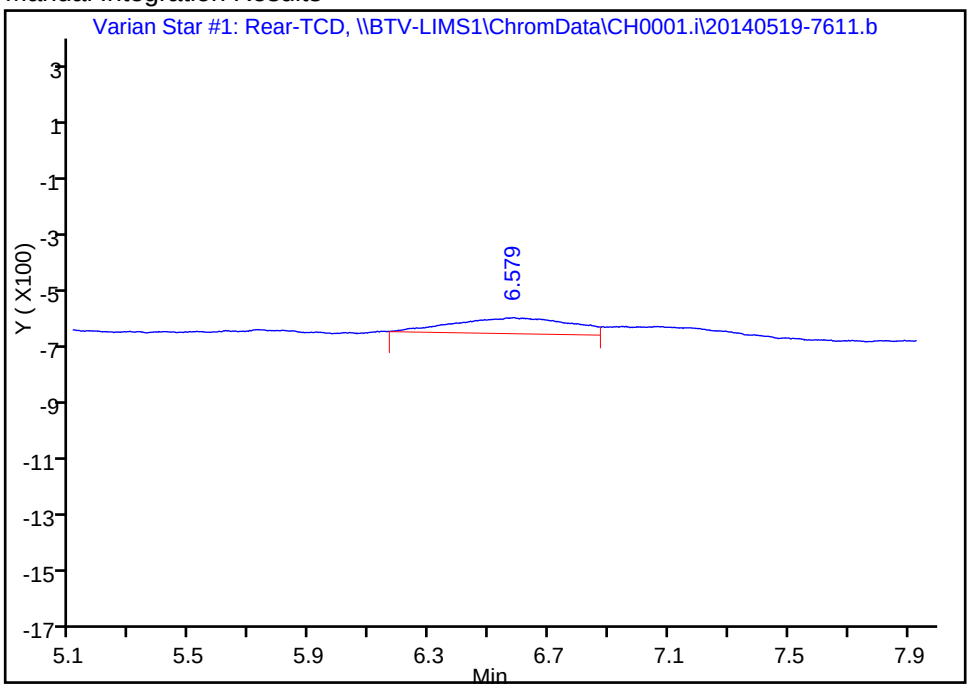
Processing Integration Results

RT: 6.59
Response: 3073
Amount: 0.075749



Manual Integration Results

RT: 6.58
Response: 1486
Amount: 0.048956



Reviewer: lyonsb, 19-May-2014 15:04:00
Audit Action: Split an Integrated Peak
Audit Reason: Baseline Event

Manual Integration/User Assign Peak Report

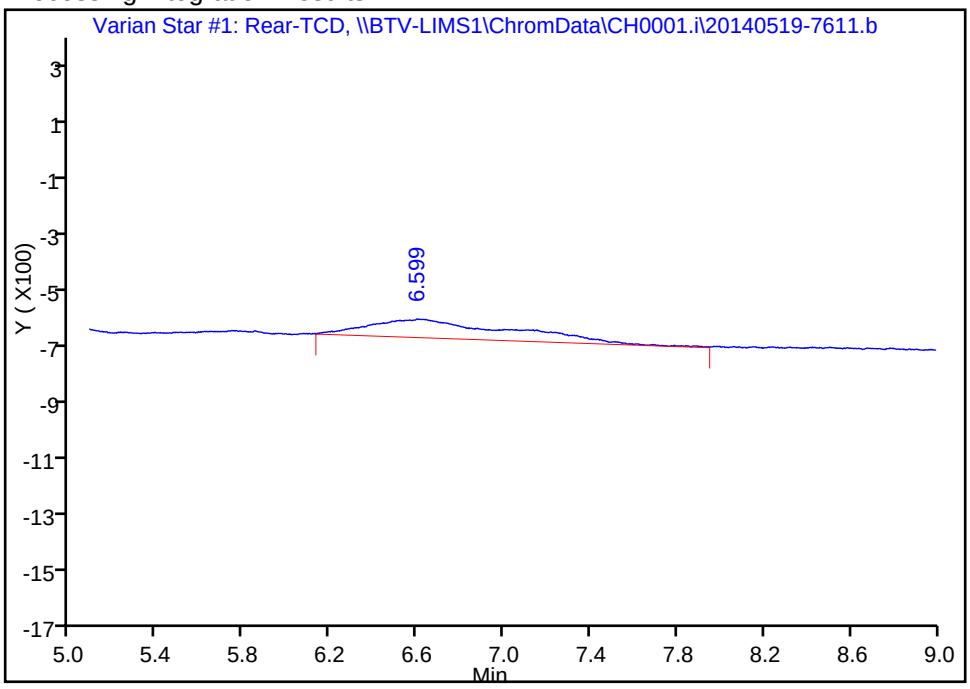
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic1051914C.d
Injection Date: 19-May-2014 14:23:19 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 12
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

4 Methane, CAS: 74-82-8

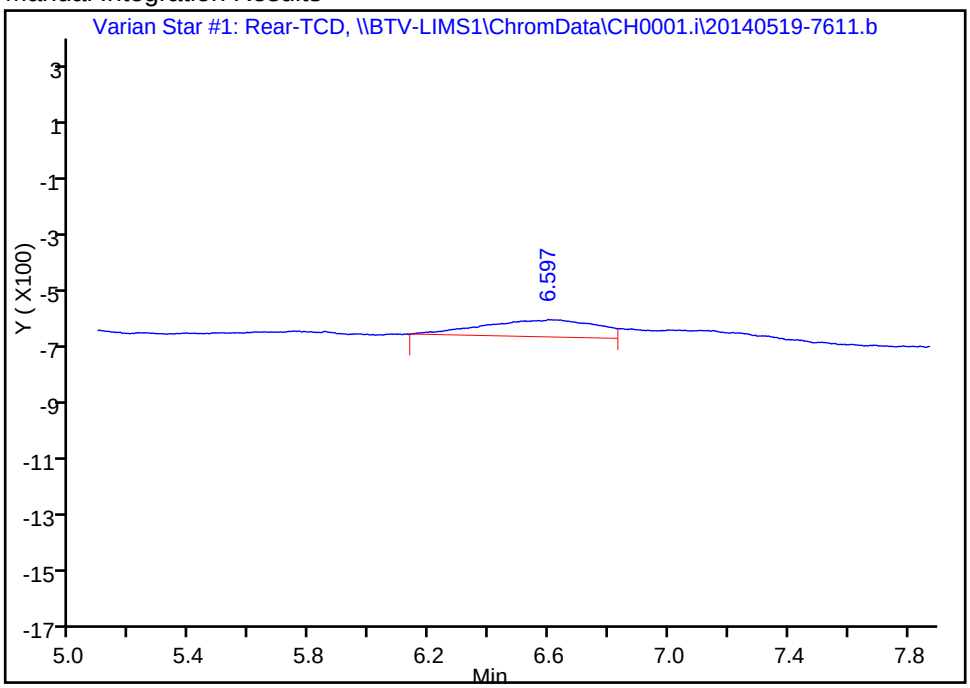
Processing Integration Results

RT: 6.60
Response: 2972
Amount: 0.079735



Manual Integration Results

RT: 6.60
Response: 1525
Amount: 0.050241



Reviewer: lyonsb, 19-May-2014 15:05:00
Audit Action: Split an Integrated Peak
Audit Reason: Baseline Event

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914A.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 13
Inject. Date: 19-May-2014 14:39:30 ALS Bottle#: 0 Worklist Smp#: 13
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC1051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:42 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 11:12:28

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.690	0.032	17612	0.5000	0.5271	
2 Oxygen	3.829	3.825	0.004	17324	0.5000	0.4989	
3 Nitrogen	4.717	4.721	-0.004	21447	0.5000	0.5713	
4 Methane	6.524	6.532	-0.008	11896	0.4000	0.3919	M
5 Carbon monoxide	7.036	7.064	-0.028	18875	0.5000	0.5381	M

QC Flag Legend

Review Flags
M - Manually Integrated

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 14
Inject. Date: 19-May-2014 14:55:22 ALS Bottle#: 0 Worklist Smp#: 14
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC2051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:42 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 15:18:57

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.690	0.030	17549	0.5000	0.5252	
2 Oxygen	3.822	3.825	-0.003	17291	0.5000	0.4979	
3 Nitrogen	4.704	4.721	-0.017	21476	0.5000	0.5721	
4 Methane	6.517	6.532	-0.015	12299	0.4000	0.4052	
5 Carbon monoxide	7.037	7.064	-0.027	18355	0.5000	0.5233	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic2051914b-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	17612	17549	17580.5	0.36
Oxygen	17324	17291	17307.5	0.19
Nitrogen	21447	21476	21461.5	0.14
Methane	11896	12299	12097.5	3.33
Carbon monoxide	18875	18355	18615	2.79

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.53	0.53	0.53	0.36
Oxygen	0.5	0.5	0.5	0.19
Nitrogen	0.57	0.57	0.57	0.14
Methane	0.39	0.41	0.4	3.33
Carbon monoxide	0.54	0.52	0.53	2.79

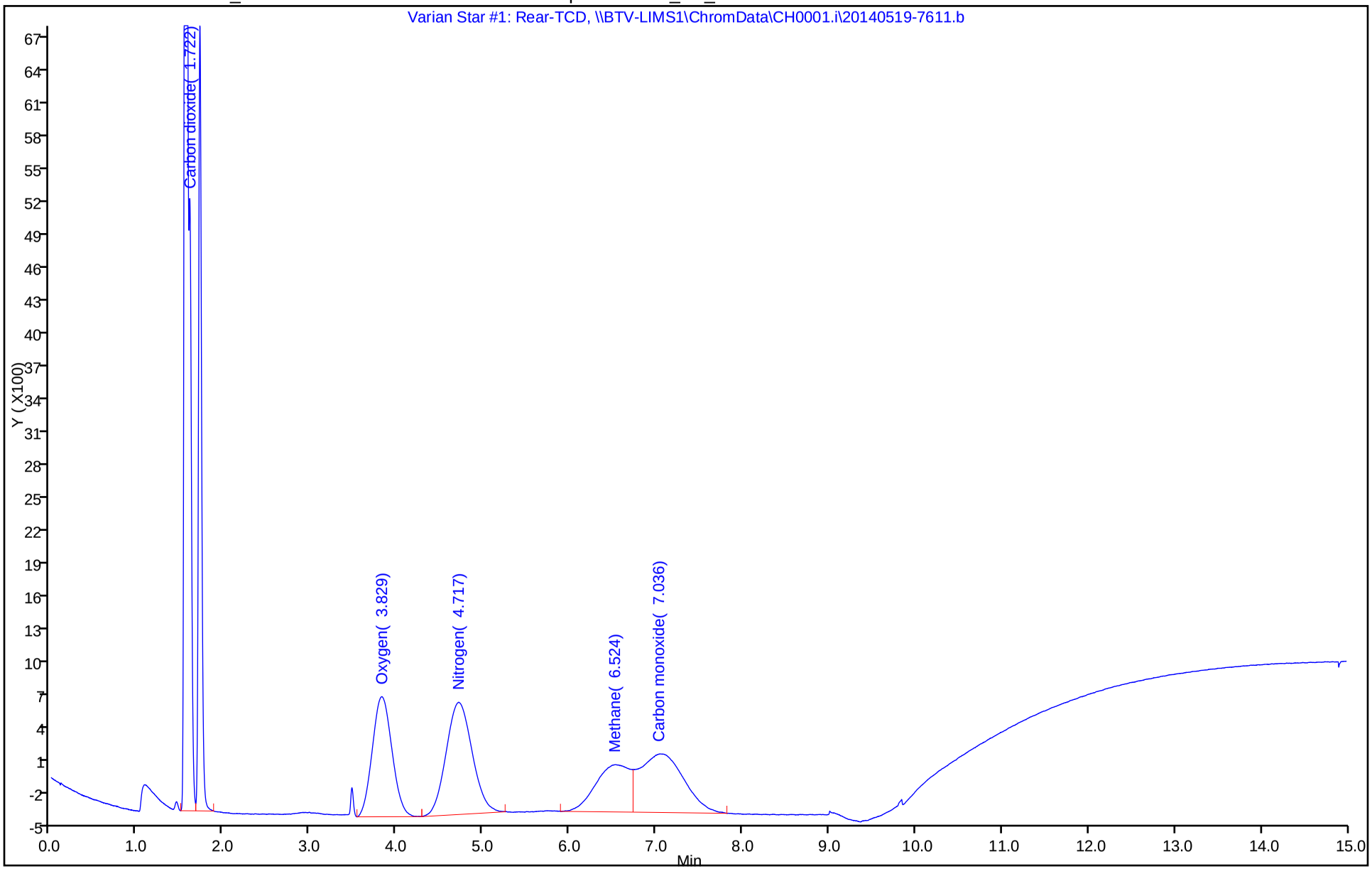
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:42 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914A.d

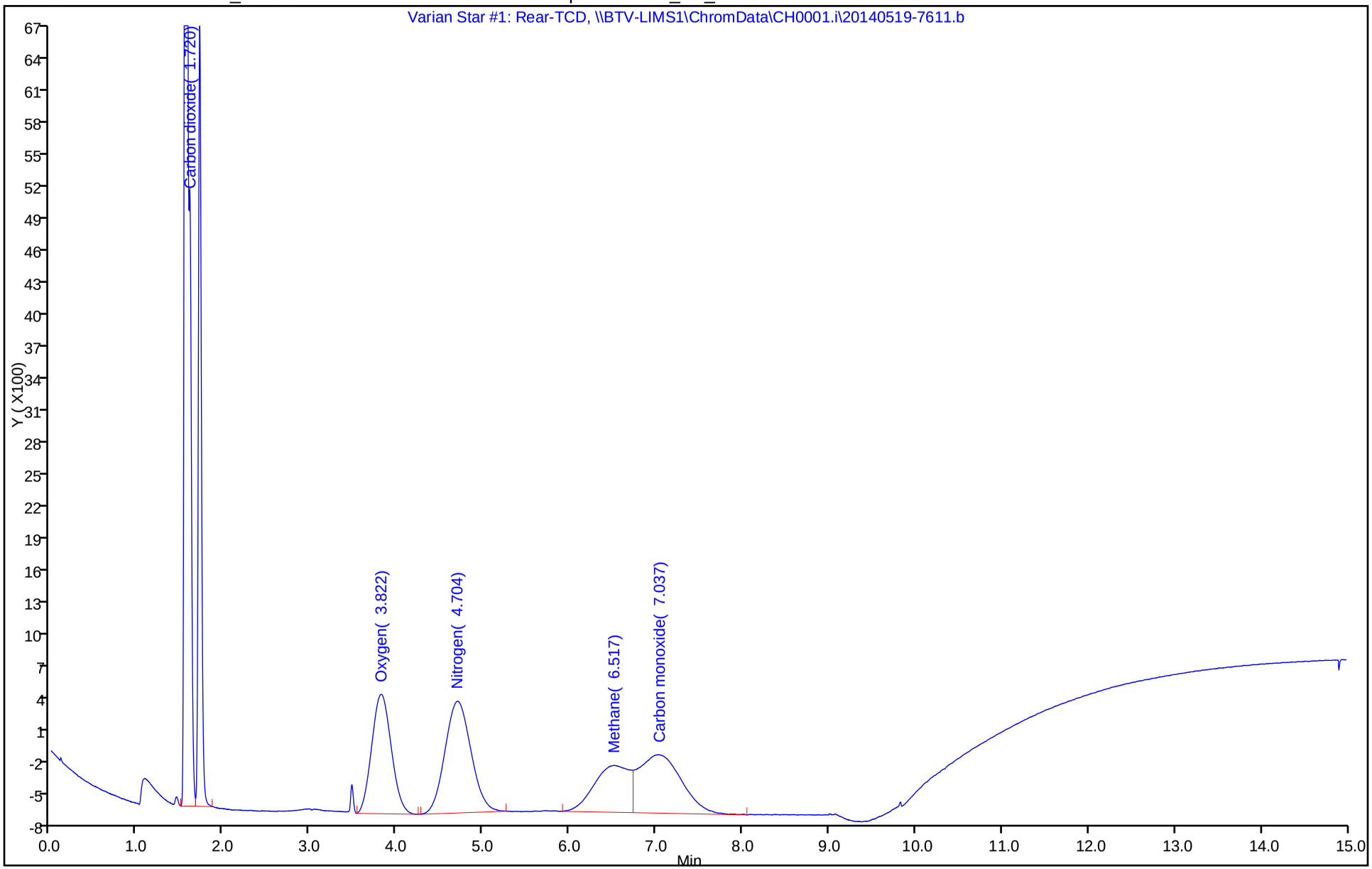
Injection Date:	19-May-2014 14:39:30	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	13
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 20-May-2014 13:27:42 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914B.d				
Injection Date:	19-May-2014 14:55:22	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	14
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Manual Integration/User Assign Peak Report

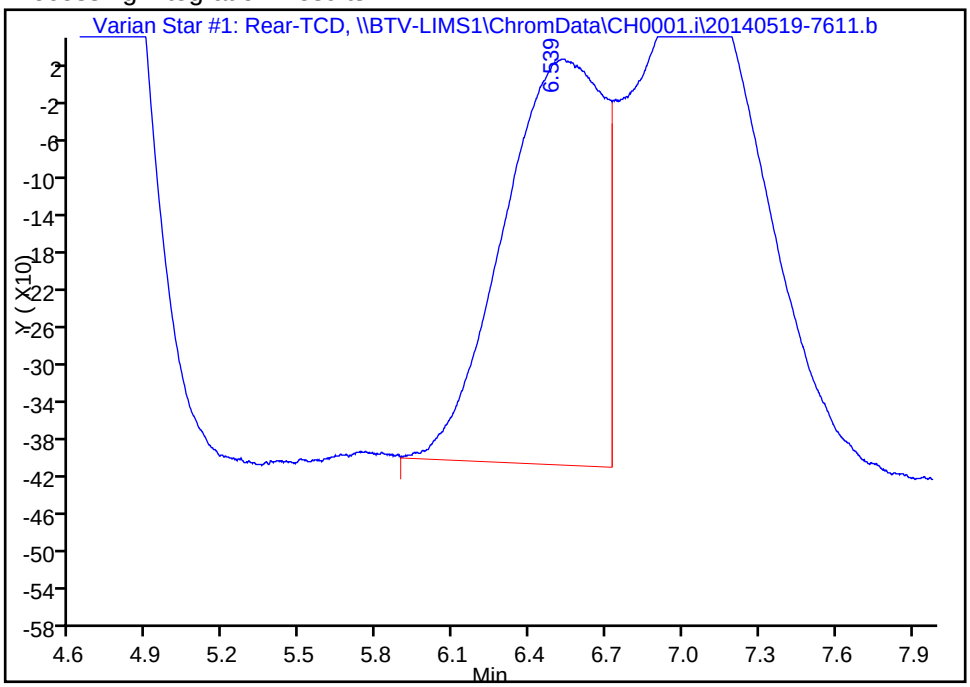
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914A.d
Injection Date: 19-May-2014 14:39:30 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 13
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

4 Methane, CAS: 74-82-8

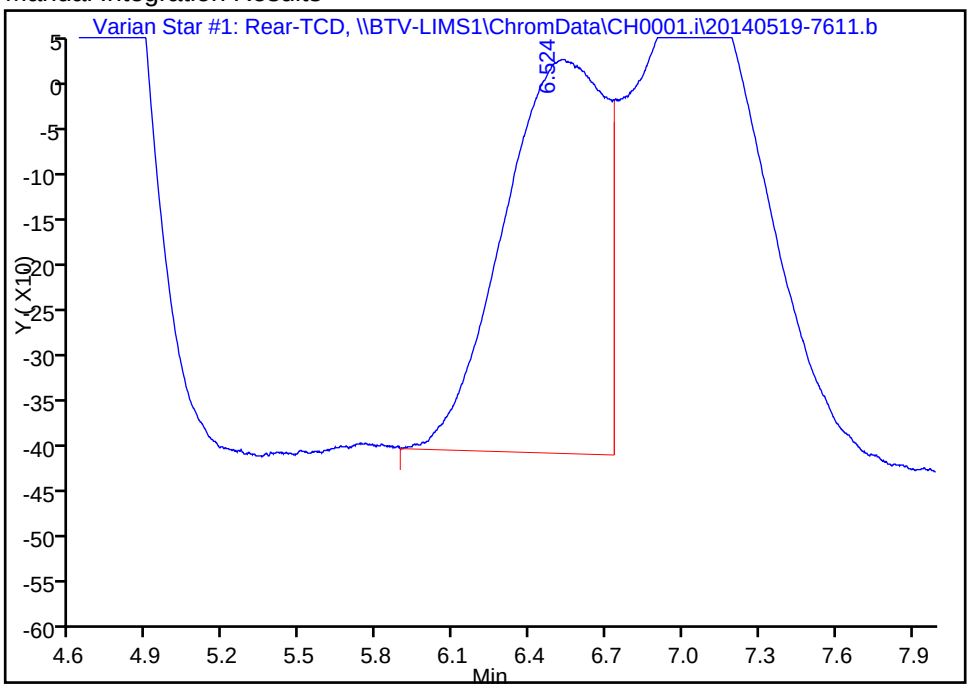
Processing Integration Results

RT: 6.54
Response: 11827
Amount: 0.390947



Manual Integration Results

RT: 6.52
Response: 11896
Amount: 0.391914



Reviewer: lyonsb, 20-May-2014 11:19:29
Audit Action: Manually Integrated/Assigned Compound ID
Audit Reason: Baseline Event

Manual Integration/User Assign Peak Report

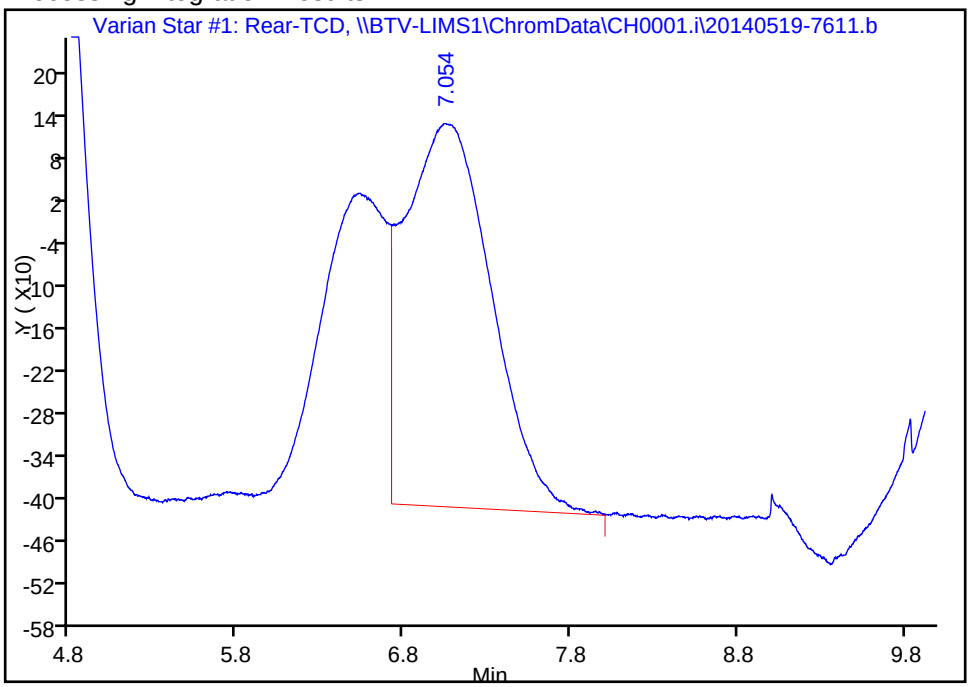
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic2051914A.d
Injection Date: 19-May-2014 14:39:30 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 13
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

5 Carbon monoxide, CAS: 630-08-0

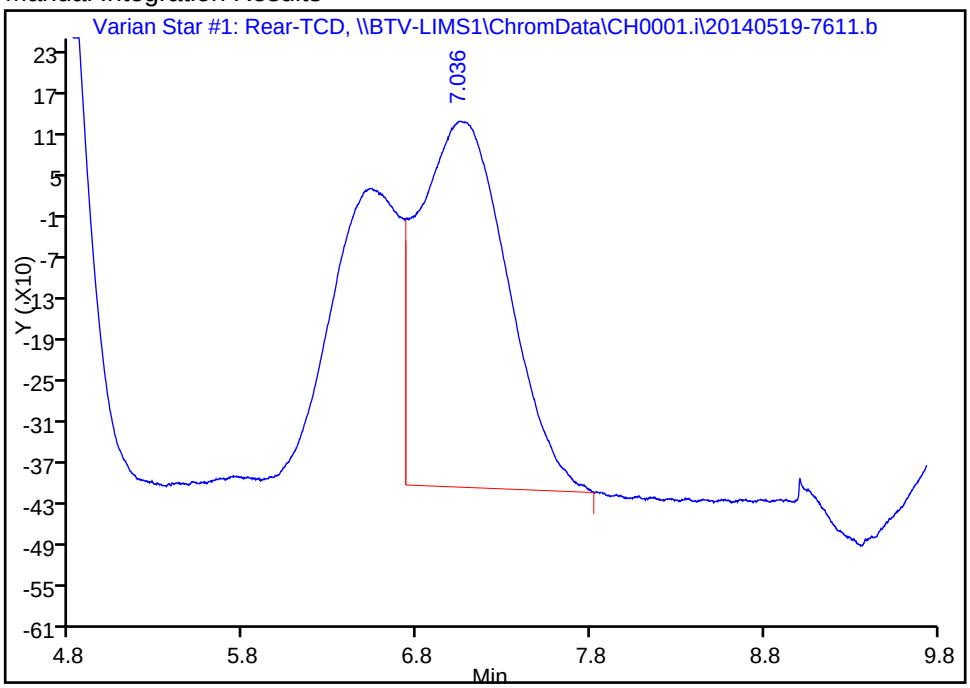
Processing Integration Results

RT: 7.05
Response: 19471
Amount: 0.556802



Manual Integration Results

RT: 7.04
Response: 18875
Amount: 0.538115



Reviewer: lyonsb, 20-May-2014 11:19:29
Audit Action: Split an Integrated Peak
Audit Reason: Baseline Event

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic3051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 17
Inject. Date: 19-May-2014 15:42:57 ALS Bottle#: 0 Worklist Smp#: 17
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC3051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:40 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 16:32:10

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.718	1.690	0.028	80678	2.50	2.41	
2 Oxygen	3.815	3.825	-0.010	80220	2.50	2.31	
3 Nitrogen	4.698	4.721	-0.023	92615	2.50	2.47	
4 Methane	6.503	6.532	-0.029	50875	2.00	1.68	
5 Carbon monoxide	7.020	7.064	-0.044	91976	2.50	2.62	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic3051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 18
Inject. Date: 19-May-2014 15:58:49 ALS Bottle#: 0 Worklist Smp#: 18
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC3051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:40 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 19-May-2014 16:36:29

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.690	0.030	80878	2.50	2.42	
2 Oxygen	3.820	3.825	-0.005	80508	2.50	2.32	
3 Nitrogen	4.705	4.721	-0.016	92955	2.50	2.48	
4 Methane	6.517	6.532	-0.015	51924	2.00	1.71	
5 Carbon monoxide	7.028	7.064	-0.036	91799	2.50	2.62	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic3051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	80678	80878	80778	0.25
Oxygen	80220	80508	80364	0.36
Nitrogen	92615	92955	92785	0.37
Methane	50875	51924	51399.5	2.04
Carbon monoxide	91976	91799	91887.5	0.19

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	2.41	2.42	2.42	0.25
Oxygen	2.31	2.32	2.31	0.36
Nitrogen	2.47	2.48	2.47	0.37
Methane	1.68	1.71	1.69	2.04
Carbon monoxide	2.62	2.62	2.62	0.19

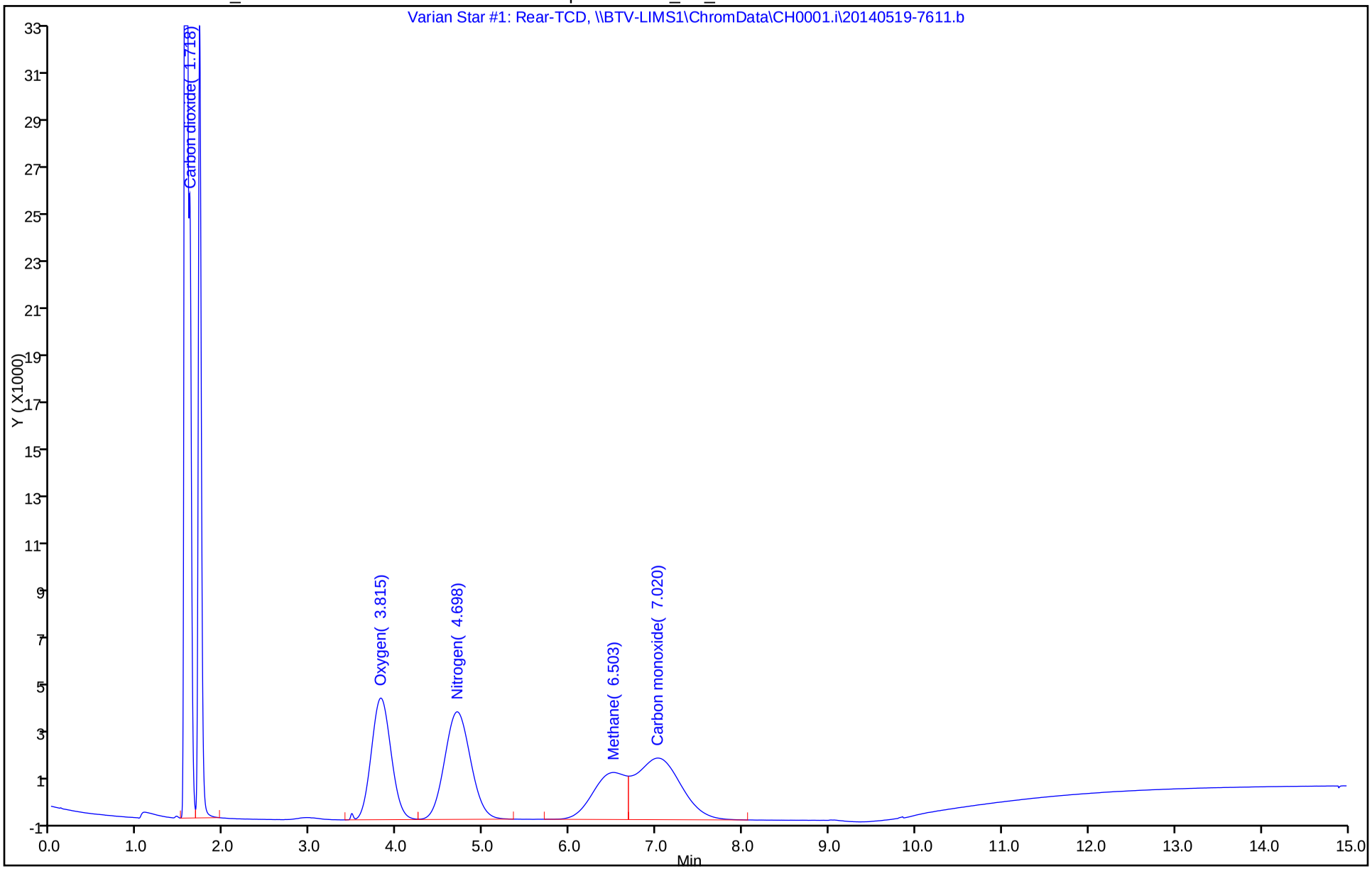
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:40 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic3051914B.d

Injection Date:	19-May-2014 15:42:57	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	17
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

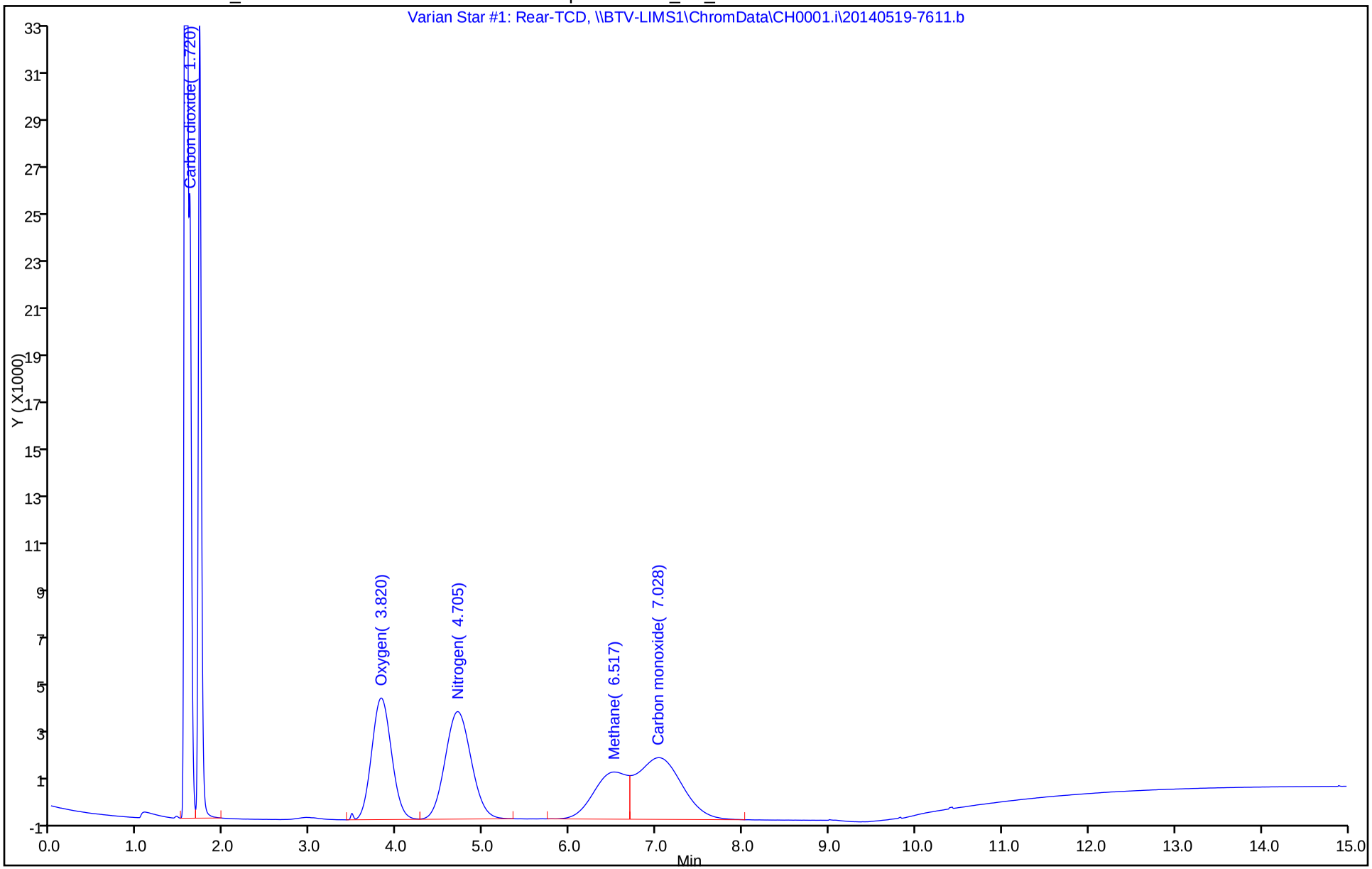


Report Date: 20-May-2014 13:27:40 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic3051914C.d

Injection Date:	19-May-2014 15:58:49	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	18
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic5051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 20
Inject. Date: 19-May-2014 16:30:31 ALS Bottle#: 0 Worklist Smp#: 20
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC5051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:38 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
2 Oxygen	3.800	3.825	-0.025	687490	22.0	19.8	
3 Nitrogen	4.647	4.721	-0.074	2845671	78.0	75.8	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic5051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 21
Inject. Date: 19-May-2014 16:46:24 ALS Bottle#: 0 Worklist Smp#: 21
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC5051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:39 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
2 Oxygen	3.798	3.825	-0.027	689877	22.0	19.9	
3 Nitrogen	4.643	4.721	-0.078	2857487	78.0	76.1	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic5051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Oxygen	687490	689877	688683.5	0.35
Nitrogen	2845671	2857487	2851579	0.41

Analyte	Conc1	Conc2	Avg Conc	RPD
Oxygen	19.8	19.87	19.83	0.35
Nitrogen	75.8	76.12	75.96	0.41

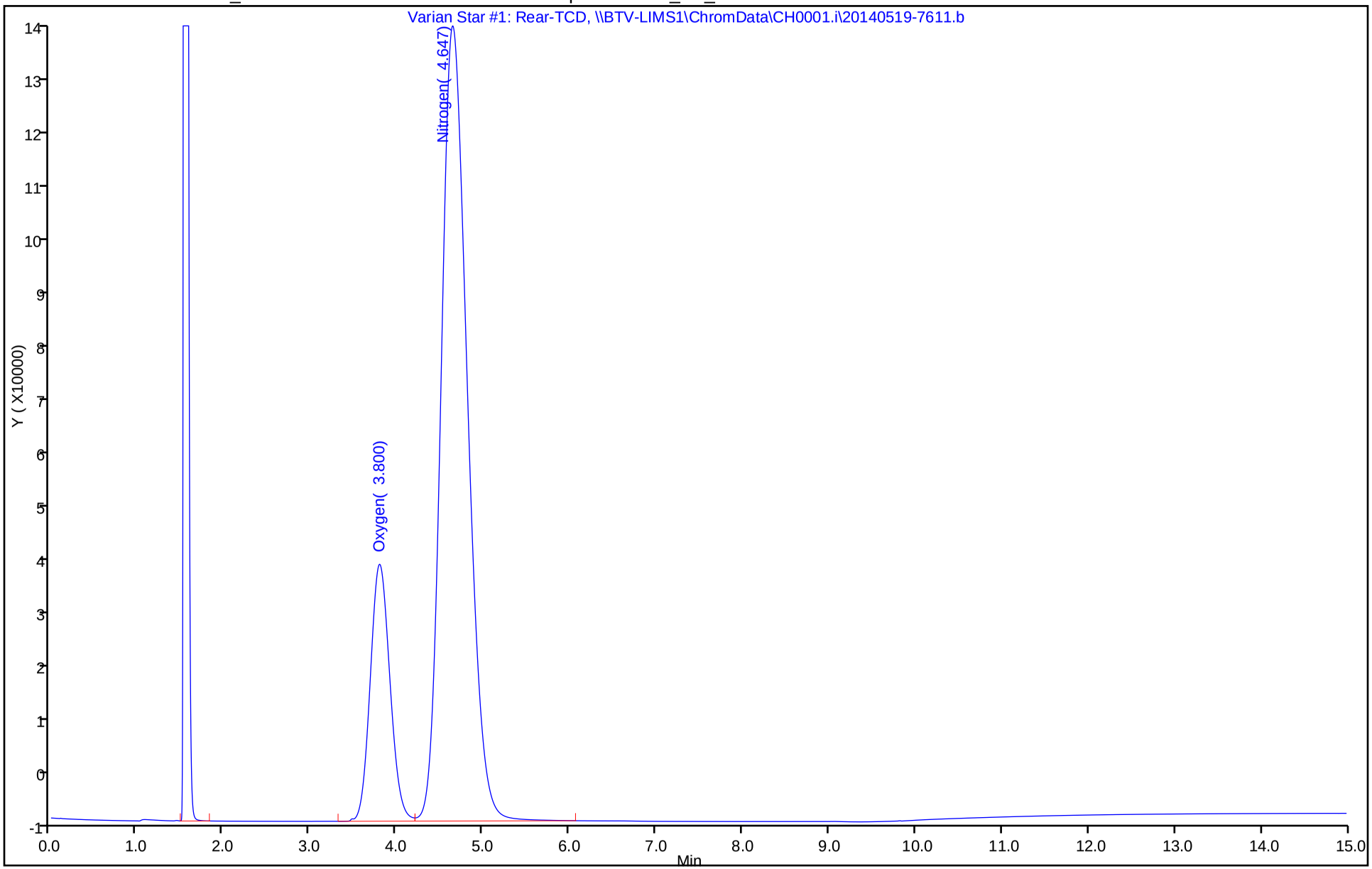
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:38 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic5051914B.d

Injection Date:	19-May-2014 16:30:31	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	20
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

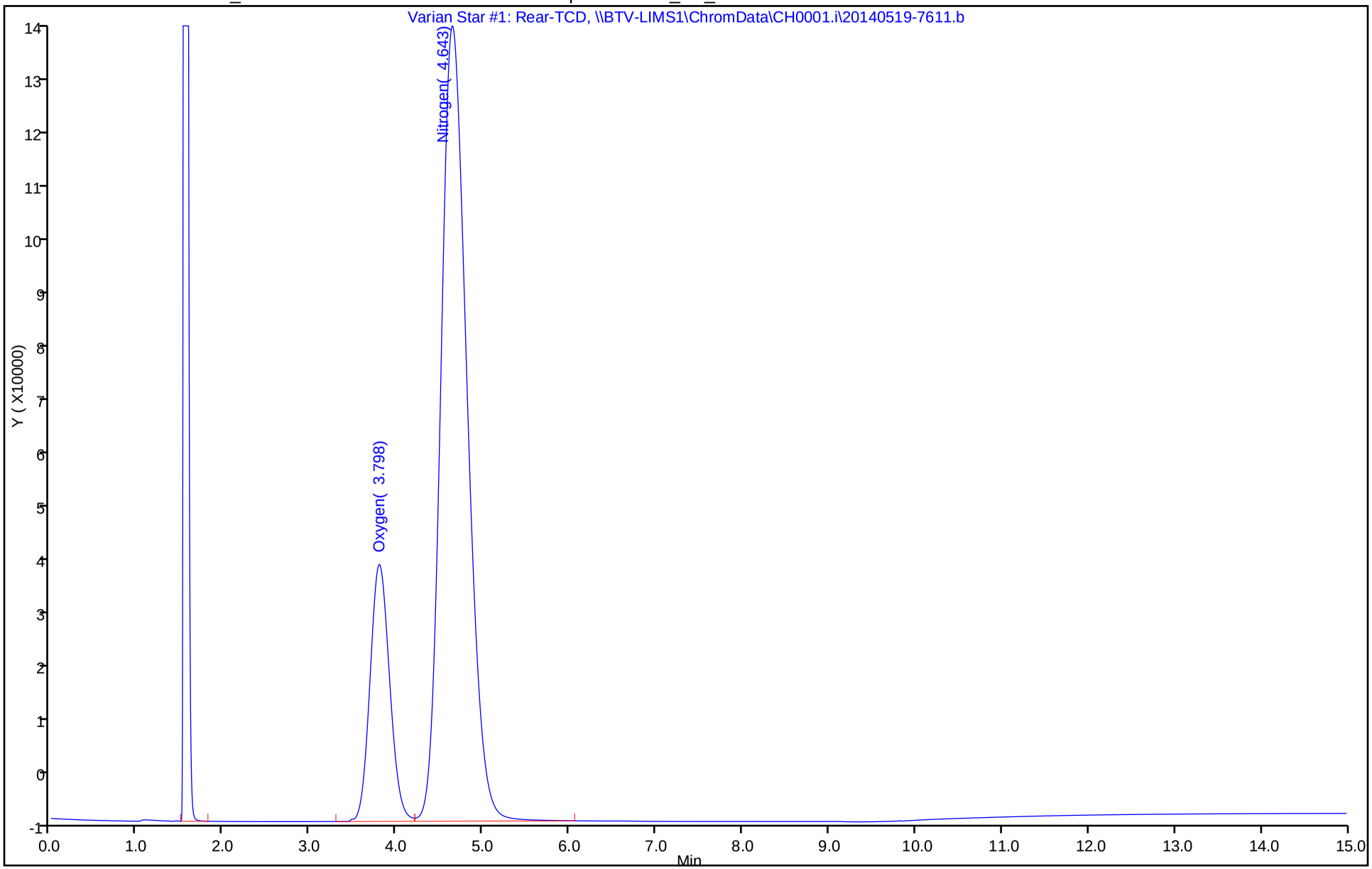


Report Date: 20-May-2014 13:27:39 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic5051914C.d

Injection Date:	19-May-2014 16:46:24	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	21
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic7051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 23
Inject. Date: 19-May-2014 17:18:07 ALS Bottle#: 0 Worklist Smp#: 23
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC7051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:38 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
3 Nitrogen	4.630	4.721	-0.091	3581392	100.0	95.4	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic7051914C.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 24
Inject. Date: 19-May-2014 17:33:58 ALS Bottle#: 0 Worklist Smp#: 24
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC7051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:38 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 10:16:33

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
3 Nitrogen	4.625	4.721	-0.096	3585163	100.0	95.5	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic7051914c-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Nitrogen	3581392	3585163	3583277.5	0.11

Analyte	Conc1	Conc2	Avg Conc	RPD
Nitrogen	95.4	95.5	95.45	0.11

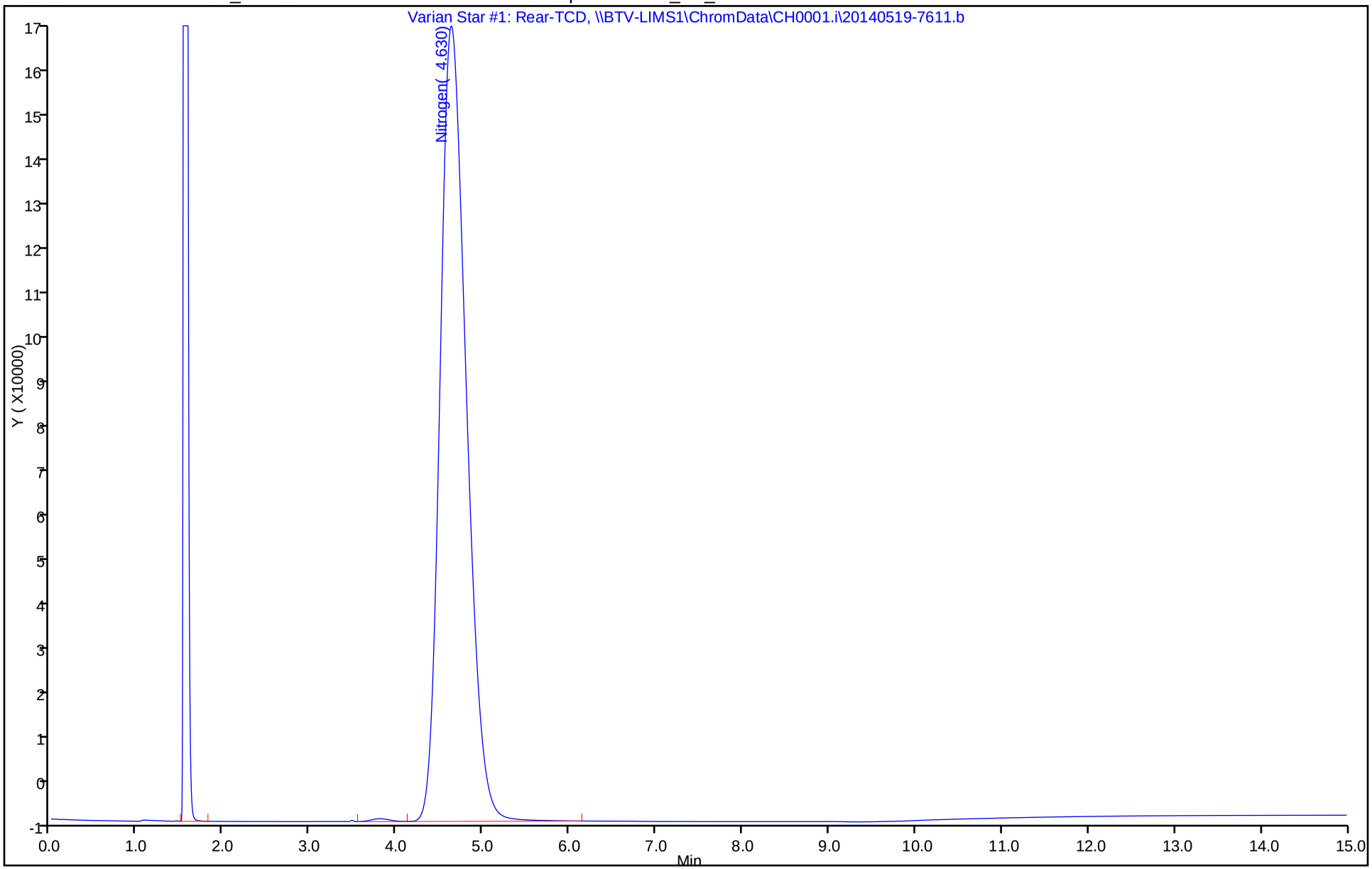
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:38 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic7051914B.d

Injection Date:	19-May-2014 17:18:07	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	23
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

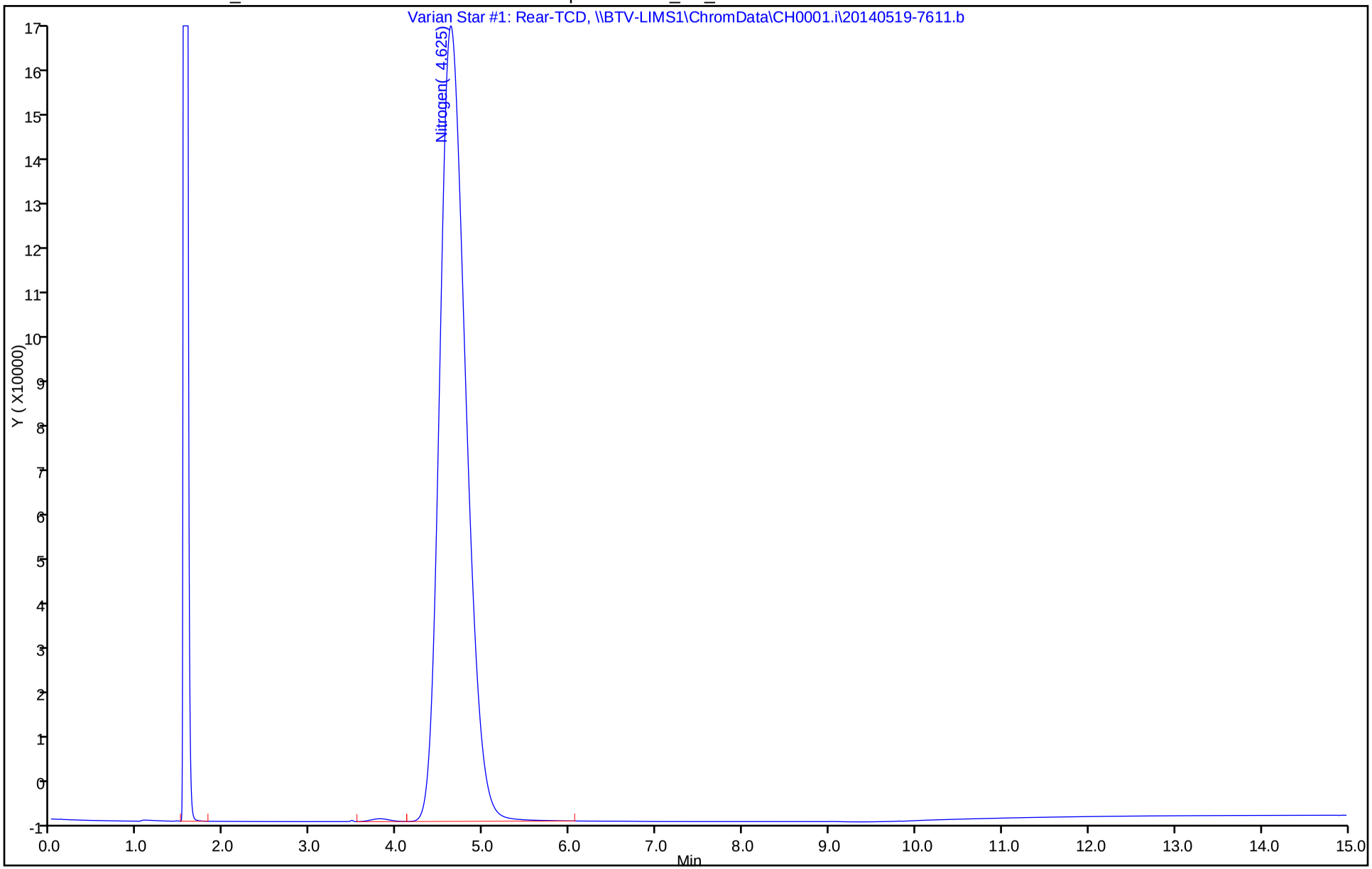


Report Date: 20-May-2014 13:27:38 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic7051914C.d

Injection Date:	19-May-2014 17:33:58	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	24
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914A.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 28
Inject. Date: 19-May-2014 18:37:26 ALS Bottle#: 0 Worklist Smp#: 80
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC10051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:36 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 10:19:29

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
5 Carbon monoxide	7.024	7.064	-0.040	2798	0.1000	0.0798	M

QC Flag Legend

Review Flags
M - Manually Integrated

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 29
Inject. Date: 19-May-2014 18:53:18 ALS Bottle#: 0 Worklist Smp#: 81
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC10051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:37 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 10:19:17

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
5 Carbon monoxide	7.037	7.064	-0.027	2903	0.1000	0.0828	M

QC Flag Legend

Review Flags
M - Manually Integrated

Processing 3C data for files:
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Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon monoxide	2798	2903	2850.5	3.68

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon monoxide	0.08	0.08	0.08	3.68

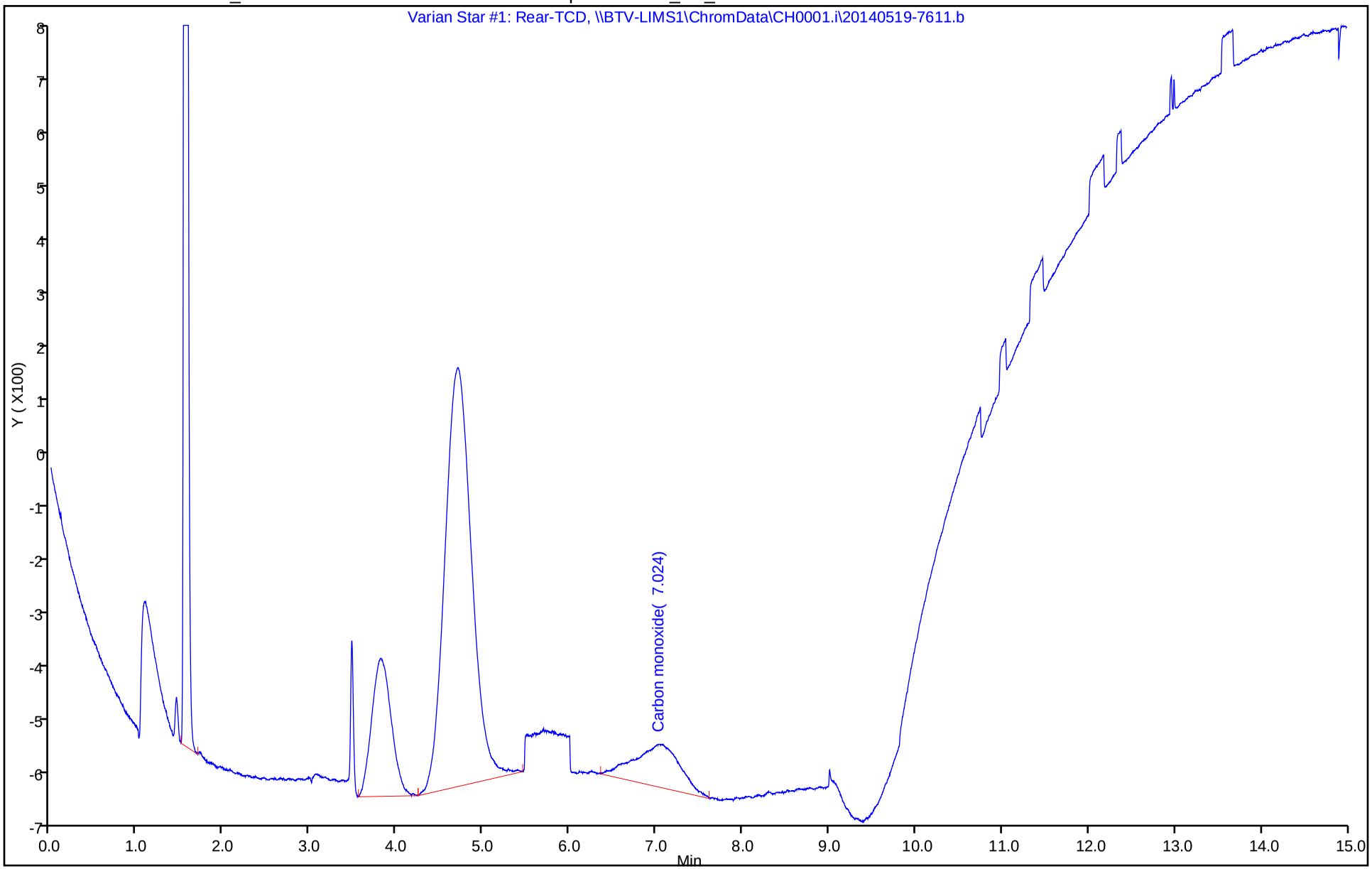
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:37 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914A.d

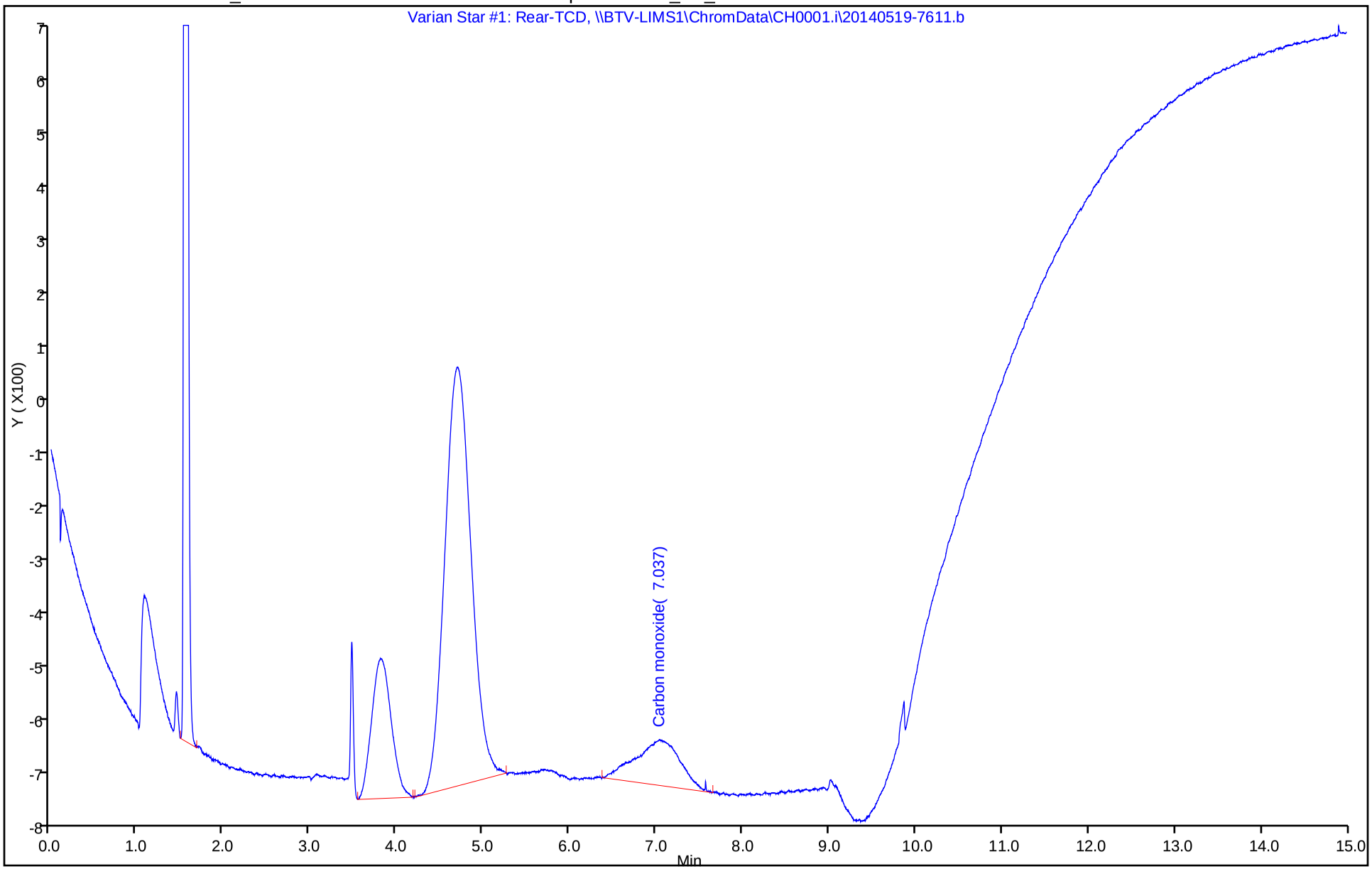
Injection Date:	19-May-2014 18:37:26	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	80
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 20-May-2014 13:27:37 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914B.d				
Injection Date:	19-May-2014 18:53:18	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	81
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



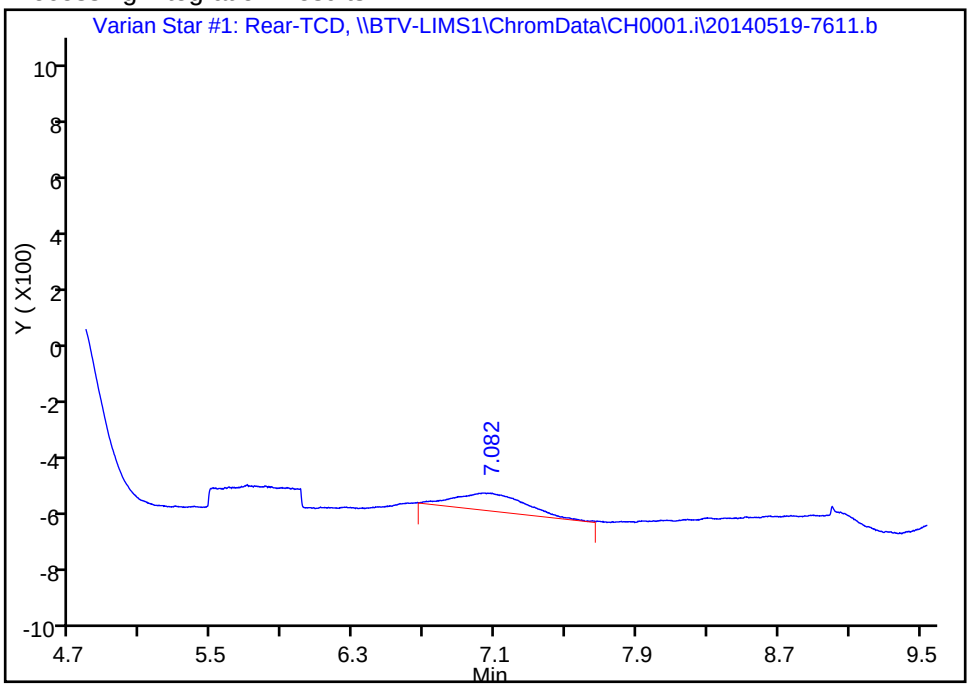
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914A.d
Injection Date: 19-May-2014 18:37:26 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 80
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

5 Carbon monoxide, CAS: 630-08-0

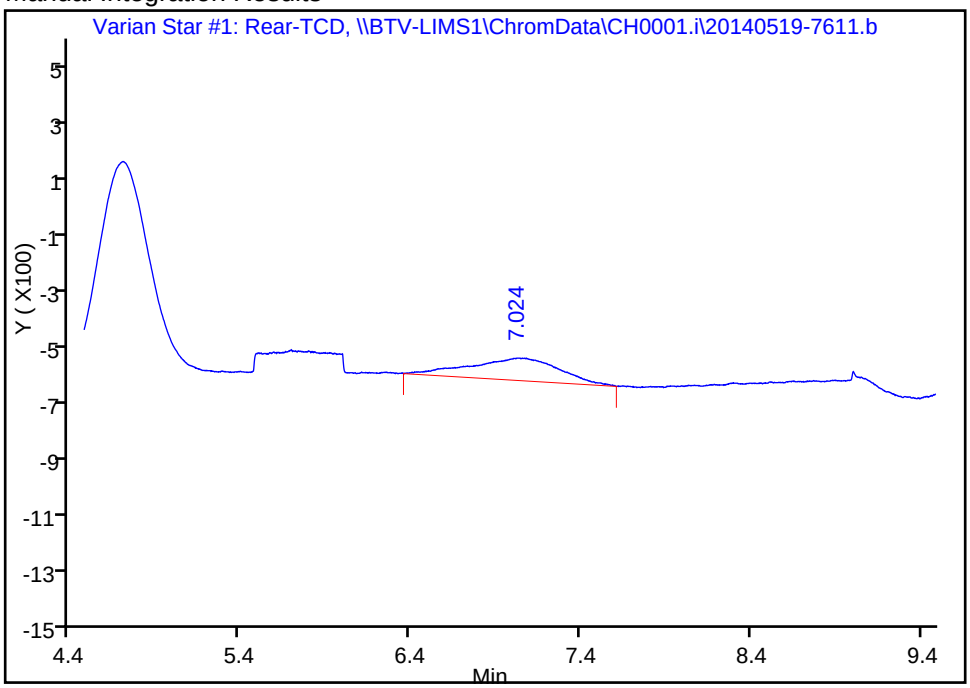
Processing Integration Results

RT: 7.08
Response: 1681
Amount: 0.045268



Manual Integration Results

RT: 7.02
Response: 2798
Amount: 0.079769



Reviewer: lyonsb, 20-May-2014 10:19:29
Audit Action: Manually Integrated
Audit Reason: Baseline Event

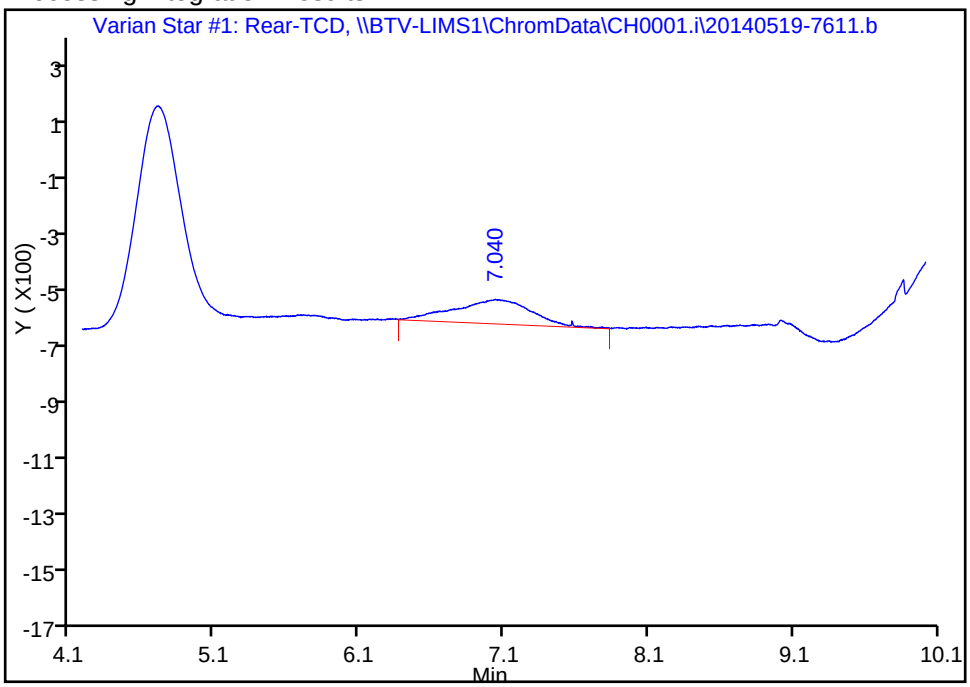
TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic10051914B.d
Injection Date: 19-May-2014 18:53:18 Instrument ID: CH0001.i
Lims ID: IC
Client ID:
Operator ID: BPL ALS Bottle#: 0 Worklist Smp#: 81
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Method: EPA3C_CH0001.i Limit Group: AI_3C_Limits
Column: Detector Varian Star #1: Rear-TCD

5 Carbon monoxide, CAS: 630-08-0

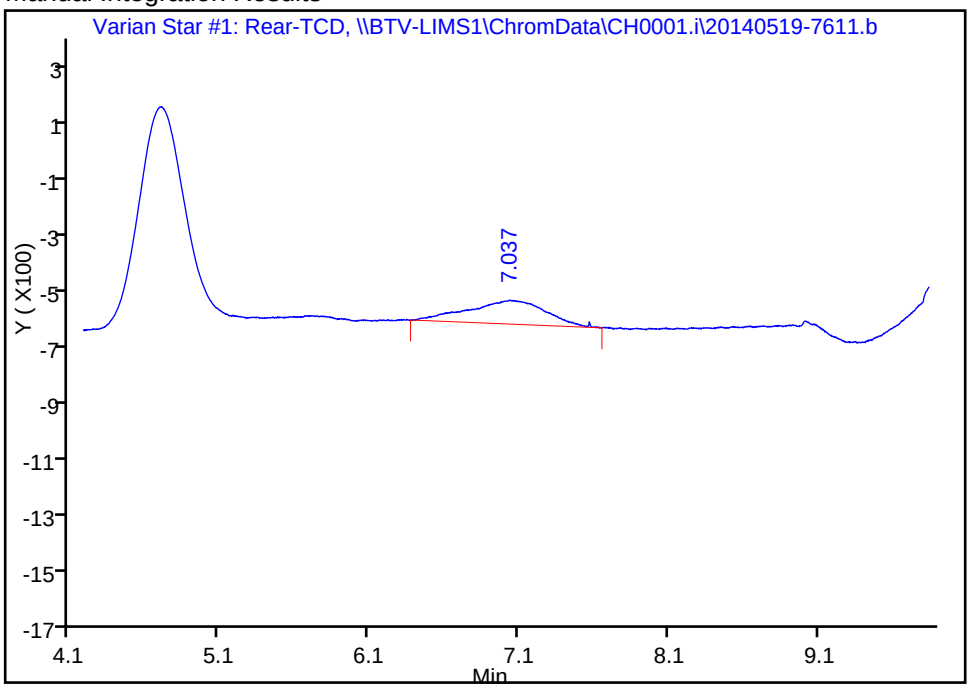
Processing Integration Results

RT: 7.04
Response: 3103
Amount: 0.083241



Manual Integration Results

RT: 7.04
Response: 2903
Amount: 0.082763



Reviewer: lyonsb, 20-May-2014 10:19:17
Audit Action: Manually Integrated
Audit Reason: Baseline Event

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914A.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 31
Inject. Date: 20-May-2014 10:29:35 ALS Bottle#: 0 Worklist Smp#: 85
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC09051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:34 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 10:47:08

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
5 Carbon monoxide	7.086	7.064	0.022	337295	10.0	9.62	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d
Lims ID: IC
Client ID:
Sample Type: IC Calib Level: 32
Inject. Date: 20-May-2014 10:45:29 ALS Bottle#: 0 Worklist Smp#: 86
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CIC09051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:35 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 11:03:49

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
5 Carbon monoxide	7.057	7.064	-0.007	340722	10.0	9.71	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cic09051914b-72292-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon monoxide	337295	340722	339008.5	1.01

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon monoxide	9.62	9.71	9.66	1.01

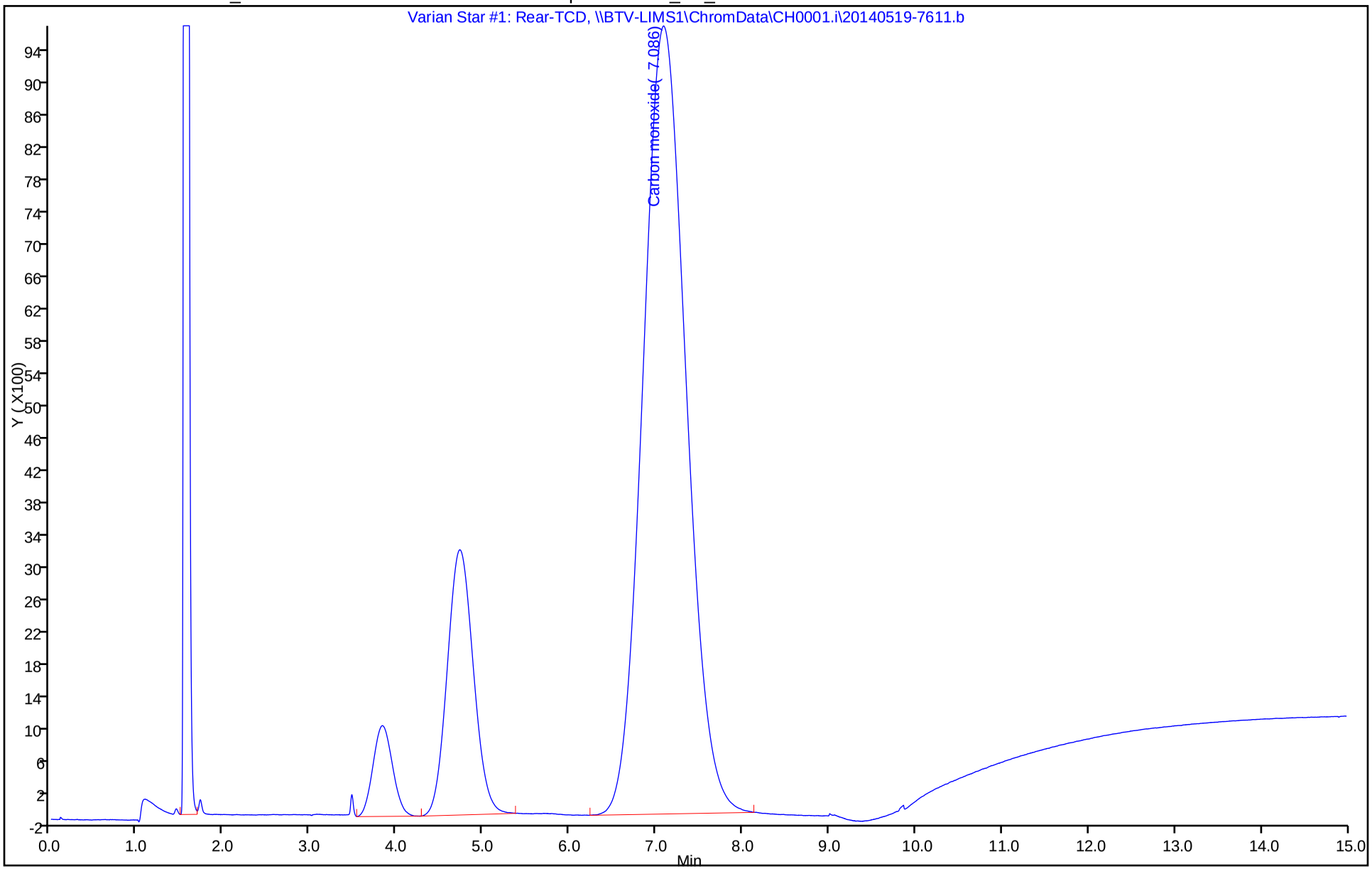
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:34 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914A.d

Injection Date:	20-May-2014 10:29:35	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	85
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

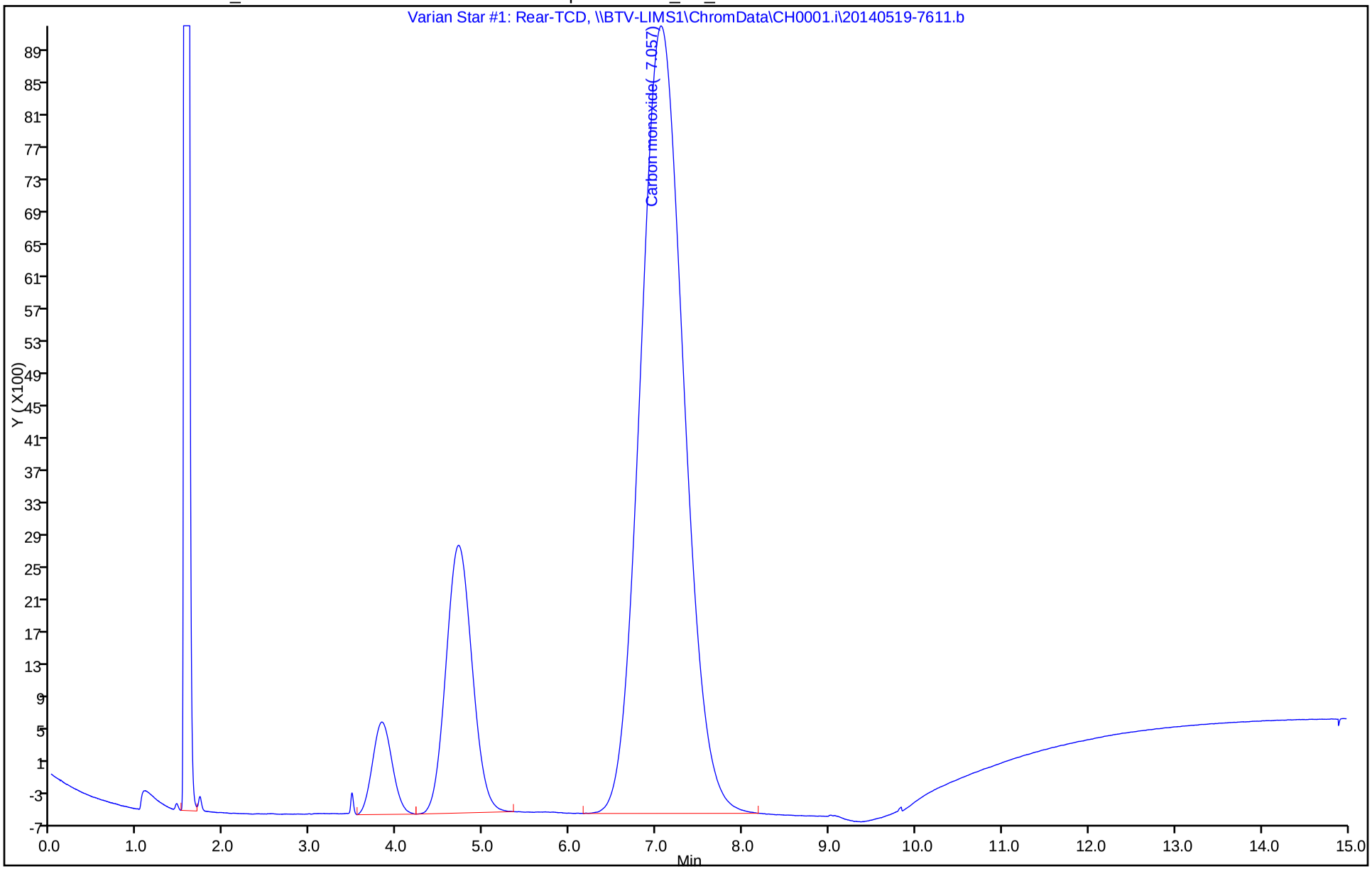


Report Date: 20-May-2014 13:27:35 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Injection Date:	20-May-2014 10:45:29	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	IC			Worklist Smp#:	86
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM VII
AIR - GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Lab Sample ID: ICV 200-72381/11 Calibration Date: 05/20/2014 11:01

Instrument ID: CH0001.i Calib Start Date: 05/19/2014 11:18

GC Column: CTR-1 ID: 3.18(mm) Calib End Date: 05/20/2014 10:29

Lab File ID: 3cicv051914C.d-avg Conc. Units: % v/v Heated Purge: (Y/N) N

ANALYTE	CURVE TYPE	AVE CF	CF	MIN CF	CALC AMOUNT	SPIKE AMOUNT	%D	MAX %D
Carbon dioxide	Ave	33413	33775		5.05	5.00	1.1	
Oxygen	Ave	34727	33019		4.75	5.00	-4.9	
Nitrogen	Ave	37541	36238		4.83	5.00	-3.5	
Methane	Ave	30354	27218		3.59	4.00	-10.3	
Carbon monoxide	Ave	35076	38310		5.46	5.00	9.2	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicv051914C.d
Lims ID: ICV
Client ID:
Sample Type: ICV
Inject. Date: 20-May-2014 11:01:20 ALS Bottle#: 0 Worklist Smp#: 87
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CICV051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist:

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:35 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

First Level Reviewer: lyonsb Date: 20-May-2014 11:23:50

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.690	0.030	168756	5.00	5.05	
2 Oxygen	3.822	3.825	-0.003	165179	5.00	4.76	
3 Nitrogen	4.706	4.721	-0.015	181105	5.00	4.82	
4 Methane	6.521	6.532	-0.011	108843	4.00	3.59	
5 Carbon monoxide	7.037	7.064	-0.027	191427	5.00	5.46	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicv051914D.d
Lims ID: ICV
Client ID:
Sample Type: ICV
Inject. Date: 20-May-2014 11:17:21 ALS Bottle#: 0 Worklist Smp#: 88
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3CICV051914,1
Operator ID: BPL Instrument ID: CH0001.i
Sublist:

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 20-May-2014 13:27:35 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK012

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.720	1.690	0.030	168989	5.00	5.06	
2 Oxygen	3.825	3.825	0.000	165013	5.00	4.75	
3 Nitrogen	4.713	4.721	-0.008	181274	5.00	4.83	
4 Methane	6.528	6.532	-0.004	108897	4.00	3.59	
5 Carbon monoxide	7.048	7.064	-0.016	191676	5.00	5.46	

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cicv051914c-72292-ai_3c_l
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cicv051914d-72292-ai_3c_l

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	168756	168989	168872.5	0.14
Oxygen	165179	165013	165096	0.1
Nitrogen	181105	181274	181189.5	0.09
Methane	108843	108897	108870	0.05
Carbon monoxide	191427	191676	191551.5	0.13

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	5.05	5.06	5.05	0.14
Oxygen	4.76	4.75	4.75	0.1
Nitrogen	4.82	4.83	4.83	0.09
Methane	3.59	3.59	3.59	0.05
Carbon monoxide	5.46	5.46	5.46	0.13

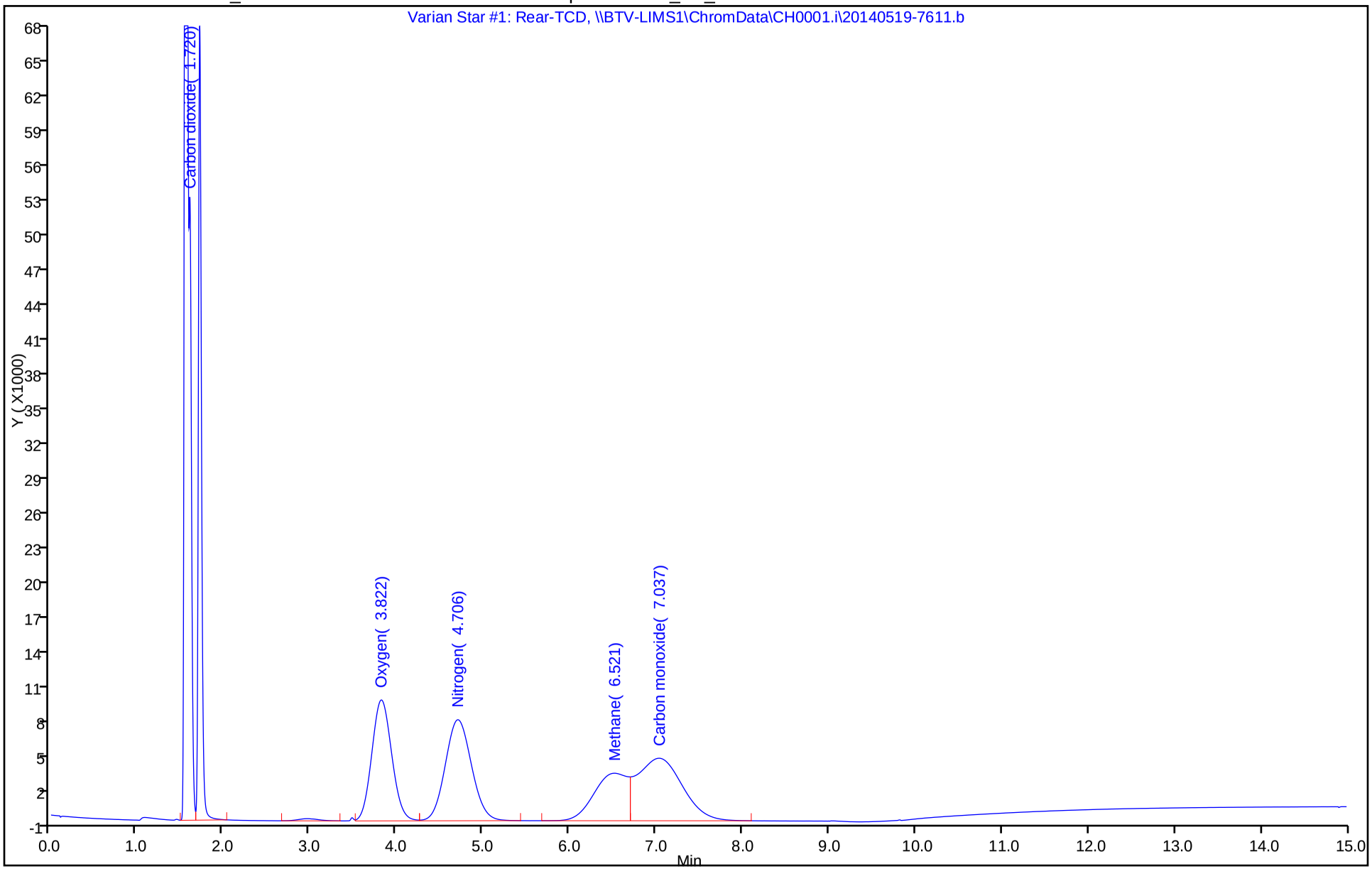
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 20-May-2014 13:27:36 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicv051914C.d

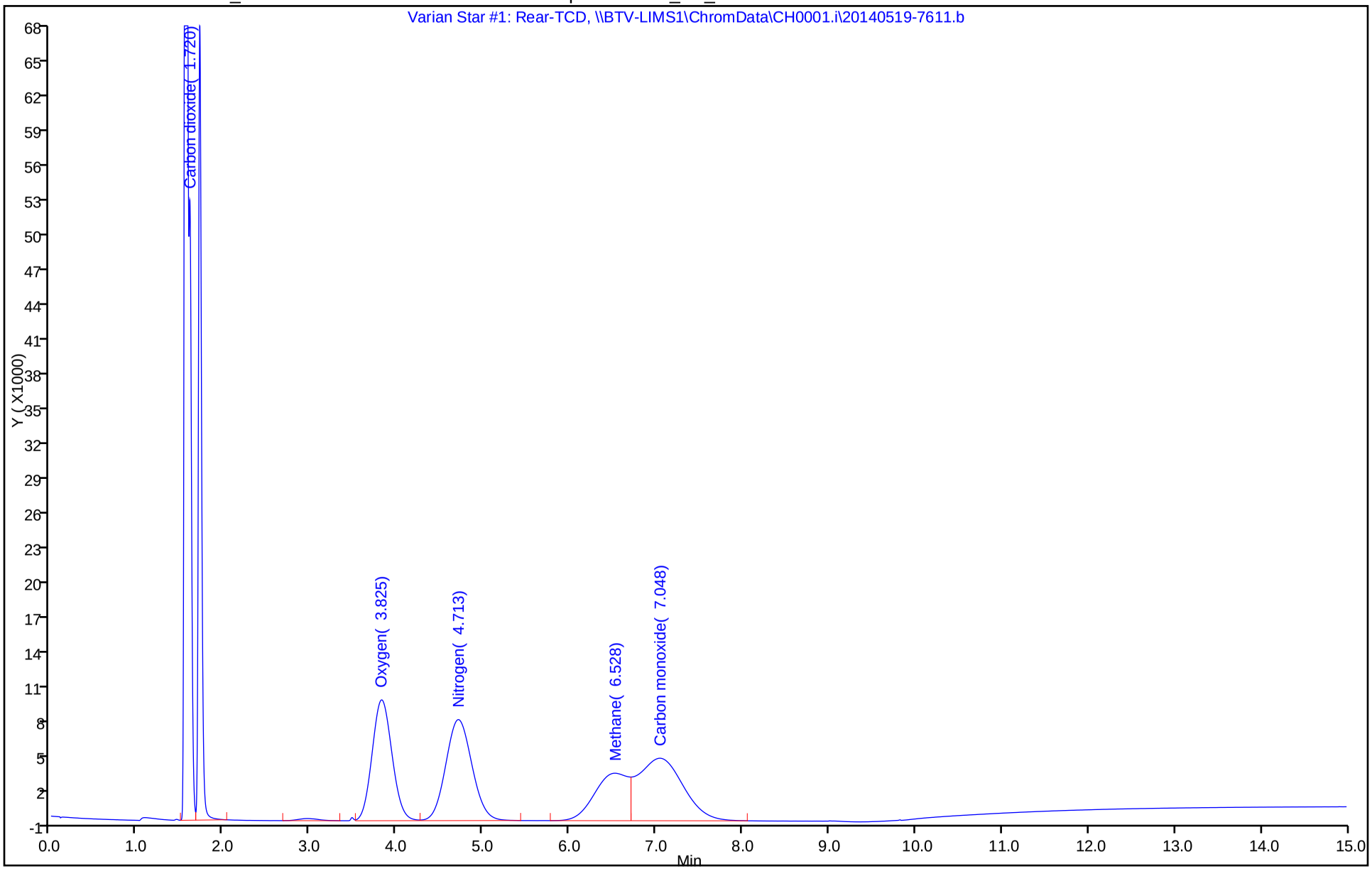
Injection Date:	20-May-2014 11:01:20	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	ICV			Worklist Smp#:	87
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 20-May-2014 13:27:36 Chrom Revision: 2.2 16-May-2014 10:46:48

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cicv051914D.d				
Injection Date:	20-May-2014 11:17:21	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	ICV			Worklist Smp#:	88
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM VII
AIR - GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Lab Sample ID: CCV 200-75942/1 Calibration Date: 08/12/2014 12:01

Instrument ID: CH0001.i Calib Start Date: 05/19/2014 11:18

GC Column: CTR-1 ID: 3.18(mm) Calib End Date: 05/20/2014 10:29

Lab File ID: 3cccv081114b.d-avg Conc. Units: % v/v Heated Purge: (Y/N) N

ANALYTE	CURVE TYPE	AVE CF	CF	MIN CF	CALC AMOUNT	SPIKE AMOUNT	%D	MAX %D
Carbon dioxide	Ave	33413	33819		5.06	5.00	1.2	20.0
Oxygen	Ave	34727	33051		4.75	5.00	-4.8	20.0
Nitrogen	Ave	37541	36889		4.89	5.00	-1.7	20.0
Methane	Ave	30354	27680		3.67	4.00	-8.8	20.0
Carbon monoxide	Ave	35076	38072		5.40	5.00	8.5	20.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccv081114b.d
Lims ID: CCV
Client ID:
Sample Type: CCV
Inject. Date: 12-Aug-2014 12:01:59 ALS Bottle#: 0 Worklist Smp#: 2
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3cccv081114b
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 13:22:04 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.724	1.722	0.002	169097	5.00	5.06	
2 Oxygen	3.830	3.824	0.006	165253	5.00	4.76	
3 Nitrogen	4.729	4.719	0.010	184443	5.00	4.91	
4 Methane	6.544	6.522	0.022	110720	4.00	3.65	
5 Carbon monoxide	7.087	7.067	0.020	190362	5.00	5.43	

Reagents:

AT3CCCVs_00056 Amount Added: 2.00 Units: mL

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clccv81114c.d
Lims ID: CCV
Client ID:
Sample Type: CCV
Inject. Date: 12-Aug-2014 12:22:00 ALS Bottle#: 0 Worklist Smp#: 3
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3clccv81114c
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 13:22:05 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 12-Aug-2014 13:21:39

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.722	0.000	168970	5.00	5.06	
2 Oxygen	3.824	3.824	0.000	164750	5.00	4.74	
3 Nitrogen	4.719	4.719	0.000	182440	5.00	4.86	
4 Methane	6.529	6.522	0.007	112235	4.00	3.70	
5 Carbon monoxide	7.059	7.067	-0.008	188676	5.00	5.38	

Reagents:

AT3CCCVs_00056 Amount Added: 2.00 Units: mL

Processing 3C data for files:
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Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	169097	168970	169033.5	0.08
Oxygen	165253	164750	165001.5	0.3
Nitrogen	184443	182440	183441.5	1.09
Methane	110720	112235	111477.5	1.36
Carbon monoxide	190362	188676	189519	0.89

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	5.06	5.06	5.06	0.08
Oxygen	4.76	4.74	4.75	0.3
Nitrogen	4.91	4.86	4.89	1.09
Methane	3.65	3.7	3.67	1.36
Carbon monoxide	5.43	5.38	5.4	0.89

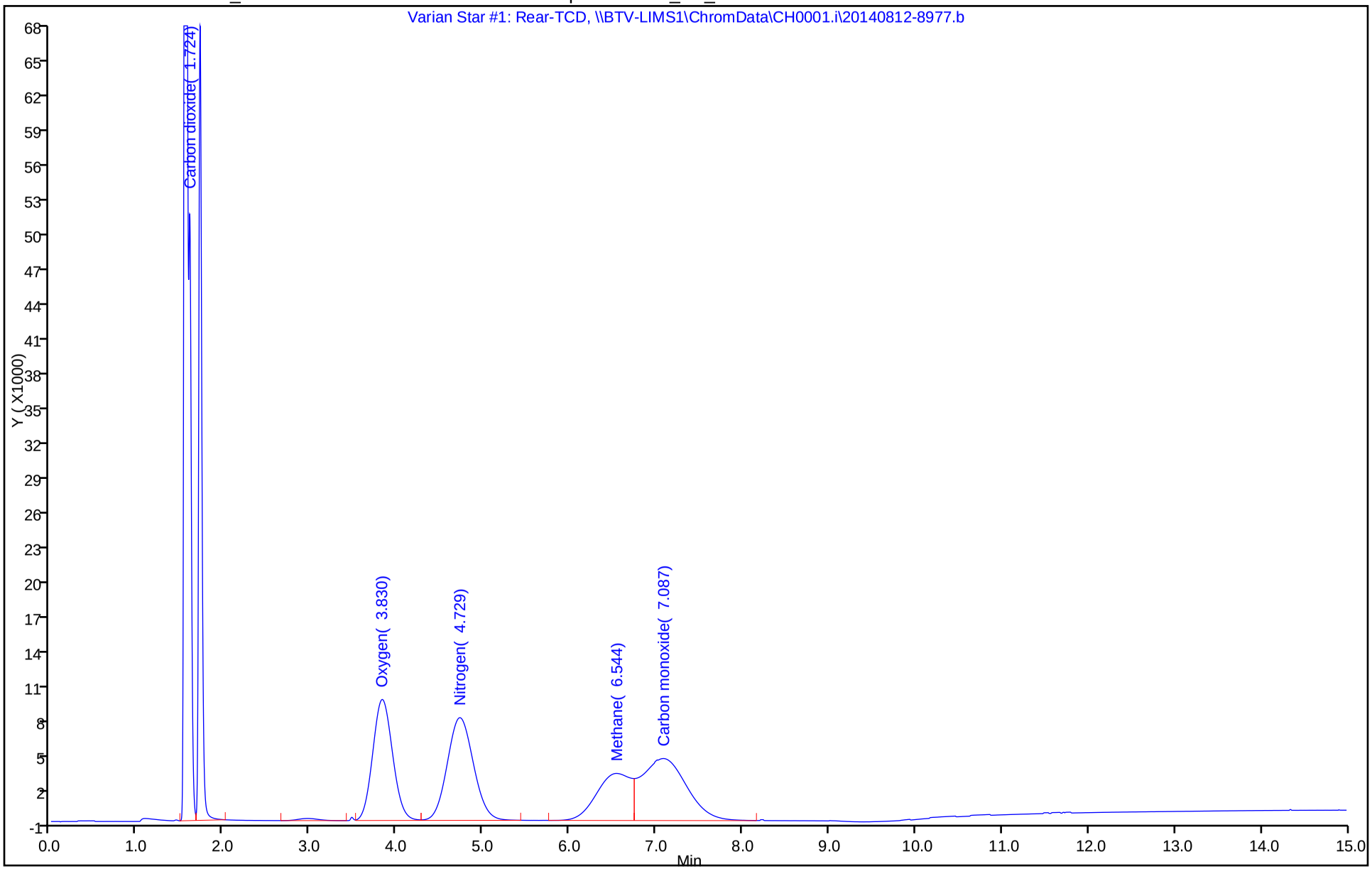
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 12-Aug-2014 13:22:04 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccv081114b.d

Injection Date:	12-Aug-2014 12:01:59	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	CCV			Worklist Smp#:	2
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

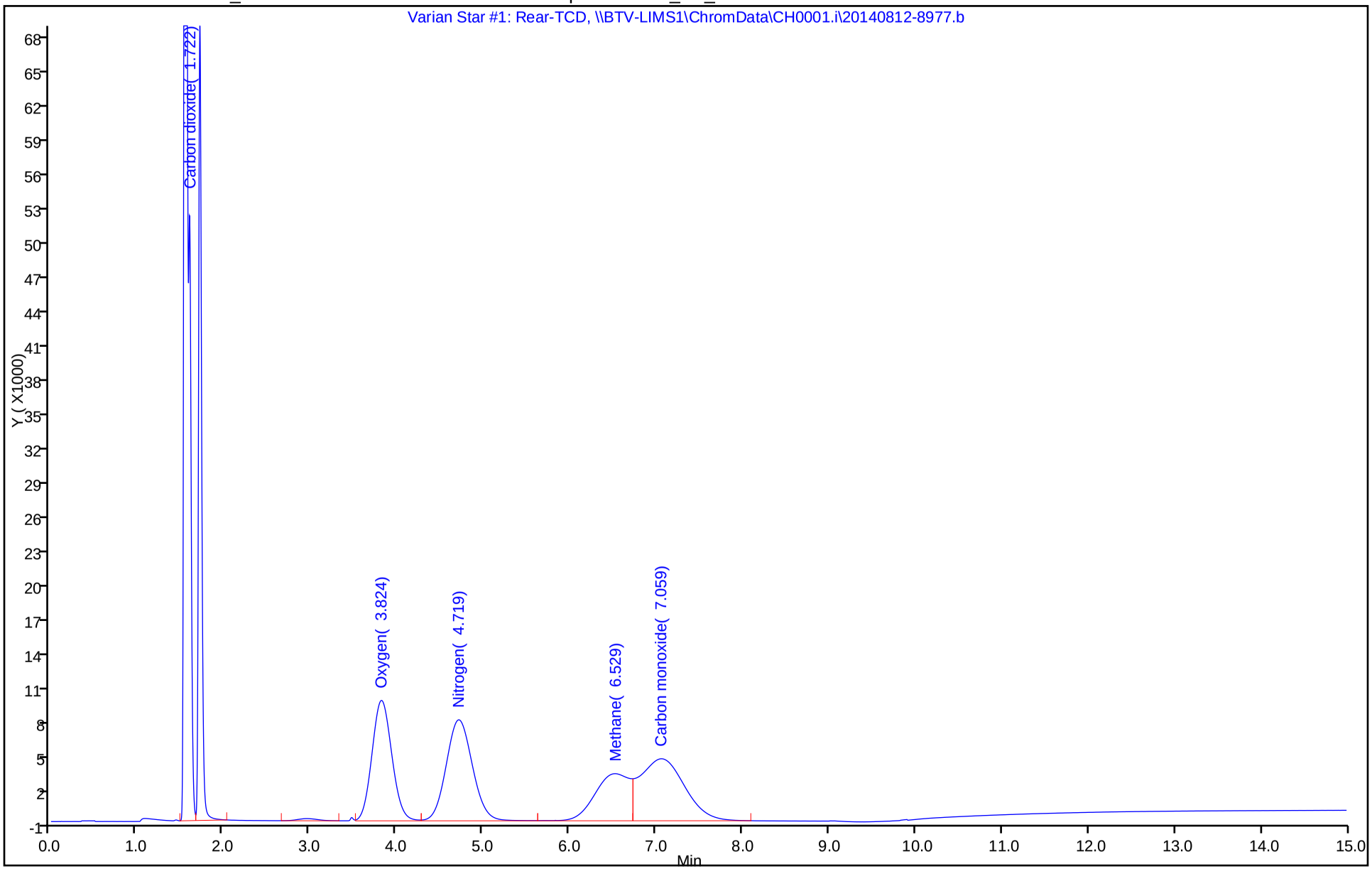


Report Date: 12-Aug-2014 13:22:05 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clccv81114c.d

Injection Date:	12-Aug-2014 12:22:00	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	CCV			Worklist Smp#:	3
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM VII
AIR - GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Lab Sample ID: CCVC 200-75942/10 Calibration Date: 08/13/2014 09:30

Instrument ID: CH0001.i Calib Start Date: 05/19/2014 11:18

GC Column: CTR-1 ID: 3.18(mm) Calib End Date: 05/20/2014 10:29

Lab File ID: 3cccvc081114a.d-avg Conc. Units: % v/v Heated Purge: (Y/N) N

ANALYTE	CURVE TYPE	AVE CF	CF	MIN CF	CALC AMOUNT	SPIKE AMOUNT	%D	MAX %D
Carbon dioxide	Ave	33413	33644		5.03	5.00	0.7	20.0
Oxygen	Ave	34727	32814		4.72	5.00	-5.5	20.0
Nitrogen	Ave	37541	36497		4.86	5.00	-2.8	20.0
Methane	Ave	30354	27520		3.63	4.00	-9.3	20.0
Carbon monoxide	Ave	35076	37744		5.38	5.00	7.6	20.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccvc081114a.d
Lims ID: CCVC
Client ID:
Sample Type: CCVC
Inject. Date: 13-Aug-2014 09:30:27 ALS Bottle#: 0 Worklist Smp#: 31
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 25cccvc081114
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 10:04:10 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.723	1.722	0.001	168453	5.00	5.04	
2 Oxygen	3.828	3.824	0.004	163776	5.00	4.72	
3 Nitrogen	4.725	4.719	0.006	183064	5.00	4.88	
4 Methane	6.538	6.522	0.016	109827	4.00	3.62	
5 Carbon monoxide	7.078	7.067	0.011	188651	5.00	5.38	

Reagents:

AT3CCCVs_00056 Amount Added: 2.00 Units: mL

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccvc081114b.d
Lims ID: CCVC
Client ID:
Sample Type: CCVC
Inject. Date: 13-Aug-2014 09:47:15 ALS Bottle#: 0 Worklist Smp#: 32
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 25cccvc081114
Operator ID: BPL Instrument ID: CH0001.i
Sublist: chrom-EPA3C_CH0001.i*sub1

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 10:04:10 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.718	1.722	-0.004	167982	5.00	5.03	
2 Oxygen	3.810	3.824	-0.014	164361	5.00	4.73	
3 Nitrogen	4.697	4.719	-0.022	181906	5.00	4.85	
4 Methane	6.498	6.522	-0.024	110335	4.00	3.63	
5 Carbon monoxide	7.022	7.067	-0.045	188789	5.00	5.38	

Reagents:

AT3CCCVs_00056 Amount Added: 2.00 Units: mL

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3cccvc081114b-75924-ai_3c_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	168453	167982	168217.5	0.28
Oxygen	163776	164361	164068.5	0.36
Nitrogen	183064	181906	182485	0.63
Methane	109827	110335	110081	0.46
Carbon monoxide	188651	188789	188720	0.07

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	5.04	5.03	5.03	0.28
Oxygen	4.72	4.73	4.72	0.36
Nitrogen	4.88	4.85	4.86	0.63
Methane	3.62	3.63	3.63	0.46
Carbon monoxide	5.38	5.38	5.38	0.07

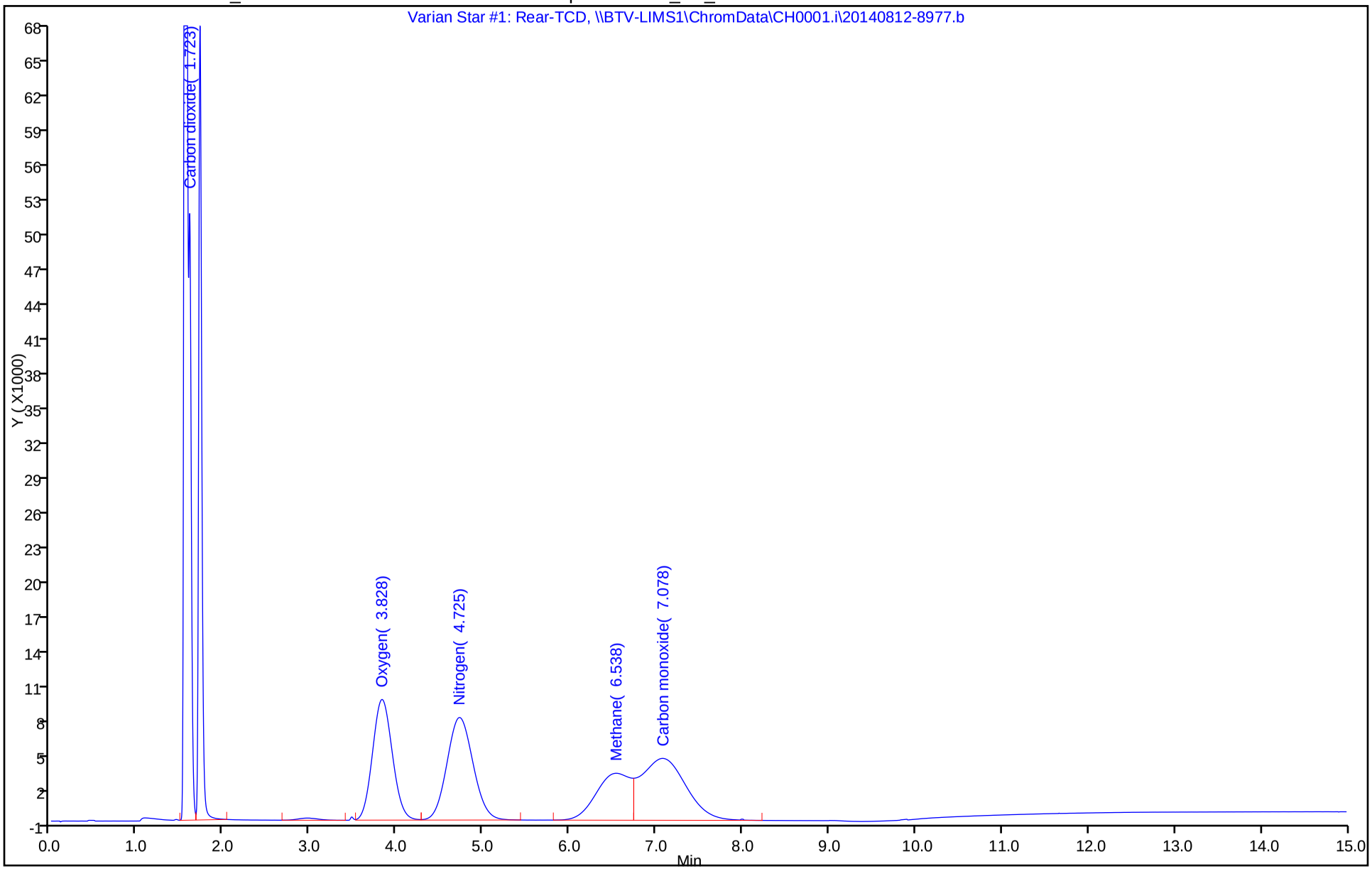
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 10:04:10 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccvc081114a.d

Injection Date:	13-Aug-2014 09:30:27	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	CCVC			Worklist Smp#:	31
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

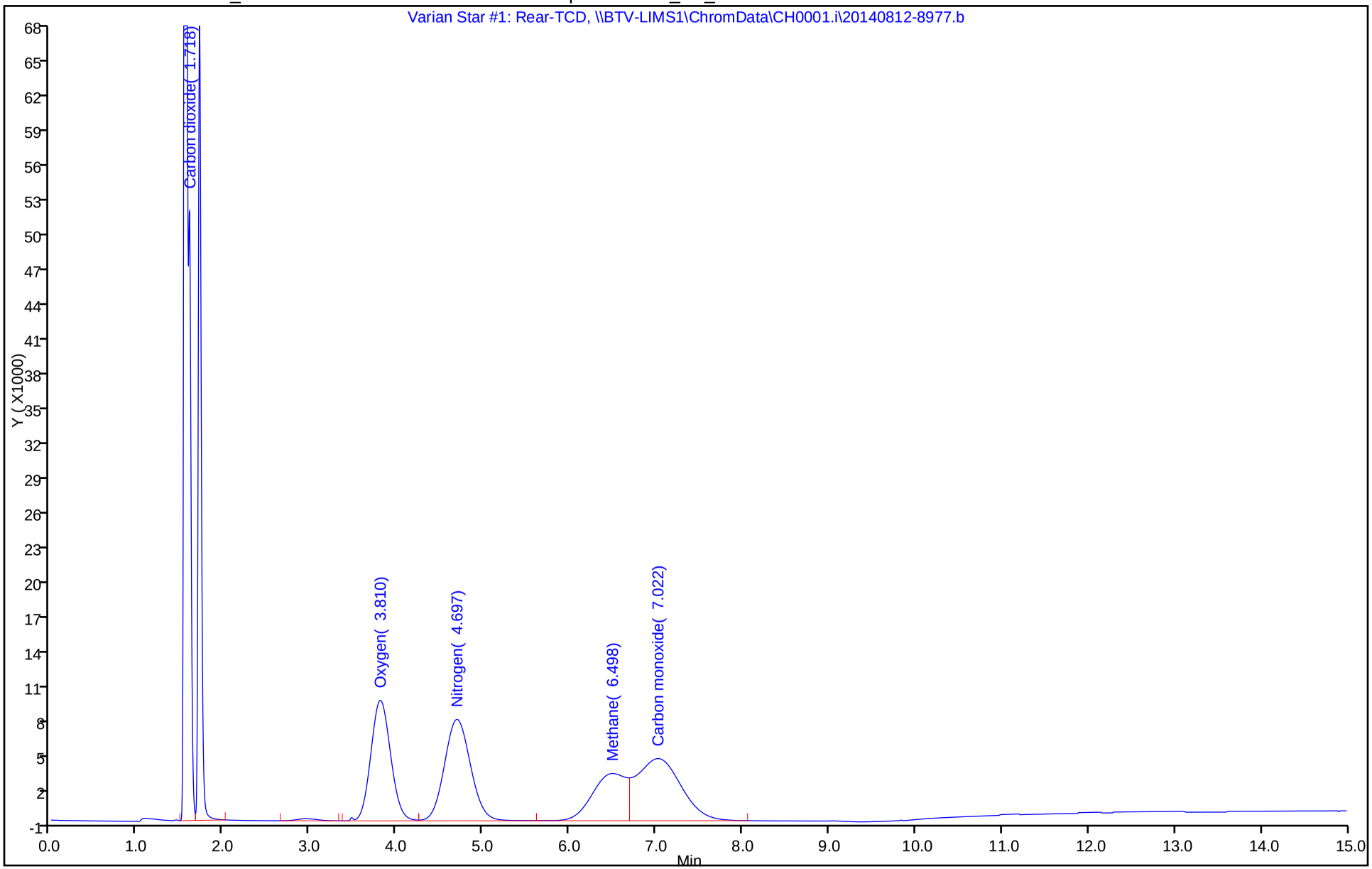


Report Date: 13-Aug-2014 10:04:10 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3cccvc081114b.d

Injection Date:	13-Aug-2014 09:47:15	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	CCVC			Worklist Smp#:	32
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: Lab Sample ID: MB 200-75942/3

Matrix: Air Lab File ID: mb081114001.d-avg

Analysis Method: EPA 3C Date Collected:

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 14:57

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.050	U	0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	0.50	U	0.50	0.50
7782-44-7	Oxygen	0.050	U	0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\mb081114001.d
Lims ID: MB
Client ID:
Sample Type: MB
Inject. Date: 12-Aug-2014 14:57:18 ALS Bottle#: 0 Worklist Smp#: 10
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: mb081114
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 15:15:17 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 12-Aug-2014 15:15:11

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
3 Nitrogen	4.710	4.719	-0.009	2399		0.0639	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\mb081114.d
Lims ID: MB
Client ID:
Sample Type: MB
Inject. Date: 12-Aug-2014 14:41:27 ALS Bottle#: 0 Worklist Smp#: 9
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: mb081114
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 15:15:17 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 12-Aug-2014 15:14:38

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
3 Nitrogen	4.745	4.719	0.026	2332		0.0621	

Processing 3C data for files:
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Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	0	0	0	0
Oxygen	0	0	0	0
Nitrogen	2399	2332	2365.5	2.83
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0	0	0	0
Oxygen	0	0	0	0
Nitrogen	0.06	0.06	0.06	2.83
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

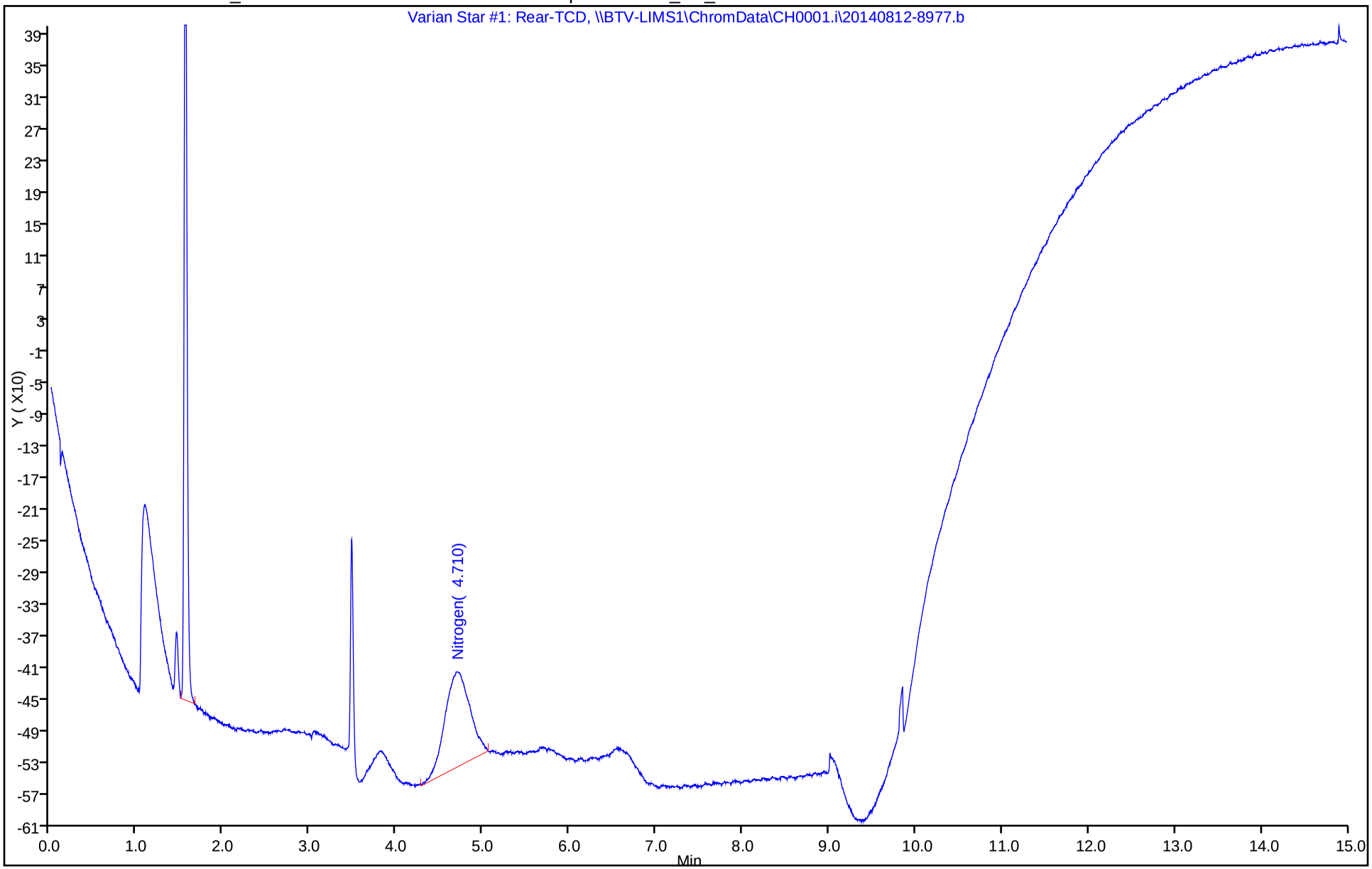
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 12-Aug-2014 15:15:18 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\mb081114001.d

Injection Date:	12-Aug-2014 14:57:18	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	MB			Worklist Smp#:	10
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

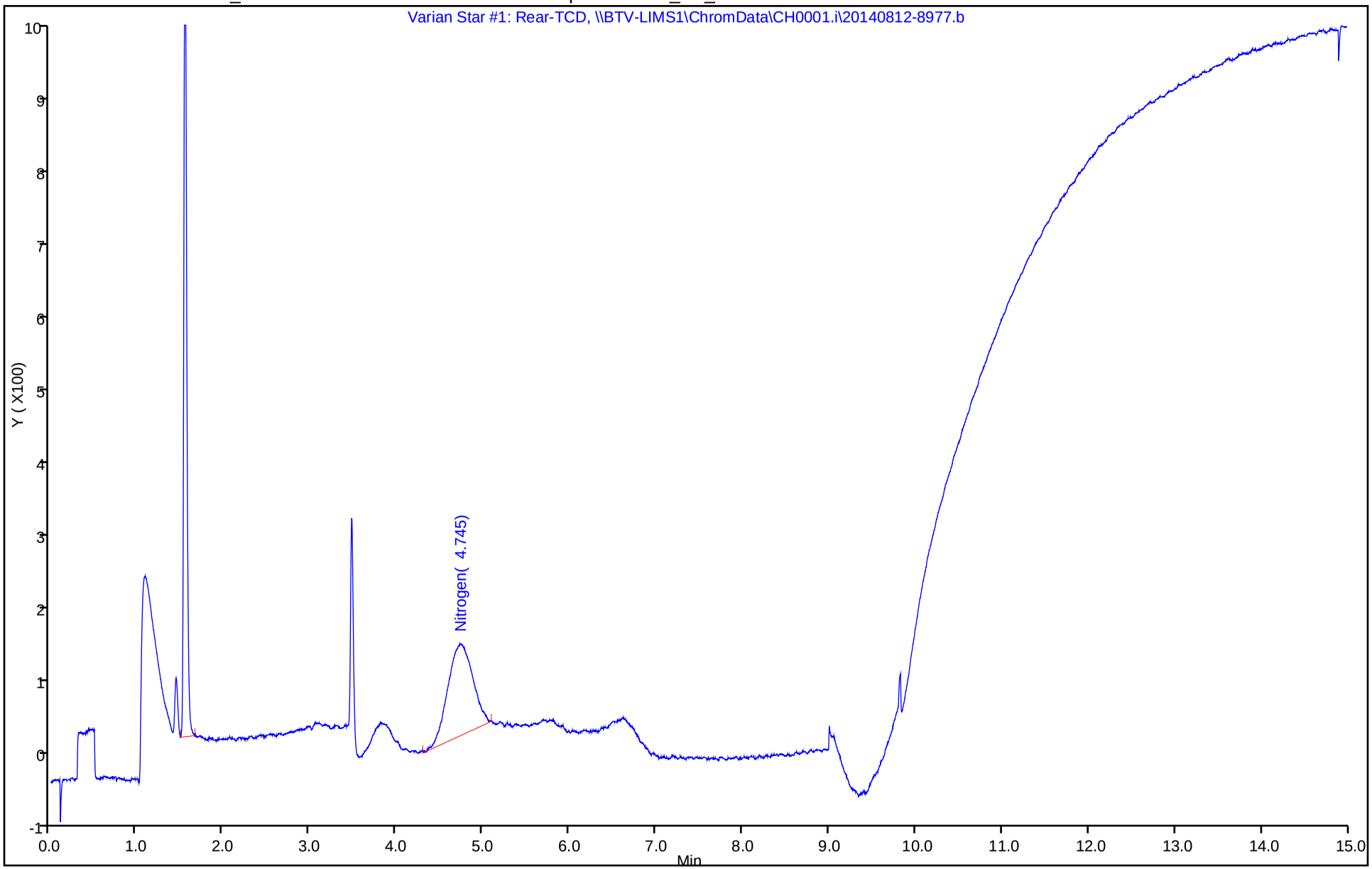


Report Date: 12-Aug-2014 15:15:17 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\mb081114.d

Injection Date:	12-Aug-2014 14:41:27	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	MB			Worklist Smp#:	9
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: Lab Sample ID: LCS 200-75942/2

Matrix: Air Lab File ID: 3clcs81114a.d-avg

Analysis Method: EPA 3C Date Collected:

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 12:42

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	5.08		0.050	0.050
74-82-8	Methane	3.66		0.040	0.040
7727-37-9	Nitrogen	4.81		0.50	0.50
7782-44-7	Oxygen	4.73		0.050	0.050
630-08-0	Carbon monoxide	5.41		1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clcs81114a.d
Lims ID: LCS
Client ID:
Sample Type: LCS
Inject. Date: 12-Aug-2014 12:42:23 ALS Bottle#: 0 Worklist Smp#: 4
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3clcs81114a
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 13:21:39 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.724	1.722	0.002	169817	5.00	5.08	
2 Oxygen	3.830	3.824	0.006	164486	5.00	4.74	
3 Nitrogen	4.727	4.719	0.008	180778	5.00	4.82	
4 Methane	6.544	6.522	0.022	110915	4.00	3.65	
5 Carbon monoxide	7.079	7.067	0.012	189777	5.00	5.41	

Reagents:

AT3CLCSs_00001 Amount Added: 2.00 Units: mL

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clcs81114b.d
Lims ID: LCS
Client ID:
Sample Type: LCS
Inject. Date: 12-Aug-2014 12:59:17 ALS Bottle#: 0 Worklist Smp#: 5
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 3clcs81114b
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 12-Aug-2014 13:21:39 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	Cal Amt % v/v	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.718	1.722	-0.004	169709	5.00	5.08	
2 Oxygen	3.813	3.824	-0.011	164226	5.00	4.73	
3 Nitrogen	4.702	4.719	-0.017	180296	5.00	4.80	
4 Methane	6.505	6.522	-0.017	111234	4.00	3.66	
5 Carbon monoxide	7.032	7.067	-0.035	189718	5.00	5.41	

Reagents:

AT3CLCSs_00001 Amount Added: 2.00 Units: mL

Processing 3C data for files:
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3clcs81114a-75924-ai_3c_li
\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\3clcs81114b-75924-ai_3c_li

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	169817	169709	169763	0.06
Oxygen	164486	164226	164356	0.16
Nitrogen	180778	180296	180537	0.27
Methane	110915	111234	111074.5	0.29
Carbon monoxide	189777	189718	189747.5	0.03

Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	5.08	5.08	5.08	0.06
Oxygen	4.74	4.73	4.73	0.16
Nitrogen	4.82	4.8	4.81	0.27
Methane	3.65	3.66	3.66	0.29
Carbon monoxide	5.41	5.41	5.41	0.03

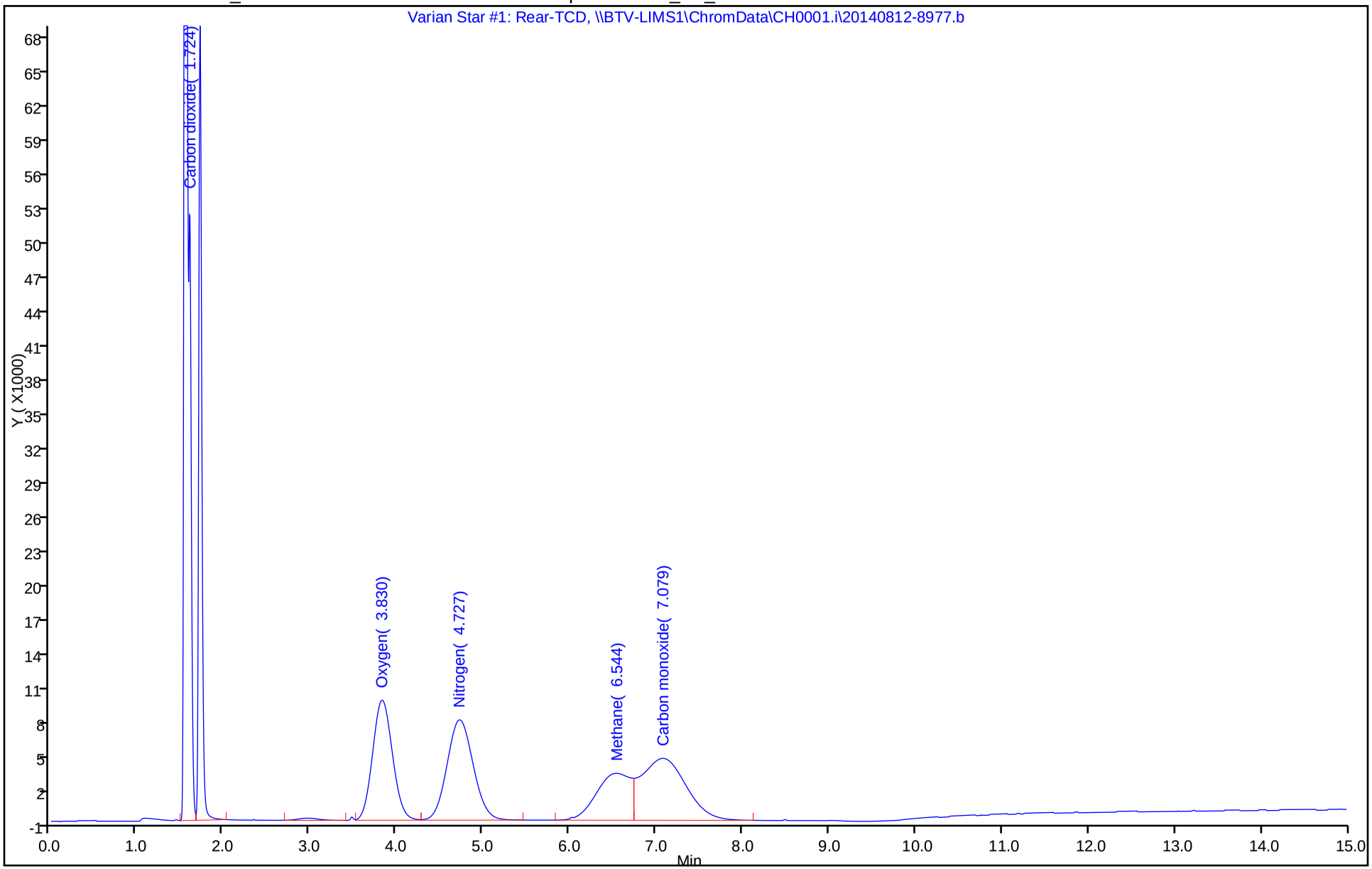
---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 12-Aug-2014 13:21:40 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clcs81114a.d

Injection Date:	12-Aug-2014 12:42:23	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	LCS			Worklist Smp#:	4
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		

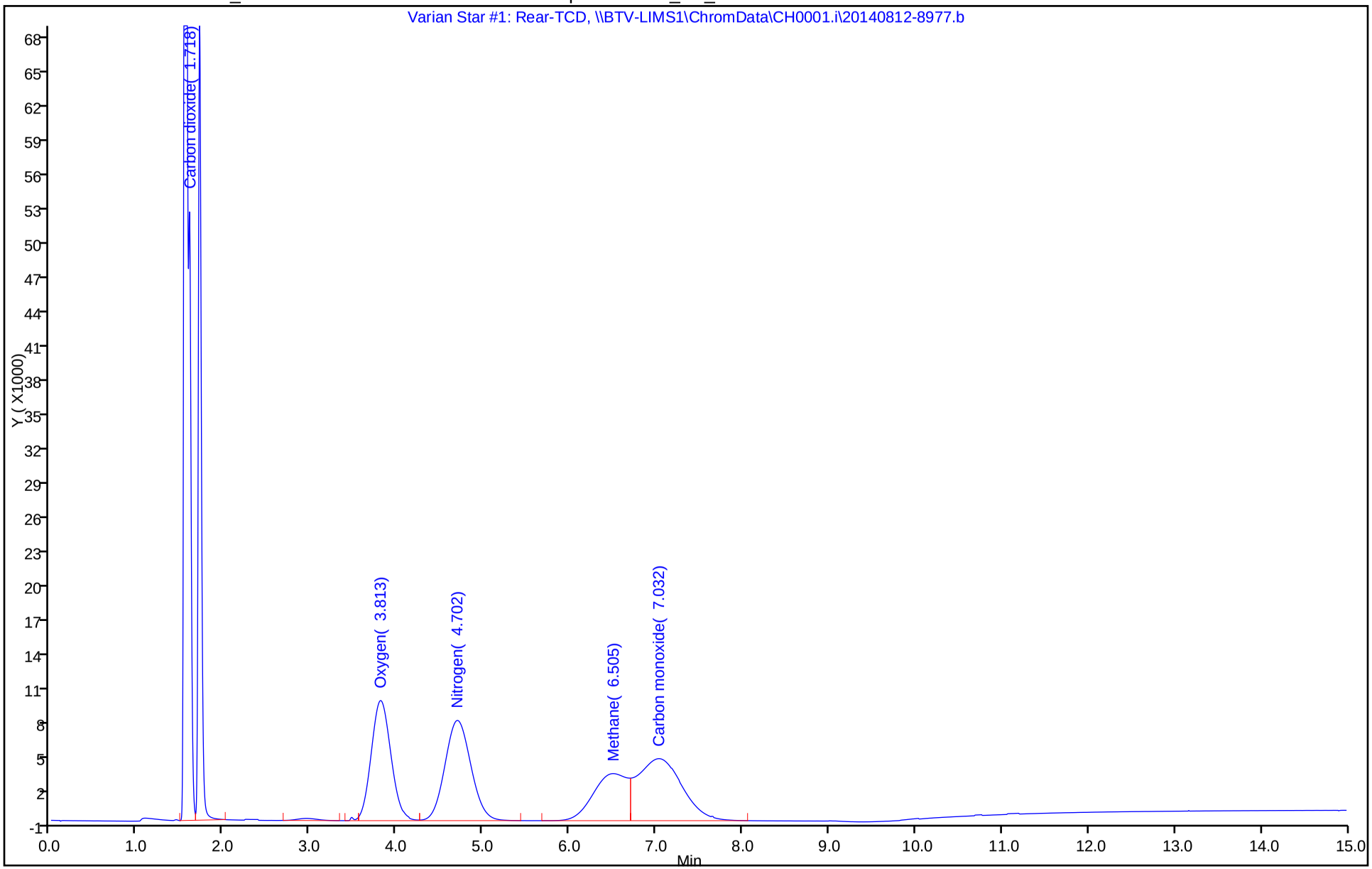


Report Date: 12-Aug-2014 13:21:40 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\3clcs81114b.d

Injection Date:	12-Aug-2014 12:59:17	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	LCS			Worklist Smp#:	5
Client ID:					
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



FORM I
AIR - GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Client Sample ID: 205-VP3a DU Lab Sample ID: 200-23612-2 DU

Matrix: Air Lab File ID: 200-23612-a-2002.d-avg

Analysis Method: EPA 3C Date Collected: 08/10/2014 09:10

Sample wt/vol: 2(mL) Date Analyzed: 08/12/2014 17:18

Soil Aliquot Vol: Dilution Factor: 1

Soil Extract Vol.: GC Column: ID:

% Moisture: Level: (low/med) Low

Analysis Batch No.: 75942 Units: % v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	RL
124-38-9	Carbon dioxide	0.468		0.050	0.050
74-82-8	Methane	0.040	U	0.040	0.040
7727-37-9	Nitrogen	74.8		0.50	0.50
7782-44-7	Oxygen	20.9		0.050	0.050
630-08-0	Carbon monoxide	1.0	U	1.0	1.0

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2002.d
Lims ID: 200-23612-A-2 DU Lab Sample ID: 200-23612-2
Client ID: 205-VP3a
Sample Type: Client
Inject. Date: 12-Aug-2014 17:18:57 ALS Bottle#: 0 Worklist Smp#: 15
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-2
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 15:05:57 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

First Level Reviewer: lyonsb Date: 13-Aug-2014 15:05:00

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.722	1.722	0.000	15563	0.4658	
2 Oxygen	3.800	3.824	-0.024	720863	20.8	
3 Nitrogen	4.652	4.719	-0.067	2790319	74.3	

TestAmerica Burlington
Target Compound Quantitation Report

Data File: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2003.d
Lims ID: 200-23612-A-2 DU Lab Sample ID: 200-23612-2
Client ID: 205-VP3a
Sample Type: Client
Inject. Date: 12-Aug-2014 17:34:48 ALS Bottle#: 0 Worklist Smp#: 38
Purge Vol: 2.000 mL Dil. Factor: 1.0000
Sample Info: 200-23612-A-2
Operator ID: BPL Instrument ID: CH0001.i

Method: \\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\EPA3C_CH0001.i.m
Limit Group: AI_3C_Limits
Last Update: 13-Aug-2014 15:05:57 Calib Date: 20-May-2014 10:45:29
Integrator: Falcon
Quant Method: External Standard Quant By: Initial Calibration
Last ICal File: \\BTV-LIMS1\ChromData\CH0001.i\20140519-7611.b\3cic09051914B.d

Column 1 : Det: Varian Star #1: Rear-TCD
Process Host: XAWRK007

Compound	RT (min.)	Exp RT (min.)	Dlt RT (min.)	Response	OnCol Amt % v/v	Flags
1 Carbon dioxide	1.719	1.722	-0.003	15686	0.4695	
2 Oxygen	3.794	3.824	-0.030	727786	21.0	
3 Nitrogen	4.641	4.719	-0.078	2823188	75.2	

Processing 3C data for files:
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\\corptalsapp05\200-bt-rawdata\organics\gc\ch0001-3hutch\200-23612-a-2003-75924-ai_

Raw Results - Fixed Gases

Analyte	Resp1	Resp2	Avg Resp	RPD
Carbon dioxide	15563	15686	15624.5	0.79
Oxygen	720863	727786	724324.5	0.96
Nitrogen	2790319	2823188	2806753.5	1.17
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

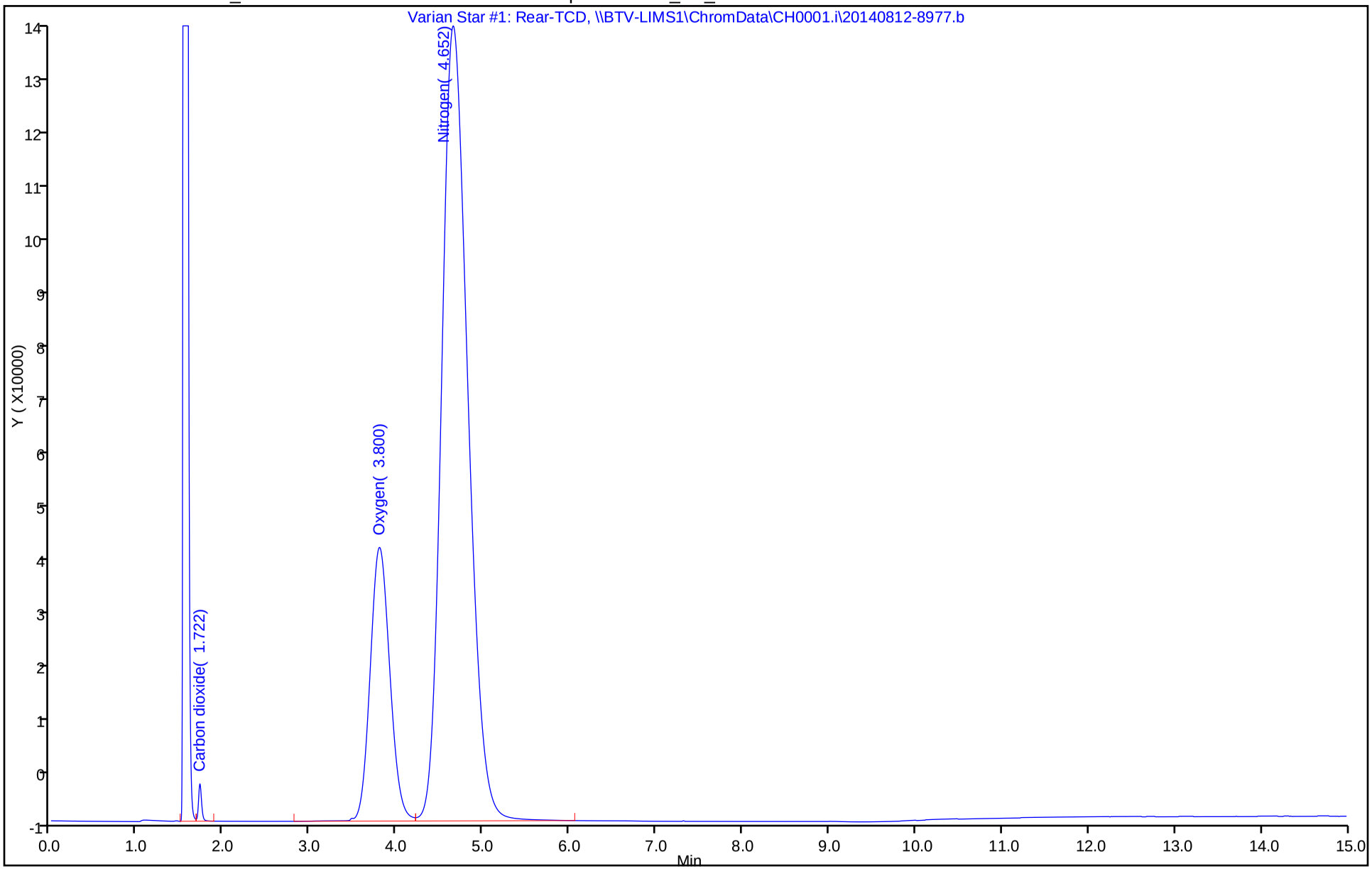
Analyte	Conc1	Conc2	Avg Conc	RPD
Carbon dioxide	0.47	0.47	0.47	0.79
Oxygen	20.76	20.96	20.86	0.96
Nitrogen	74.33	75.2	74.76	1.17
Methane	0	0	0	0
Carbon monoxide	0	0	0	0

---------- NMOC Correction----------
NMOC correction not requested, NMOC correction not applied

Report Date: 13-Aug-2014 15:06:43 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

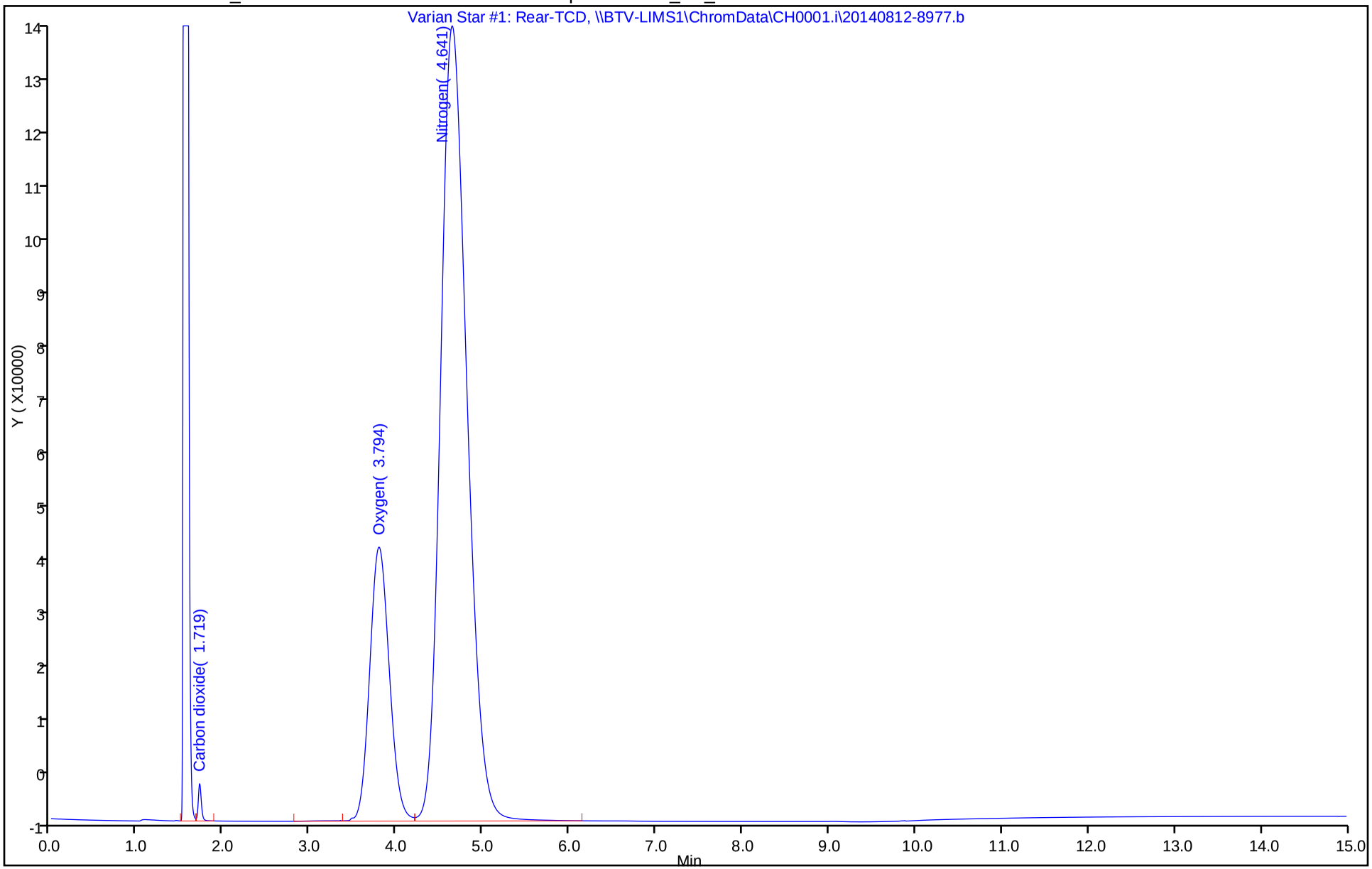
Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2002.d				
Injection Date:	12-Aug-2014 17:18:57	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-2 DU	Lab Sample ID:	200-23612-2	Worklist Smp#:	15
Client ID:	205-VP3a				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



Report Date: 13-Aug-2014 15:06:44 Chrom Revision: 2.2 24-Jun-2014 07:21:42

TestAmerica Burlington

Data File:	\\BTV-LIMS1\ChromData\CH0001.i\20140812-8977.b\200-23612-a-2003.d				
Injection Date:	12-Aug-2014 17:34:48	Instrument ID:	CH0001.i	Operator ID:	BPL
Lims ID:	200-23612-A-2 DU	Lab Sample ID:	200-23612-2	Worklist Smp#:	38
Client ID:	205-VP3a				
Purge Vol:	2.000 mL	Dil. Factor:	1.0000	ALS Bottle#:	0
Method:	EPA3C_CH0001.i	Limit Group:	AI_3C_Limits		



AIR - GC VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Instrument ID: CH0001.i Start Date: 05/19/2014 11:18

Analysis Batch Number: 72381 End Date: 05/20/2014 11:01

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE ANALYZED	DILUTION FACTOR	LAB FILE ID	COLUMN ID
ICIS 200-72381/1		05/19/2014 11:18	1	3cicis051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/2		05/19/2014 12:08	1	3cic6051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/3		05/19/2014 13:13	1	3cic8051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/4		05/19/2014 14:07	1	3cic1051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/5		05/19/2014 14:39	1	3cic2051914A.d-avg	CTR-1 3.175(mm)
IC 200-72381/6		05/19/2014 15:42	1	3cic3051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/7		05/19/2014 16:30	1	3cic5051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/8		05/19/2014 17:18	1	3cic7051914B.d-avg	CTR-1 3.175(mm)
IC 200-72381/9		05/19/2014 18:37	1	3cic10051914A.d-avg	CTR-1 3.175(mm)
IC 200-72381/10		05/20/2014 10:29	1	3cic09051914A.d-avg	CTR-1 3.175(mm)
ICV 200-72381/11		05/20/2014 11:01	1	3cicv051914C.d-avg	CTR-1 3.175(mm)

AIR - GC VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Burlington Job No.: 200-23612-1

SDG No.: 200-23612

Instrument ID: CH0001.i Start Date: 08/12/2014 12:01

Analysis Batch Number: 75942 End Date: 08/13/2014 09:30

LAB SAMPLE ID	CLIENT SAMPLE ID	DATE ANALYZED	DILUTION FACTOR	LAB FILE ID	COLUMN ID
CCV 200-75942/1		08/12/2014 12:01	1	3cccv081114b.d-avg	CTR-1 3.175(mm)
LCS 200-75942/2		08/12/2014 12:42	1	3clcs81114a.d-avg	CTR-1 3.175(mm)
MB 200-75942/3		08/12/2014 14:57	1	mb081114001.d-avg	CTR-1 3.175(mm)
200-23612-1	205-VP3b	08/12/2014 15:31	1	200-23612-a-1a.d-avg	CTR-1 3.175(mm)
200-23612-2	205-VP3a	08/12/2014 17:02	1	200-23612-a-2001.d-avg	CTR-1 3.175(mm)
200-23612-2 DU	205-VP3a DU	08/12/2014 17:18	1	200-23612-a-2002.d-avg	CTR-1 3.175(mm)
200-23612-3	205-VP3a-DUP	08/12/2014 18:38	1	200-23612-a-3001.d-avg	CTR-1 3.175(mm)
200-23612-4	205-VP3c	08/12/2014 19:25	1	200-23612-a-4001.d-avg	CTR-1 3.175(mm)
200-23612-6	CALGAS1000	08/12/2014 21:00	1	200-23612-a-6001.d-avg	CTR-1 3.175(mm)
200-23612-7	CALGAS2000	08/12/2014 21:48	1	200-23612-a-7001.d-avg	CTR-1 3.175(mm)
ZZZZZ		08/12/2014 22:36	1.5		CTR-1 3.175(mm)
CCVC 200-75942/10		08/13/2014 09:30	1	3cccvc081114a.d-avg	CTR-1 3.175(mm)

EPA 3C

Shipping and Receiving Documents

TestAmerica Burlington
30 Community Drive
Suite 11
South Burlington, VT 05403
phone 802.660.1990 fax 802.660.1919

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information	**Project Manager: Paul Nicholson**	**Samples Collected By: Darius Mali**	COC No:
Company Name: Geosyntec Consultants	**Phone: 519-515-0864**		___1___ of ___1___ COCs
Address: 130 Research Lane Suite 2	**Email: pnicholson@geosyntec.com**		
Guelph Ontario, Canada, N1G5G3			**For Lab Use Only:**
Phone: 519-822-2230	**Site Contact:**		Walk-in Client:
FAX: 519-822-3151	**TA Contact:**		Lab Sampling:
Project Name:ESTCP	**Anaylsis Turnaround Time**		
Site/Location: Building 205	Standard (Specific):_____		Job / SDG No.:
P O # TR0479	Rush (Specifiy):_____1-day_____		(See below for Add'l Items)

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, 'Hg (Start)'	Canister Vacuum in Field, 'Hg (Stop)'	Flow Controller ID	Canister ID	TO-15 (Med / Std / Low / SIM)	MA-APH	EPA 3C	EPA 25C / 25.3	ASTM D-1946 / 1945 / 3588	EPA 15/16	TO-3	Other (Please specify in notes section)	*Sample Type*	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)	Sample Specific Notes:
205-VP3b	10-Aug	9:05	9:05	Tedlar Bag						X									X			CO2 CH4 N2 CO
205-VP3a	10-Aug	9:10	**9:10**	Tedlar Bag						X									X			CO2 CH4 N2 CO
205-VP3a-DUP	10-Aug	9:15	**9:15**	Tedlar Bag						X									X			CO2 CH4 N2 CO
205-VP3c	10-Aug	9:20	**9:20**	Tedlar Bag						X									X			CO2 CH4 N2 CO
205-VP3c-DUP	10-Aug	9:25	**9:25**	Tedlar Bag						X									X			CO2 CH4 N2 CO
CALGAS1000	10-Aug	9:30	**9:30**	Tedlar Bag						X									X			CO2 CH4 N2 CO
CALGAS2000	10-Aug	9:35	**9:35**	Tedlar Bag						X									X			CO2 CH4 N2 CO

	Temperature (Fahrenheit)			
	Start	**Interior**	**Ambient**	
	Stop			

	Temperature (Fahrenheit)			
	Start	**Interior**	**Ambient**	
	Stop			

200-23612 Chain of Custody

Special Instructions/QC Requirements & Comments:

Samples Shipped by:	**Date / Time:** 8/11/14/1800	**Samples Received by:**	8/12/14 9:46
Samples Relinquished by:	**Date / Time:** 08/11/14 15:27	**Received by:**	
Relinquished by:	**Date / Time:**	**Received by:**	8/11/14
Lab Use Only: **Shipper Name:**	**Opened by:**	**Condition:**	

Login Sample Receipt Checklist

Client: Geosyntec Consultants, Inc.

Job Number: 200-23612-1
SDG Number: 200-23612

Login Number: 23612
List Number: 1
Creator: Atherton, Joel E

List Source: TestAmerica Burlington

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	NO SAMPLE TIMES ON CONTAINER LABELS
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Refer to Job Narrative for details.
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

ANALYTICAL REPORT

Lab Number:	L1519907
Client:	Geosyntec Consultants 130 Research Lane Suite 2 Guelph, ON N1G563
ATTN:	Todd McAlary
Phone:	(609) 462-1198
Project Name:	ESTCP 2013
Project Number:	TR0479
Report Date:	08/25/15

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Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1519907-01	205-IA-05-PS	AIR	BUILDIING 205	08/16/15 13:22	08/18/15
L1519907-02	205-IA-06-PS-1	AIR	BUILDIING 205	08/16/15 13:22	08/18/15
L1519907-03	205-IA-07-PW	AIR	BUILDIING 205	08/16/15 13:22	08/18/15
L1519907-04	205-IA-01-GS	AIR	BUILDIING 205	08/16/15 13:19	08/18/15
L1519907-05	205-IA-02-GW	AIR	BUILDIING 205	08/16/15 13:19	08/18/15
L1519907-06	205-IA-03-YS	AIR	BUILDIING 205	08/16/15 13:26	08/18/15
L1519907-07	205-IA-04-YW	AIR	BUILDIING 205	08/16/15 13:26	08/18/15
L1519907-08	BUILDING 205_SOUTH EXHAUST	AIR	BUILDIING 205	08/16/15 10:54	08/18/15
L1519907-09	BUILDING 205_NORTH EXHAUST	AIR	BUILDIING 205	08/16/15 10:56	08/18/15
L1519907-10	BUILDING 205_MID EXHAUST	AIR	BUILDIING 205	08/16/15 10:55	08/18/15
L1519907-11	UNUSED CAN #650	AIR	BUILDIING 205		08/18/15

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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: ESTCP 2013 **Lab Number:** L1519907
Project Number: TR0479 **Report Date:** 08/25/15

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on August 13, 2015. The canister certification results are provided as an addendum.

Samples L1519907-01 through -06 and -09 The presence of Isopropyl Alcohol could not be determined in these samples due to a non-target compound interfering with the identification and quantification of this compound.

Samples L1519907-07, -08 and -10: The presence of Acetone could not be determined in these samples due to a non-target compound interfering with the identification and quantification of this compound.

Sample L1519907-07 results for Isopropyl Alcohol should be considered estimated due to co-elution with a non-target peak.

Sample Receipt

The canister ID number for the sample designated 205-IA-04-YW (L1519907-07) is listed on the chain of custody form as 1553 but should be 1593.

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: 08/25/15

AIR

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-01
Client ID: 205-IA-05-PS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 19:00
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.337	0.200	--	1.67	0.989	--		1
Chloromethane	0.599	0.200	--	1.24	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	3.53	2.50	--	6.65	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	7.09	1.00	--	16.8	2.38	--		1
Trichlorofluoromethane	0.248	0.200	--	1.39	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.689	0.500	--	2.39	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.501	0.500	--	1.48	1.47	--		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
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-01 Date Collected: 08/16/15 13:22

Client ID: 205-IA-05-PS Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-01 Date Collected: 08/16/15 13:22

Client ID: 205-IA-05-PS Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	81		60-140
Bromochloromethane	85		60-140
chlorobenzene-d5	88		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-01
Client ID: 205-IA-05-PS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 19:00
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	82		60-140
bromochloromethane	85		60-140
chlorobenzene-d5	88		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-02
Client ID: 205-IA-06-PS-1
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 19:32
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
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								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.496	0.200	--	2.45	0.989	--		1
Chloromethane	0.574	0.200	--	1.19	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	3.60	2.50	--	6.78	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	7.08	1.00	--	16.8	2.38	--		1
Trichlorofluoromethane	0.247	0.200	--	1.39	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.653	0.500	--	2.27	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		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
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
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-02 Date Collected: 08/16/15 13:22

Client ID: 205-IA-06-PS-1 Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-02
Client ID: 205-IA-06-PS-1
Sample Location: BUILDIING 205

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	87		60-140
Bromochloromethane	84		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-02
Client ID: 205-IA-06-PS-1
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 19:32
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	88		60-140
bromochloromethane	85		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-03
Client ID: 205-IA-07-PW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 20:04
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.396	0.200	--	1.96	0.989	--		1
Chloromethane	0.577	0.200	--	1.19	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	4.15	2.50	--	7.82	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	6.45	1.00	--	15.3	2.38	--		1
Trichlorofluoromethane	0.219	0.200	--	1.23	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.684	0.500	--	2.38	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.534	0.500	--	1.57	1.47	--		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
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-03 Date Collected: 08/16/15 13:22

Client ID: 205-IA-07-PW Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
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	0.250	0.200	--	0.942	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
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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-03 Date Collected: 08/16/15 13:22

Client ID: 205-IA-07-PW Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	85		60-140
Bromochloromethane	86		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-03
Client ID: 205-IA-07-PW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 20:04
Analyst: RY

Date Collected: 08/16/15 13:22
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	87		60-140
bromochloromethane	87		60-140
chlorobenzene-d5	92		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-04
Client ID: 205-IA-01-GS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 20:36
Analyst: RY

Date Collected: 08/16/15 13:19
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.521	0.200	--	2.58	0.989	--		1
Chloromethane	0.621	0.200	--	1.28	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	6.24	2.50	--	11.8	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	9.36	1.00	--	22.2	2.38	--		1
Trichlorofluoromethane	0.250	0.200	--	1.40	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.599	0.500	--	2.08	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.643	0.500	--	1.90	1.47	--		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
n-Hexane	0.251	0.200	--	0.885	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-04 Date Collected: 08/16/15 13:19

Client ID: 205-IA-01-GS Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
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	0.308	0.200	--	1.16	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
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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-04 Date Collected: 08/16/15 13:19

Client ID: 205-IA-01-GS Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	84		60-140
Bromochloromethane	85		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-04
Client ID: 205-IA-01-GS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 20:36
Analyst: RY

Date Collected: 08/16/15 13:19
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	86		60-140
bromochloromethane	87		60-140
chlorobenzene-d5	92		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-05
Client ID: 205-IA-02-GW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 21:08
Analyst: RY

Date Collected: 08/16/15 13:19
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.368	0.200	--	1.82	0.989	--		1
Chloromethane	0.632	0.200	--	1.31	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	9.28	2.50	--	17.5	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	10.1	1.00	--	24.0	2.38	--		1
Trichlorofluoromethane	0.254	0.200	--	1.43	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.535	0.500	--	1.86	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.577	0.500	--	1.70	1.47	--		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
n-Hexane	0.272	0.200	--	0.959	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-05 Date Collected: 08/16/15 13:19

Client ID: 205-IA-02-GW Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
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	0.390	0.200	--	1.47	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
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
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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-05
Client ID: 205-IA-02-GW
Sample Location: BUILDIING 205

Date Collected: 08/16/15 13:19
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	84		60-140
Bromochloromethane	87		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-05
Client ID: 205-IA-02-GW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 21:08
Analyst: RY

Date Collected: 08/16/15 13:19
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	0.051	0.020	--	0.206	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	86		60-140
bromochloromethane	88		60-140
chlorobenzene-d5	92		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-06
Client ID: 205-IA-03-YS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 21:41
Analyst: RY

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.417	0.200	--	2.06	0.989	--		1
Chloromethane	0.819	0.200	--	1.69	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	6.28	2.50	--	11.8	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	8.36	1.00	--	19.9	2.38	--		1
Trichlorofluoromethane	0.236	0.200	--	1.33	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
Methylene chloride	0.560	0.500	--	1.95	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.598	0.500	--	1.76	1.47	--		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
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-06 Date Collected: 08/16/15 13:26

Client ID: 205-IA-03-YS Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
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	0.236	0.200	--	0.889	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
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
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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-06
Client ID: 205-IA-03-YS
Sample Location: BUILDIING 205

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	81		60-140
Bromochloromethane	89		60-140
chlorobenzene-d5	89		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-06
Client ID: 205-IA-03-YS
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 21:41
Analyst: RY

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	0.028	0.020	--	0.113	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	0.026	0.020	--	0.140	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	85		60-140
bromochloromethane	91		60-140
chlorobenzene-d5	90		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-07
Client ID: 205-IA-04-YW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 22:13
Analyst: RY

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.571	0.200	--	2.82	0.989	--		1
Chloromethane	0.707	0.200	--	1.46	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	6.31	2.50	--	11.9	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	0.229	0.200	--	1.29	1.12	--		1
iso-Propyl Alcohol	5.09	0.500	--	12.5	1.23	--		1
Methylene chloride	3.76	0.500	--	13.1	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.549	0.500	--	1.62	1.47	--		1
Ethyl Acetate	9.22	0.500	--	33.2	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
n-Hexane	0.385	0.200	--	1.36	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-07 Date Collected: 08/16/15 13:26

Client ID: 205-IA-04-YW Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	0.350	0.200	--	1.20	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
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	0.238	0.200	--	0.975	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	2.68	0.200	--	10.1	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
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	0.273	0.200	--	1.16	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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-07
Client ID: 205-IA-04-YW
Sample Location: BUILDIING 205

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	85		60-140
Bromochloromethane	87		60-140
chlorobenzene-d5	88		60-140

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-07
Client ID: 205-IA-04-YW
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 22:13
Analyst: RY

Date Collected: 08/16/15 13:26
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	0.039	0.020	--	0.158	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	0.035	0.020	--	0.237	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	85		60-140
bromochloromethane	87		60-140
chlorobenzene-d5	87		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-08
Client ID: BUILDING 205_SOUTH EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 22:45
Analyst: RY

Date Collected: 08/16/15 10:54
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.440	0.200	--	2.18	0.989	--		1
Chloromethane	0.576	0.200	--	1.19	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	0.212	0.200	--	1.19	1.12	--		1
iso-Propyl Alcohol	2.32	0.500	--	5.70	1.23	--		1
Methylene chloride	3.40	0.500	--	11.8	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		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
Ethyl Acetate	2.81	0.500	--	10.1	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
n-Hexane	0.245	0.200	--	0.863	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-08 Date Collected: 08/16/15 10:54

Client ID: BUILDING 205_SOUTH EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	0.285	0.200	--	0.981	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
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	0.878	0.200	--	3.31	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
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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-08 Date Collected: 08/16/15 10:54

Client ID: BUILDING 205_SOUTH EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	87		60-140
Bromochloromethane	90		60-140
chlorobenzene-d5	88		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-08
Client ID: BUILDING 205_SOUTH EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 22:45
Analyst: RY

Date Collected: 08/16/15 10:54
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	0.034	0.020	--	0.135	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	89		60-140
bromochloromethane	92		60-140
chlorobenzene-d5	90		60-140

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-09
Client ID: BUILDING 205_NORTH EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 23:17
Analyst: RY

Date Collected: 08/16/15 10:56
Date Received: 08/18/15
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								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.509	0.200	--	2.52	0.989	--		1
Chloromethane	0.632	0.200	--	1.31	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	7.54	2.50	--	14.2	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	8.04	1.00	--	19.1	2.38	--		1
Trichlorofluoromethane	0.236	0.200	--	1.33	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		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
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	0.650	0.500	--	1.92	1.47	--		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
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-09 Date Collected: 08/16/15 10:56

Client ID: BUILDING 205_NORTH EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	0.858	0.200	--	2.95	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
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	0.339	0.200	--	1.28	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
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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-09 Date Collected: 08/16/15 10:56

Client ID: BUILDING 205_NORTH EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	86		60-140
Bromochloromethane	88		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-09
Client ID: BUILDING 205_NORTH EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 23:17
Analyst: RY

Date Collected: 08/16/15 10:56
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	0.022	0.020	--	0.089	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	88		60-140
bromochloromethane	91		60-140
chlorobenzene-d5	92		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-10
Client ID: BUILDING 205_MID EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/21/15 23:49
Analyst: RY

Date Collected: 08/16/15 10:55
Date Received: 08/18/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.487	0.200	--	2.41	0.989	--		1
Chloromethane	0.583	0.200	--	1.20	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	3.22	2.50	--	6.07	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	0.236	0.200	--	1.33	1.12	--		1
iso-Propyl Alcohol	4.25	0.500	--	10.4	1.23	--		1
Methylene chloride	7.18	0.500	--	24.9	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		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
Ethyl Acetate	7.82	0.500	--	28.2	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
n-Hexane	0.401	0.200	--	1.41	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-10 Date Collected: 08/16/15 10:55

Client ID: BUILDING 205_MID EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	0.694	0.200	--	2.39	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
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	2.39	0.200	--	9.01	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
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	0.289	0.200	--	1.23	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

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-10 Date Collected: 08/16/15 10:55

Client ID: BUILDING 205_MID EXHAUST Date Received: 08/18/15

Sample Location: BUILDIING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	84		60-140
Bromochloromethane	90		60-140
chlorobenzene-d5	89		60-140

Project Name: ESTCP 2013 ***Lab Number:*** L1519907

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1519907-10
Client ID: BUILDING 205_MID EXHAUST
Sample Location: BUILDIING 205
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 23:49
Analyst: RY

Date Collected: 08/16/15 10:55
Date Received: 08/18/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	0.026	0.020	--	0.105	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	0.031	0.020	--	0.210	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	87		60-140
bromochloromethane	92		60-140
chlorobenzene-d5	91		60-140

Project Name: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 14:44

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 for sample(s): 01-10 Batch: WG814443-4								
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 14:44

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 for sample(s): 01-10 Batch: WG814443-4								
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	0.020	--	ND	0.092	--		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-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
1,3-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
1,4-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name: ESTCP 2013
Project Number: TR0479
Lab Number: L1519907
Report Date: 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 08/21/15 14:44

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 for sample(s): 01-10 Batch: WG814443-4								
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
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

Project Name: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-10 Batch: WG814444-4								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Propane	ND	0.500	--	ND	0.902	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		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
iso-Propyl Alcohol	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
tert-Butyl Alcohol	ND	0.500	--	ND	1.52	--		1

Project Name: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-10 Batch: WG814444-4								
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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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
Isopropyl Ether	ND	0.200	--	ND	0.836	--		1
Ethyl-Tert-Butyl-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
Tertiary-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1

Project Name: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-10 Batch: WG814444-4								
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
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

Project Name: ESTCP 2013 **Lab Number:** L1519907

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-10 Batch: WG814444-4								
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 (C9)	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
o-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
p-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 (C10)	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 (C12)	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-10 Batch: WG814444-4								
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					

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-10 Batch: WG814443-3								
Dichlorodifluoromethane	87		-		70-130	-		25
Chloromethane	101		-		70-130	-		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	100		-		70-130	-		25
Vinyl chloride	100		-		70-130	-		25
1,3-Butadiene	106		-		70-130	-		25
Bromomethane	97		-		70-130	-		25
Chloroethane	92		-		70-130	-		25
Acetone	102		-		70-130	-		25
Trichlorofluoromethane	100		-		70-130	-		25
Acrylonitrile	92		-		70-130	-		25
1,1-Dichloroethene	98		-		70-130	-		25
Methylene chloride	107		-		70-130	-		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	100		-		70-130	-		25
Halothane	104		-		70-130	-		25
trans-1,2-Dichloroethene	80		-		70-130	-		25
1,1-Dichloroethane	80		-		70-130	-		25
Methyl tert butyl ether	81		-		70-130	-		25
2-Butanone	94		-		70-130	-		25
cis-1,2-Dichloroethene	107		-		70-130	-		25
Chloroform	97		-		70-130	-		25
1,2-Dichloroethane	94		-		70-130	-		25

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-10 Batch: WG814443-3								
1,1,1-Trichloroethane	95		-		70-130	-		25
Benzene	91		-		70-130	-		25
Carbon tetrachloride	105		-		70-130	-		25
1,2-Dichloropropane	94		-		70-130	-		25
Bromodichloromethane	97		-		70-130	-		25
1,4-Dioxane	93		-		70-130	-		25
Trichloroethene	94		-		70-130	-		25
cis-1,3-Dichloropropene	100		-		70-130	-		25
4-Methyl-2-pentanone	97		-		70-130	-		25
trans-1,3-Dichloropropene	86		-		70-130	-		25
1,1,2-Trichloroethane	99		-		70-130	-		25
Toluene	91		-		70-130	-		25
Dibromochloromethane	96		-		70-130	-		25
1,2-Dibromoethane	97		-		70-130	-		25
Tetrachloroethene	92		-		70-130	-		25
1,1,1,2-Tetrachloroethane	88		-		70-130	-		25
Chlorobenzene	93		-		70-130	-		25
Ethylbenzene	93		-		70-130	-		25
p/m-Xylene	93		-		70-130	-		25
Bromoform	96		-		70-130	-		25
Styrene	95		-		70-130	-		25

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-10 Batch: WG814443-3								
1,1,2,2-Tetrachloroethane	98		-		70-130	-		25
o-Xylene	93		-		70-130	-		25
Isopropylbenzene	91		-		70-130	-		25
4-Ethyltoluene	91		-		70-130	-		25
1,3,5-Trimethylbenzene	94		-		70-130	-		25
1,2,4-Trimethylbenzene	97		-		70-130	-		25
1,3-Dichlorobenzene	100		-		70-130	-		25
1,4-Dichlorobenzene	98		-		70-130	-		25
sec-Butylbenzene	91		-		70-130	-		25
p-Isopropyltoluene	86		-		70-130	-		25
1,2-Dichlorobenzene	99		-		70-130	-		25
n-Butylbenzene	101		-		70-130	-		25
1,2,4-Trichlorobenzene	118		-		70-130	-		25
Naphthalene	112		-		70-130	-		25
1,2,3-Trichlorobenzene	114		-		70-130	-		25
Hexachlorobutadiene	107		-		70-130	-		25

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 Batch: WG814444-3								
Chlorodifluoromethane	92		-		70-130	-		
Propylene	110		-		70-130	-		
Propane	83		-		70-130	-		
Dichlorodifluoromethane	92		-		70-130	-		
Chloromethane	102		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	106		-		70-130	-		
Methanol	103		-		70-130	-		
Vinyl chloride	105		-		70-130	-		
1,3-Butadiene	113		-		70-130	-		
Butane	98		-		70-130	-		
Bromomethane	99		-		70-130	-		
Chloroethane	98		-		70-130	-		
Ethyl Alcohol	107		-		70-130	-		
Dichlorofluoromethane	94		-		70-130	-		
Vinyl bromide	100		-		70-130	-		
Acrolein	100		-		70-130	-		
Acetone	108		-		70-130	-		
Acetonitrile	102		-		70-130	-		
Trichlorofluoromethane	99		-		70-130	-		
iso-Propyl Alcohol	109		-		70-130	-		
Acrylonitrile	96		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 Batch: WG814444-3								
Pentane	87		-		70-130	-		
Ethyl ether	93		-		70-130	-		
1,1-Dichloroethene	94		-		70-130	-		
tert-Butyl Alcohol	91		-		70-130	-		
Methylene chloride	98		-		70-130	-		
3-Chloropropene	101		-		70-130	-		
Carbon disulfide	88		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	95		-		70-130	-		
trans-1,2-Dichloroethene	79		-		70-130	-		
1,1-Dichloroethane	83		-		70-130	-		
Methyl tert butyl ether	83		-		70-130	-		
Vinyl acetate	88		-		70-130	-		
2-Butanone	80		-		70-130	-		
cis-1,2-Dichloroethene	103		-		70-130	-		
Ethyl Acetate	101		-		70-130	-		
Chloroform	102		-		70-130	-		
Tetrahydrofuran	94		-		70-130	-		
2,2-Dichloropropane	89		-		70-130	-		
1,2-Dichloroethane	97		-		70-130	-		
n-Hexane	96		-		70-130	-		
Isopropyl Ether	91		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 Batch: WG814444-3								
Ethyl-Tert-Butyl-Ether	90		-		70-130	-		
1,1,1-Trichloroethane	99		-		70-130	-		
1,1-Dichloropropene	94		-		70-130	-		
Benzene	95		-		70-130	-		
Carbon tetrachloride	103		-		70-130	-		
Cyclohexane	100		-		70-130	-		
Tertiary-Amyl Methyl Ether	88		-		70-130	-		
Dibromomethane	94		-		70-130	-		
1,2-Dichloropropane	98		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	100		-		70-130	-		
Trichloroethene	99		-		70-130	-		
2,2,4-Trimethylpentane	96		-		70-130	-		
Methyl Methacrylate	93		-		70-130	-		
Heptane	96		-		70-130	-		
cis-1,3-Dichloropropene	104		-		70-130	-		
4-Methyl-2-pentanone	102		-		70-130	-		
trans-1,3-Dichloropropene	89		-		70-130	-		
1,1,2-Trichloroethane	101		-		70-130	-		
Toluene	93		-		70-130	-		
1,3-Dichloropropane	89		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 Batch: WG814444-3								
2-Hexanone	101		-		70-130	-		
Dibromochloromethane	100		-		70-130	-		
1,2-Dibromoethane	98		-		70-130	-		
Butyl Acetate	95		-		70-130	-		
Octane	86		-		70-130	-		
Tetrachloroethene	94		-		70-130	-		
1,1,1,2-Tetrachloroethane	92		-		70-130	-		
Chlorobenzene	95		-		70-130	-		
Ethylbenzene	94		-		70-130	-		
p/m-Xylene	96		-		70-130	-		
Bromoform	95		-		70-130	-		
Styrene	95		-		70-130	-		
1,1,2,2-Tetrachloroethane	102		-		70-130	-		
o-Xylene	98		-		70-130	-		
1,2,3-Trichloropropane	92		-		70-130	-		
Nonane (C9)	92		-		70-130	-		
Isopropylbenzene	93		-		70-130	-		
Bromobenzene	89		-		70-130	-		
o-Chlorotoluene	89		-		70-130	-		
n-Propylbenzene	92		-		70-130	-		
p-Chlorotoluene	91		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 Batch: WG814444-3								
4-Ethyltoluene	89		-		70-130	-		
1,3,5-Trimethylbenzene	96		-		70-130	-		
tert-Butylbenzene	91		-		70-130	-		
1,2,4-Trimethylbenzene	100		-		70-130	-		
Decane (C10)	94		-		70-130	-		
Benzyl chloride	97		-		70-130	-		
1,3-Dichlorobenzene	99		-		70-130	-		
1,4-Dichlorobenzene	97		-		70-130	-		
sec-Butylbenzene	93		-		70-130	-		
p-Isopropyltoluene	88		-		70-130	-		
1,2-Dichlorobenzene	98		-		70-130	-		
n-Butylbenzene	98		-		70-130	-		
1,2-Dibromo-3-chloropropane	92		-		70-130	-		
Undecane	103		-		70-130	-		
Dodecane (C12)	125		-		70-130	-		
1,2,4-Trichlorobenzene	111		-		70-130	-		
Naphthalene	110		-		70-130	-		
1,2,3-Trichlorobenzene	108		-		70-130	-		
Hexachlorobutadiene	107		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01-10 QC Batch ID: WG814443-5 QC Sample: L1520119-03 Client ID: DUP Sample						
Vinyl chloride	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC		25
1,1,1-Trichloroethane	ND	ND	ppbV	NC		25
Carbon tetrachloride	0.065	0.070	ppbV	7		25
Trichloroethene	ND	ND	ppbV	NC		25
Tetrachloroethene	0.058	0.060	ppbV	3		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample					
Dichlorodifluoromethane	0.386	0.406	ppbV	5	25
Chloromethane	0.761	0.699	ppbV	8	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	11.1	11.3	ppbV	2	25
Vinyl bromide	ND	ND	ppbV	NC	25
Acetone	13.2	13.3	ppbV	1	25
Trichlorofluoromethane	0.243	0.247	ppbV	2	25
iso-Propyl Alcohol	1.96	1.88	ppbV	4	25
tert-Butyl Alcohol	ND	ND	ppbV	NC	25
Methylene chloride	2.17	2.02	ppbV	7	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

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample					
2-Butanone	0.799	0.769	ppbV	4	25
Ethyl Acetate	ND	ND	ppbV	NC	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	0.248	0.312	ppbV	23	25
Benzene	0.202	0.202	ppbV	0	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	0.214	0.231	ppbV	8	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	0.786	0.809	ppbV	3	25
2-Hexanone	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-10 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample					
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
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	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: ESTCP 2013

Project Number: TR0479

Lab Number: L1519907

Report Date: 08/25/15

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
L1519907-01	205-IA-05-PS	0508	SV200	08/13/15	207352		-	-	-	Pass	215	211	2
L1519907-01	205-IA-05-PS	1554	6.0L Can	08/13/15	207352	L1518789-10	Pass	-29.5	-3.8	-	-	-	-
L1519907-02	205-IA-06-PS-1	0705	SV200	08/13/15	207352		-	-	-	Pass	221	218	1
L1519907-02	205-IA-06-PS-1	1611	6.0L Can	08/13/15	207352	L1518789-08	Pass	-29.5	-3.4	-	-	-	-
L1519907-03	205-IA-07-PW	0672	sv200	08/13/15	207352		-	-	-	Pass	216	215	0
L1519907-03	205-IA-07-PW	1704	6.0L Can	08/13/15	207352	L1518789-02	Pass	-29.4	-3.8	-	-	-	-
L1519907-04	205-IA-01-GS	0523	SV200	08/13/15	207352		-	-	-	Pass	217	218	0
L1519907-04	205-IA-01-GS	1053	6.0L Can	08/13/15	207352	L1518789-05	Pass	-29.4	-4.5	-	-	-	-
L1519907-05	205-IA-02-GW	0540	SV200	08/13/15	207352		-	-	-	Pass	213	219	3
L1519907-05	205-IA-02-GW	1856	6.0L Can	08/13/15	207352	L1518789-06	Pass	-29.3	-4.8	-	-	-	-
L1519907-06	205-IA-03-YS	0527	SV200	08/13/15	207352		-	-	-	Pass	219	219	0
L1519907-06	205-IA-03-YS	1984	6.0L Can	08/13/15	207352	L1518789-11	Pass	-29.5	-3.6	-	-	-	-
L1519907-07	205-IA-04-YW	0611	SV200	08/13/15	207352		-	-	-	Pass	215	217	1
L1519907-07	205-IA-04-YW	1593	6.0L Can	08/13/15	207352	L1518789-12	Pass	-29.3	0.0	-	-	-	-
L1519907-08	BUILDING 205_SOUTH EXHAUST	0703	SV200	08/13/15	207352		-	-	-	Pass	220	212	4

Project Name: ESTCP 2013

Project Number: TR0479

Lab Number: L1519907

Report Date: 08/25/15

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
L1519907-08	BUILDING 205_SOUTH EXHAUST	811	6.0L Can	08/13/15	207352	L1518789-07	Pass	-29.3	0.0	-	-	-	-
L1519907-09	BUILDING 205_NORTH EXHAUST	0514	SV200	08/13/15	207352		-	-	-	Pass	214	217	1
L1519907-09	BUILDING 205_NORTH EXHAUST	1702	6.0L Can	08/13/15	207352	L1518789-04	Pass	-29.5	-0.9	-	-	-	-
L1519907-10	BUILDING 205_MID EXHAUST	0518	SV200	08/13/15	207352		-	-	-	Pass	216	213	1
L1519907-10	BUILDING 205_MID EXHAUST	1715	6.0L Can	08/13/15	207352	L1518789-03	Pass	-29.4	0.0	-	-	-	-
L1519907-11	UNUSED CAN #650	0691	SV200	08/13/15	207352		-	-	-	Pass	211	215	2
L1519907-11	UNUSED CAN #650	650	6.0L Can	08/13/15	207352	L1518789-01	Pass	-29.3	-29.1	-	-	-	-

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-01
Client ID: CAN 650 FC 514
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 14:01
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-01
Client ID: CAN 650 FC 514
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-01
Client ID: CAN 650 FC 514
Sample Location:

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-01 Date Collected: 08/07/15 15:46

Client ID: CAN 650 FC 514 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	95		60-140
Bromochloromethane	97		60-140
chlorobenzene-d5	87		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-01
Client ID: CAN 650 FC 514
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 14:01
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	98		60-140
bromochloromethane	100		60-140
chlorobenzene-d5	92		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-02
Client ID: CAN 1704 FC 672
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 14:35
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-02 Date Collected: 08/07/15 15:46

Client ID: CAN 1704 FC 672 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-02 Date Collected: 08/07/15 15:46

Client ID: CAN 1704 FC 672 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-02 Date Collected: 08/07/15 15:46

Client ID: CAN 1704 FC 672 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	90		60-140
Bromochloromethane	91		60-140
chlorobenzene-d5	79		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-02
Client ID: CAN 1704 FC 672
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 14:35
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	93		60-140
bromochloromethane	95		60-140
chlorobenzene-d5	85		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-03
Client ID: CAN 1715 FC 691
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 15:09
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-03
Client ID: CAN 1715 FC 691
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-03 Date Collected: 08/07/15 15:46

Client ID: CAN 1715 FC 691 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-03 Date Collected: 08/07/15 15:46

Client ID: CAN 1715 FC 691 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	88		60-140
Bromochloromethane	91		60-140
chlorobenzene-d5	78		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-03
Client ID: CAN 1715 FC 691
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 15:09
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	92		60-140
bromochloromethane	94		60-140
chlorobenzene-d5	87		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-04
Client ID: CAN 1702 FC 518
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 15:44
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-04
Client ID: CAN 1702 FC 518
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-04 Date Collected: 08/07/15 15:46

Client ID: CAN 1702 FC 518 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-04 Date Collected: 08/07/15 15:46

Client ID: CAN 1702 FC 518 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	93		60-140
Bromochloromethane	94		60-140
chlorobenzene-d5	80		60-140

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-04
Client ID: CAN 1702 FC 518
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 15:44
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	96		60-140
bromochloromethane	97		60-140
chlorobenzene-d5	87		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-05
Client ID: CAN 1053 FC 703
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 16:19
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-05 Date Collected: 08/07/15 15:46

Client ID: CAN 1053 FC 703 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-05
Client ID: CAN 1053 FC 703
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-05 Date Collected: 08/07/15 15:46

Client ID: CAN 1053 FC 703 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	91		60-140
Bromochloromethane	94		60-140
chlorobenzene-d5	83		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-05
Client ID: CAN 1053 FC 703
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 16:19
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	95		60-140
bromochloromethane	98		60-140
chlorobenzene-d5	88		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-06
Client ID: CAN 1856 FC 611
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 16:53
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-06
Client ID: CAN 1856 FC 611
Sample Location:

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-06 Date Collected: 08/07/15 15:46

Client ID: CAN 1856 FC 611 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-06 Date Collected: 08/07/15 15:46

Client ID: CAN 1856 FC 611 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	92		60-140
Bromochloromethane	93		60-140
chlorobenzene-d5	80		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-06
Client ID: CAN 1856 FC 611
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 16:53
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	95		60-140
bromochloromethane	97		60-140
chlorobenzene-d5	87		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-07
Client ID: CAN 811 FC 523
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 17:28
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-07
Client ID: CAN 811 FC 523
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-07 Date Collected: 08/07/15 15:46

Client ID: CAN 811 FC 523 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-07 Date Collected: 08/07/15 15:46

Client ID: CAN 811 FC 523 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	90		60-140
Bromochloromethane	92		60-140
chlorobenzene-d5	78		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-07
Client ID: CAN 811 FC 523
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 17:28
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	93		60-140
bromochloromethane	96		60-140
chlorobenzene-d5	85		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-08
Client ID: CAN 1611 FC 540
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 18:03
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-08 Date Collected: 08/07/15 15:46

Client ID: CAN 1611 FC 540 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-08 Date Collected: 08/07/15 15:46

Client ID: CAN 1611 FC 540 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-08 Date Collected: 08/07/15 15:46

Client ID: CAN 1611 FC 540 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	91		60-140
Bromochloromethane	93		60-140
chlorobenzene-d5	82		60-140

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-08
Client ID: CAN 1611 FC 540
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 18:03
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	95		60-140
bromochloromethane	98		60-140
chlorobenzene-d5	90		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV

Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-10
Client ID: CAN 1554 FC 527
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 19:11
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-10
Client ID: CAN 1554 FC 527
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-10
Client ID: CAN 1554 FC 527
Sample Location:
Date Collected: 08/07/15 15:46
Date Received: 08/07/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-10 Date Collected: 08/07/15 15:46

Client ID: CAN 1554 FC 527 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	89		60-140
Bromochloromethane	91		60-140
chlorobenzene-d5	76		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-10
Client ID: CAN 1554 FC 527
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 19:11
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	92		60-140
bromochloromethane	95		60-140
chlorobenzene-d5	86		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-11
Client ID: CAN 1984 FC 508
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 19:46
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-11 Date Collected: 08/07/15 15:46

Client ID: CAN 1984 FC 508 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-11 Date Collected: 08/07/15 15:46

Client ID: CAN 1984 FC 508 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-11 Date Collected: 08/07/15 15:46

Client ID: CAN 1984 FC 508 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	90		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	78		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-11
Client ID: CAN 1984 FC 508
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 19:46
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	94		60-140
bromochloromethane	96		60-140
chlorobenzene-d5	86		60-140

Project Name: INDIV. CANISTER CERTIFICATION
Project Number: CANISTER QC INDIV
Lab Number: L1518789
Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518789-12
Client ID: CAN 1593 FC 705
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 20:20
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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
Propane	ND	0.500	--	ND	0.902	--		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	2.50	--	ND	4.71	--		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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-12 Date Collected: 08/07/15 15:46

Client ID: CAN 1593 FC 705 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-12 Date Collected: 08/07/15 15:46

Client ID: CAN 1593 FC 705 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-12 Date Collected: 08/07/15 15:46

Client ID: CAN 1593 FC 705 Date Received: 08/07/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	90		60-140
Bromochloromethane	93		60-140
chlorobenzene-d5	81		60-140

Project Name: INDIV. CANISTER CERTIFICATION **Lab Number:** L1518789

Project Number: CANISTER QC INDIV **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518789-12
Client ID: CAN 1593 FC 705
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 20:20
Analyst: RY

Date Collected: 08/07/15 15:46
Date Received: 08/07/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	94		60-140
bromochloromethane	96		60-140
chlorobenzene-d5	87		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1519907
Report Date: 08/25/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information **Custody Seal**

Cooler	
N/A	Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1519907-01A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-02A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-03A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-04A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-05A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-06A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-07A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-08A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-09A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-10A	Canister - 6 Liter	N/A	N/A		Y	Absent	TO15-LL(30),TO15-SIM(30)
L1519907-11A	Canister - 6 Liter	N/A	N/A		Y	Absent	CLEAN-FEE()

*Values in parentheses indicate holding time in days

Project Name:	ESTCP 2013	**Lab Number:**	L1519907
Project Number:	TR0479	**Report Date:**	08/25/15

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.
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.
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

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.

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.

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 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.

Report Format: Data Usability Report

Project Name:	ESTCP 2013	**Lab Number:**	L1519907
Project Number:	TR0479	**Report Date:**	08/25/15

Data Qualifiers

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

Last revised December 16, 2014

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

Westborough Facility
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 625: 4-Chloroaniline, 4-Methylphenol.
SM4500: Soil: Total Phosphorus, TKN, NO2, NO3.
EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility
EPA 8270D: Biphenyl.
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

AIR ANALYSIS

PAGE 1 OF 1

CHAIN OF CUSTODY

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

Date Rec'd in Lab: 8/18/15

ALPHA Job #: L1519907

Client Information

Client: GeoSyntec
Address: 230 Research Ln
Guelph ON N1H 5G3 Canada
Phone: (519) 093-5754
Fax:
Email: dmali@geosyntec.com
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: ESTCP 2013
Project Location: Buildings 205
Project #: TR0479
Project Manager: T. McAlary
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	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
19907-01	205-IA-05-PS	8/16/15	12:56	13:22	29.66	3.87	AA	WW	6L	1554	0508		✓	✓					
-02	205-IA-06-PS-1	8/16/15	12:56	13:22	29.77	3.44	AA	WW	6L	16:11	0705		✓	✓					
-03	205-IA-07-PW	8/16/15	12:56	13:22	29.71	3.80	AA	WW	6L	1704	0672		✓	✓					
-04	205-IA-01-GS	8/16/15	12:55	13:19	29.75	4.39	AA	WW	6L	1053	0523		✓	✓					
-05	205-IA-02-GW	8/16/15	12:55	13:19	29.77	4.62	AA	WW	6L	1856	0540		✓	✓					
-06	205-IA-03-YS	8/16/15	12:59	13:26	29.62	3.60	AA	WW	6L	1984	0527		✓	✓					
-07	205-IA-04-YW	8/16/15	12:59	13:26	29.83	3.18	AA	WW	6L	1553	0611		✓	✓					
-08	Building 205_South Exhaust	8/16/15	10:07	10:54	-29.76	0.17(psi)	AA	DM	6L	811	0703								
-09	Building 205_North Exhaust	8/16/15	10:23	10:56	-30.35	-0.18	AA	DM	6L	1702	0514								
-10	Building 205_Mid Exhaust	8/16/15	10:15	10:55	-30.42	0.20(psi)	AA	DM	6L	1715	0518								

*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:
Fedex	8/16/15 16:00	Fedex	
Fedex	8/18/15 10:03		8/18/15 10:03

ANALYTICAL REPORT

Lab Number:	L1520027
Client:	Geosyntec Consultants 130 Research Lane Suite 2 Guelph, ON N1G563
ATTN:	Todd McAlary
Phone:	(609) 462-1198
Project Name:	ESTCP 2013
Project Number:	TR0479
Report Date:	08/25/15

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1520027-01	205-V3-01-10	SOIL_VAPOR	BUILDING 205	08/16/15 14:45	08/19/15
L1520027-02	205-V3-02-100	SOIL_VAPOR	BUILDING 205	08/16/15 16:35	08/19/15
L1520027-03	205-V3-03-1000	SOIL_VAPOR	BUILDING 205	08/17/15 08:48	08/19/15

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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: ESTCP 2013 **Lab Number:** L1520027
Project Number: TR0479 **Report Date:** 08/25/15

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on August 12, 2015. The canister certification results are provided as an addendum.

Samples L1520027-02 and -03 The presence of Isopropyl Alcohol could not be determined in these samples due to a non-target compound interfering with the identification and quantification of this compound.

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: 08/25/15

AIR

Project Name: ESTCP 2013 ***Lab Number:*** L1520027

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-01
Client ID: 205-V3-01-10
Sample Location: BUILDING 205
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 08/22/15 00:21
Analyst: RY

Date Collected: 08/16/15 14:45
Date Received: 08/19/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.458	0.200	--	2.26	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	1.26	1.00	--	2.99	2.38	--		1
Trichlorofluoromethane	0.277	0.200	--	1.56	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-01
Client ID: 205-V3-01-10
Sample Location: BUILDING 205

Date Collected: 08/16/15 14:45
Date Received: 08/19/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	3.70	0.200	--	18.1	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	46.2	0.200	--	248	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
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

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-01
Client ID: 205-V3-01-10
Sample Location: BUILDING 205

Date Collected: 08/16/15 14:45
Date Received: 08/19/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	87		60-140
Bromochloromethane	87		60-140
chlorobenzene-d5	92		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-02
Client ID: 205-V3-02-100
Sample Location: BUILDING 205
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 08/22/15 00:53
Analyst: RY

Date Collected: 08/16/15 16:35
Date Received: 08/19/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.591	0.200	--	2.92	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	1.47	1.00	--	3.49	2.38	--		1
Trichlorofluoromethane	0.309	0.200	--	1.74	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Methylene chloride	1.17	0.500	--	4.06	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	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: ESTCP 2013 ***Lab Number:*** L1520027

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-02 Date Collected: 08/16/15 16:35

Client ID: 205-V3-02-100 Date Received: 08/19/15

Sample Location: BUILDING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	3.75	0.200	--	18.3	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	45.7	0.200	--	246	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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1520027

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-02 Date Collected: 08/16/15 16:35

Client ID: 205-V3-02-100 Date Received: 08/19/15

Sample Location: BUILDING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	81		60-140
Bromochloromethane	79		60-140
chlorobenzene-d5	90		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-03
Client ID: 205-V3-03-1000
Sample Location: BUILDING 205
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 08/22/15 01:26
Analyst: RY

Date Collected: 08/17/15 08:48
Date Received: 08/19/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.397	0.200	--	1.96	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	1.34	1.00	--	3.18	2.38	--		1
Trichlorofluoromethane	0.326	0.200	--	1.83	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Methylene chloride	1.28	0.500	--	4.45	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	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: ESTCP 2013 ***Lab Number:*** L1520027

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-03 Date Collected: 08/17/15 08:48

Client ID: 205-V3-03-1000 Date Received: 08/19/15

Sample Location: BUILDING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	4.00	0.200	--	19.5	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	0.415	0.200	--	1.46	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	44.7	0.200	--	240	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	0.291	0.200	--	1.19	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
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

Project Name: ESTCP 2013 ***Lab Number:*** L1520027

Project Number: TR0479 ***Report Date:*** 08/25/15

SAMPLE RESULTS

Lab ID: L1520027-03 Date Collected: 08/17/15 08:48

Client ID: 205-V3-03-1000 Date Received: 08/19/15

Sample Location: BUILDING 205 Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	81		60-140
Bromochloromethane	81		60-140
chlorobenzene-d5	87		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-03 Batch: WG814444-4								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Propane	ND	0.500	--	ND	0.902	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		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
iso-Propyl Alcohol	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
tert-Butyl Alcohol	ND	0.500	--	ND	1.52	--		1

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-03 Batch: WG814444-4								
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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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
Isopropyl Ether	ND	0.200	--	ND	0.836	--		1
Ethyl-Tert-Butyl-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
Tertiary-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1

Project Name: ESTCP 2013 **Lab Number:** L1520027

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-03 Batch: WG814444-4								
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
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

Project Name: ESTCP 2013 **Lab Number:** L1520027

Project Number: TR0479 **Report Date:** 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-03 Batch: WG814444-4								
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 (C9)	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
o-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
p-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 (C10)	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 (C12)	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 08/21/15 14:12

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): 01-03 Batch: WG814444-4								
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					

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 Batch: WG814444-3								
Chlorodifluoromethane	92		-		70-130	-		
Propylene	110		-		70-130	-		
Propane	83		-		70-130	-		
Dichlorodifluoromethane	92		-		70-130	-		
Chloromethane	102		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	106		-		70-130	-		
Methanol	103		-		70-130	-		
Vinyl chloride	105		-		70-130	-		
1,3-Butadiene	113		-		70-130	-		
Butane	98		-		70-130	-		
Bromomethane	99		-		70-130	-		
Chloroethane	98		-		70-130	-		
Ethyl Alcohol	107		-		70-130	-		
Dichlorofluoromethane	94		-		70-130	-		
Vinyl bromide	100		-		70-130	-		
Acrolein	100		-		70-130	-		
Acetone	108		-		70-130	-		
Acetonitrile	102		-		70-130	-		
Trichlorofluoromethane	99		-		70-130	-		
iso-Propyl Alcohol	109		-		70-130	-		
Acrylonitrile	96		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 Batch: WG814444-3								
Pentane	87		-		70-130	-		
Ethyl ether	93		-		70-130	-		
1,1-Dichloroethene	94		-		70-130	-		
tert-Butyl Alcohol	91		-		70-130	-		
Methylene chloride	98		-		70-130	-		
3-Chloropropene	101		-		70-130	-		
Carbon disulfide	88		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	95		-		70-130	-		
trans-1,2-Dichloroethene	79		-		70-130	-		
1,1-Dichloroethane	83		-		70-130	-		
Methyl tert butyl ether	83		-		70-130	-		
Vinyl acetate	88		-		70-130	-		
2-Butanone	80		-		70-130	-		
cis-1,2-Dichloroethene	103		-		70-130	-		
Ethyl Acetate	101		-		70-130	-		
Chloroform	102		-		70-130	-		
Tetrahydrofuran	94		-		70-130	-		
2,2-Dichloropropane	89		-		70-130	-		
1,2-Dichloroethane	97		-		70-130	-		
n-Hexane	96		-		70-130	-		
Isopropyl Ether	91		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 Batch: WG814444-3								
Ethyl-Tert-Butyl-Ether	90		-		70-130	-		
1,1,1-Trichloroethane	99		-		70-130	-		
1,1-Dichloropropene	94		-		70-130	-		
Benzene	95		-		70-130	-		
Carbon tetrachloride	103		-		70-130	-		
Cyclohexane	100		-		70-130	-		
Tertiary-Amyl Methyl Ether	88		-		70-130	-		
Dibromomethane	94		-		70-130	-		
1,2-Dichloropropane	98		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	100		-		70-130	-		
Trichloroethene	99		-		70-130	-		
2,2,4-Trimethylpentane	96		-		70-130	-		
Methyl Methacrylate	93		-		70-130	-		
Heptane	96		-		70-130	-		
cis-1,3-Dichloropropene	104		-		70-130	-		
4-Methyl-2-pentanone	102		-		70-130	-		
trans-1,3-Dichloropropene	89		-		70-130	-		
1,1,2-Trichloroethane	101		-		70-130	-		
Toluene	93		-		70-130	-		
1,3-Dichloropropane	89		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 Batch: WG814444-3								
2-Hexanone	101		-		70-130	-		
Dibromochloromethane	100		-		70-130	-		
1,2-Dibromoethane	98		-		70-130	-		
Butyl Acetate	95		-		70-130	-		
Octane	86		-		70-130	-		
Tetrachloroethene	94		-		70-130	-		
1,1,1,2-Tetrachloroethane	92		-		70-130	-		
Chlorobenzene	95		-		70-130	-		
Ethylbenzene	94		-		70-130	-		
p/m-Xylene	96		-		70-130	-		
Bromoform	95		-		70-130	-		
Styrene	95		-		70-130	-		
1,1,2,2-Tetrachloroethane	102		-		70-130	-		
o-Xylene	98		-		70-130	-		
1,2,3-Trichloropropane	92		-		70-130	-		
Nonane (C9)	92		-		70-130	-		
Isopropylbenzene	93		-		70-130	-		
Bromobenzene	89		-		70-130	-		
o-Chlorotoluene	89		-		70-130	-		
n-Propylbenzene	92		-		70-130	-		
p-Chlorotoluene	91		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 Batch: WG814444-3								
4-Ethyltoluene	89		-		70-130	-		
1,3,5-Trimethylbenzene	96		-		70-130	-		
tert-Butylbenzene	91		-		70-130	-		
1,2,4-Trimethylbenzene	100		-		70-130	-		
Decane (C10)	94		-		70-130	-		
Benzyl chloride	97		-		70-130	-		
1,3-Dichlorobenzene	99		-		70-130	-		
1,4-Dichlorobenzene	97		-		70-130	-		
sec-Butylbenzene	93		-		70-130	-		
p-Isopropyltoluene	88		-		70-130	-		
1,2-Dichlorobenzene	98		-		70-130	-		
n-Butylbenzene	98		-		70-130	-		
1,2-Dibromo-3-chloropropane	92		-		70-130	-		
Undecane	103		-		70-130	-		
Dodecane (C12)	125		-		70-130	-		
1,2,4-Trichlorobenzene	111		-		70-130	-		
Naphthalene	110		-		70-130	-		
1,2,3-Trichlorobenzene	108		-		70-130	-		
Hexachlorobutadiene	107		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample						
Dichlorodifluoromethane	0.386	0.406	ppbV	5		25
Chloromethane	0.761	0.699	ppbV	8		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	11.1	11.3	ppbV	2		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	13.2	13.3	ppbV	1		25
Trichlorofluoromethane	0.243	0.247	ppbV	2		25
iso-Propyl Alcohol	1.96	1.88	ppbV	4		25
tert-Butyl Alcohol	ND	ND	ppbV	NC		25
Methylene chloride	2.17	2.02	ppbV	7		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

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample					
2-Butanone	0.799	0.769	ppbV	4	25
Ethyl Acetate	ND	ND	ppbV	NC	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	0.248	0.312	ppbV	23	25
Benzene	0.202	0.202	ppbV	0	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	0.214	0.231	ppbV	8	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	0.786	0.809	ppbV	3	25
2-Hexanone	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG814444-5 QC Sample: L1520119-03 Client ID: DUP Sample					
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
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	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: ESTCP 2013

Project Number: TR0479

Lab Number: L1520027

Report Date: 08/25/15

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
L1520027-01	205-V3-01-10	111	2.7L Can	08/12/15	207454	L1518830-01	Pass	-29.4	-2.2	-	-	-	-
L1520027-02	205-V3-02-100	2073	2.7L Can	08/12/15	207454	L1518830-01	Pass	-28.8	-6.0	-	-	-	-
L1520027-03	205-V3-03-1000	2026	2.7L Can	08/12/15	207454	L1518830-01	Pass	-29.6	-7.0	-	-	-	-

Project Name:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 08/08/15 15:01
Analyst: RY

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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
Propane	ND	0.500	--	ND	0.902	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		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
iso-Propyl Alcohol	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
tert-Butyl Alcohol	ND	0.500	--	ND	1.52	--		1

Project Name: **Lab Number:** L1518830

Project Number: CANISTER QC BAT **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01 Date Collected: 08/07/15 18:00

Client ID: CAN 2079 SHELF 7 Date Received: 08/08/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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
Isopropyl Ether	ND	0.200	--	ND	0.836	--		1
Ethyl-Tert-Butyl-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
Tertiary-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

Project Name:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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 (C9)	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1

Project Name: **Lab Number:** L1518830

Project Number: CANISTER QC BAT **Report Date:** 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01 Date Collected: 08/07/15 18:00

Client ID: CAN 2079 SHELF 7 Date Received: 08/08/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
o-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
p-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 (C10)	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 (C12)	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:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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	89		60-140
Bromochloromethane	82		60-140
chlorobenzene-d5	87		60-140

Project Name:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 08/08/15 15:01
Analyst: RY

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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								
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	0.020	--	ND	0.092	--		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-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name:

Lab Number: L1518830

Project Number: CANISTER QC BAT

Report Date: 08/25/15

Air Canister Certification Results

Lab ID: L1518830-01
Client ID: CAN 2079 SHELF 7
Sample Location:

Date Collected: 08/07/15 18:00
Date Received: 08/08/15
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								
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	89		60-140
bromochloromethane	83		60-140
chlorobenzene-d5	88		60-140

Project Name: ESTCP 2013
Project Number: TR0479

Lab Number: L1520027
Report Date: 08/25/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information **Custody Seal**
Cooler
N/A Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1520027-01A	Canister - 2.7 Liter	N/A	N/A		Y	Absent	TO15-LL(30)
L1520027-02A	Canister - 2.7 Liter	N/A	N/A		Y	Absent	TO15-LL(30)
L1520027-03A	Canister - 2.7 Liter	N/A	N/A		Y	Absent	TO15-LL(30)

*Values in parentheses indicate holding time in days

Project Name:	ESTCP 2013	**Lab Number:**	L1520027
Project Number:	TR0479	**Report Date:**	08/25/15

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.
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.
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

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.

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.

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 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.

Report Format: Data Usability Report

Project Name:	ESTCP 2013	**Lab Number:**	L1520027
Project Number:	TR0479	**Report Date:**	08/25/15

Data Qualifiers

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

Last revised December 16, 2014

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

Westborough Facility
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 625: 4-Chloroaniline, 4-Methylphenol.
SM4500: Soil: Total Phosphorus, TKN, NO2, NO3.
EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility
EPA 8270D: Biphenyl.
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

AIR ANALYSIS

PAGE_____ OF _____

CHAIN OF CUSTODY

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

Date Rec'd in Lab: 8/19/15

ALPHA Job #: L1520027

Client Information

Client: Geosyntec
Address: 230 Research Ln
Guelph ON N1H5G3 Canada
Phone: (519)993-5754
Fax:
Email: dmali@geosyntec.com
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: ESTCP 2013
Project Location: Building 205
Project #: T20479
Project Manager: Todd McAlary
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	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
	~~Blank~~																		
20027-01	205-V3-01-10	8/16/15	1445	1485	29.61		SSD STACK	WW	1L	111	NA		✓						NO VISIBLE VAC ON GAUGE WHEN OPENED
-02	205-V3-02-100	8/16/15	1635	1635	29.04		SSD STACK	WW	1L	203	NA		✓						
-03	205-V3-03-1000	8/17/15	0848	0848	29.87		SSD STACK	EO	1L	2026	NA		✓						

*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:
Fedex	8/17/15 14:00	Fedex	
	8/19/15 10:30	Bethany Bedard	8/19/15 10:30

ANALYTICAL REPORT

Lab Number:	L1521189
Client:	Geosyntec Consultants 130 Research Lane Suite 2 Guelph, ON N1G563
ATTN:	Todd McAlary
Phone:	(609) 462-1198
Project Name:	ESTCP
Project Number:	TR0479
Report Date:	09/08/15

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1521189-01	HSF3-10000	SOIL_VAPOR	B205 FAN 3	08/28/15 18:21	08/31/15

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on August 28, 2015. The canister certification results are provided as an addendum.

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: 09/08/15

AIR

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

SAMPLE RESULTS

Lab ID: L1521189-01
Client ID: HSF3-10000
Sample Location: B205 FAN 3
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 09/03/15 22:54
Analyst: RY

Date Collected: 08/28/15 18:21
Date Received: 08/31/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	0.503	0.200	--	2.49	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.200	--	ND	1.40	--		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
Ethyl Alcohol	7.74	2.50	--	14.6	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	12.3	1.00	--	29.2	2.38	--		1
Trichlorofluoromethane	0.315	0.200	--	1.77	1.12	--		1
iso-Propyl Alcohol	ND	0.500	--	ND	1.23	--		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
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	0.200	--	ND	1.53	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	1.49	0.500	--	4.39	1.47	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	5.34	0.200	--	26.1	0.977	--		1
Tetrahydrofuran	1.11	0.500	--	3.27	1.47	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
Benzene	ND	0.200	--	ND	0.639	--		1

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

SAMPLE RESULTS

Lab ID: L1521189-01
Client ID: HSF3-10000
Sample Location: B205 FAN 3

Date Collected: 08/28/15 18:21
Date Received: 08/31/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Carbon tetrachloride	0.201	0.200	--	1.26	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
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
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
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

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

SAMPLE RESULTS

Lab ID: L1521189-01
Client ID: HSF3-10000
Sample Location: B205 FAN 3

Date Collected: 08/28/15 18:21
Date Received: 08/31/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	91		60-140
Bromochloromethane	91		60-140
chlorobenzene-d5	96		60-140

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

SAMPLE RESULTS

Lab ID: L1521189-01
Client ID: HSF3-10000
Sample Location: B205 FAN 3
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15-SIM
Analytical Date: 09/03/15 22:54
Analyst: RY

Date Collected: 08/28/15 18:21
Date Received: 08/31/15
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								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	42.4	0.020	--	228	0.107	--		1
Tetrachloroethene	0.382	0.020	--	2.59	0.136	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	91		60-140
bromochloromethane	91		60-140
chlorobenzene-d5	96		60-140

Project Name: ESTCP
Project Number: TR0479
Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15-SIM
Analytical Date: 09/03/15 15:01

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 for sample(s): 01 Batch: WG818337-4								
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1

Project Name: ESTCP
Project Number: TR0479
Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/03/15 14:29

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: WG818339-4								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Propane	ND	0.500	--	ND	0.902	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		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
iso-Propyl Alcohol	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
tert-Butyl Alcohol	ND	0.500	--	ND	1.52	--		1

Project Name: ESTCP
Project Number: TR0479
Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/03/15 14:29

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: WG818339-4								
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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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
Isopropyl Ether	ND	0.200	--	ND	0.836	--		1
Ethyl-Tert-Butyl-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
Tertiary-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1

Project Name: ESTCP
Project Number: TR0479
Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/03/15 14:29

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: WG818339-4								
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
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

Project Name: ESTCP
Project Number: TR0479
Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/03/15 14:29

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: WG818339-4								
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 (C9)	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
o-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
p-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 (C10)	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 (C12)	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 09/03/15 14:29

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: WG818339-4								
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					

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01 Batch: WG818337-3								
Dichlorodifluoromethane	105		-		70-130	-		25
Chloromethane	98		-		70-130	-		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	96		-		70-130	-		25
Vinyl chloride	98		-		70-130	-		25
1,3-Butadiene	103		-		70-130	-		25
Bromomethane	95		-		70-130	-		25
Chloroethane	89		-		70-130	-		25
Acetone	102		-		70-130	-		25
Trichlorofluoromethane	98		-		70-130	-		25
Acrylonitrile	91		-		70-130	-		25
1,1-Dichloroethene	97		-		70-130	-		25
Methylene chloride	106		-		70-130	-		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	98		-		70-130	-		25
Halothane	104		-		70-130	-		25
trans-1,2-Dichloroethene	84		-		70-130	-		25
1,1-Dichloroethane	91		-		70-130	-		25
Methyl tert butyl ether	89		-		70-130	-		25
2-Butanone	90		-		70-130	-		25
cis-1,2-Dichloroethene	106		-		70-130	-		25
Chloroform	96		-		70-130	-		25
1,2-Dichloroethane	93		-		70-130	-		25

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01 Batch: WG818337-3								
1,1,1-Trichloroethane	97		-		70-130	-		25
Benzene	89		-		70-130	-		25
Carbon tetrachloride	107		-		70-130	-		25
1,2-Dichloropropane	93		-		70-130	-		25
Bromodichloromethane	99		-		70-130	-		25
1,4-Dioxane	91		-		70-130	-		25
Trichloroethene	93		-		70-130	-		25
cis-1,3-Dichloropropene	100		-		70-130	-		25
4-Methyl-2-pentanone	96		-		70-130	-		25
trans-1,3-Dichloropropene	86		-		70-130	-		25
1,1,2-Trichloroethane	97		-		70-130	-		25
Toluene	88		-		70-130	-		25
Dibromochloromethane	95		-		70-130	-		25
1,2-Dibromoethane	95		-		70-130	-		25
Tetrachloroethene	89		-		70-130	-		25
1,1,1,2-Tetrachloroethane	87		-		70-130	-		25
Chlorobenzene	90		-		70-130	-		25
Ethylbenzene	89		-		70-130	-		25
p/m-Xylene	90		-		70-130	-		25
Bromoform	95		-		70-130	-		25
Styrene	91		-		70-130	-		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: ESTCP

Project Number: TR0479

Lab Number: L1521189

Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01 Batch: WG818337-3								
1,1,2,2-Tetrachloroethane	96		-		70-130	-		25
o-Xylene	90		-		70-130	-		25
Isopropylbenzene	88		-		70-130	-		25
4-Ethyltoluene	88		-		70-130	-		25
1,3,5-Trimethylbenzene	91		-		70-130	-		25
1,2,4-Trimethylbenzene	95		-		70-130	-		25
1,3-Dichlorobenzene	96		-		70-130	-		25
1,4-Dichlorobenzene	96		-		70-130	-		25
sec-Butylbenzene	90		-		70-130	-		25
p-Isopropyltoluene	84		-		70-130	-		25
1,2-Dichlorobenzene	96		-		70-130	-		25
n-Butylbenzene	99		-		70-130	-		25
1,2,4-Trichlorobenzene	112		-		70-130	-		25
Naphthalene	108		-		70-130	-		25
1,2,3-Trichlorobenzene	106		-		70-130	-		25
Hexachlorobutadiene	102		-		70-130	-		25

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG818339-3								
Chlorodifluoromethane	89		-		70-130	-		
Propylene	106		-		70-130	-		
Propane	76		-		70-130	-		
Dichlorodifluoromethane	82		-		70-130	-		
Chloromethane	103		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	104		-		70-130	-		
Methanol	100		-		70-130	-		
Vinyl chloride	102		-		70-130	-		
1,3-Butadiene	110		-		70-130	-		
Butane	95		-		70-130	-		
Bromomethane	94		-		70-130	-		
Chloroethane	99		-		70-130	-		
Ethyl Alcohol	107		-		70-130	-		
Dichlorofluoromethane	92		-		70-130	-		
Vinyl bromide	97		-		70-130	-		
Acrolein	99		-		70-130	-		
Acetone	109		-		70-130	-		
Acetonitrile	103		-		70-130	-		
Trichlorofluoromethane	100		-		70-130	-		
iso-Propyl Alcohol	111		-		70-130	-		
Acrylonitrile	103		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: ESTCP

Project Number: TR0479

Lab Number: L1521189

Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG818339-3								
Pentane	94		-		70-130	-		
Ethyl ether	98		-		70-130	-		
1,1-Dichloroethene	98		-		70-130	-		
tert-Butyl Alcohol	98		-		70-130	-		
Methylene chloride	107		-		70-130	-		
3-Chloropropene	106		-		70-130	-		
Carbon disulfide	97		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	100		-		70-130	-		
trans-1,2-Dichloroethene	86		-		70-130	-		
1,1-Dichloroethane	88		-		70-130	-		
Methyl tert butyl ether	92		-		70-130	-		
Vinyl acetate	103		-		70-130	-		
2-Butanone	97		-		70-130	-		
cis-1,2-Dichloroethene	107		-		70-130	-		
Ethyl Acetate	99		-		70-130	-		
Chloroform	98		-		70-130	-		
Tetrahydrofuran	91		-		70-130	-		
2,2-Dichloropropane	89		-		70-130	-		
1,2-Dichloroethane	97		-		70-130	-		
n-Hexane	94		-		70-130	-		
Isopropyl Ether	92		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG818339-3								
Ethyl-Tert-Butyl-Ether	92		-		70-130	-		
1,1,1-Trichloroethane	97		-		70-130	-		
1,1-Dichloropropene	96		-		70-130	-		
Benzene	92		-		70-130	-		
Carbon tetrachloride	104		-		70-130	-		
Cyclohexane	96		-		70-130	-		
Tertiary-Amyl Methyl Ether	90		-		70-130	-		
Dibromomethane	91		-		70-130	-		
1,2-Dichloropropane	96		-		70-130	-		
Bromodichloromethane	98		-		70-130	-		
1,4-Dioxane	98		-		70-130	-		
Trichloroethene	94		-		70-130	-		
2,2,4-Trimethylpentane	93		-		70-130	-		
Methyl Methacrylate	93		-		70-130	-		
Heptane	95		-		70-130	-		
cis-1,3-Dichloropropene	102		-		70-130	-		
4-Methyl-2-pentanone	101		-		70-130	-		
trans-1,3-Dichloropropene	90		-		70-130	-		
1,1,2-Trichloroethane	99		-		70-130	-		
Toluene	89		-		70-130	-		
1,3-Dichloropropane	85		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG818339-3								
2-Hexanone	99		-		70-130	-		
Dibromochloromethane	97		-		70-130	-		
1,2-Dibromoethane	95		-		70-130	-		
Butyl Acetate	92		-		70-130	-		
Octane	83		-		70-130	-		
Tetrachloroethene	90		-		70-130	-		
1,1,1,2-Tetrachloroethane	88		-		70-130	-		
Chlorobenzene	91		-		70-130	-		
Ethylbenzene	91		-		70-130	-		
p/m-Xylene	93		-		70-130	-		
Bromoform	93		-		70-130	-		
Styrene	92		-		70-130	-		
1,1,2,2-Tetrachloroethane	98		-		70-130	-		
o-Xylene	94		-		70-130	-		
1,2,3-Trichloropropane	90		-		70-130	-		
Nonane (C9)	89		-		70-130	-		
Isopropylbenzene	91		-		70-130	-		
Bromobenzene	88		-		70-130	-		
o-Chlorotoluene	88		-		70-130	-		
n-Propylbenzene	90		-		70-130	-		
p-Chlorotoluene	88		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: ESTCP

Project Number: TR0479

Lab Number: L1521189

Report Date: 09/08/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG818339-3								
4-Ethyltoluene	90		-		70-130	-		
1,3,5-Trimethylbenzene	93		-		70-130	-		
tert-Butylbenzene	90		-		70-130	-		
1,2,4-Trimethylbenzene	97		-		70-130	-		
Decane (C10)	91		-		70-130	-		
Benzyl chloride	96		-		70-130	-		
1,3-Dichlorobenzene	95		-		70-130	-		
1,4-Dichlorobenzene	94		-		70-130	-		
sec-Butylbenzene	89		-		70-130	-		
p-Isopropyltoluene	86		-		70-130	-		
1,2-Dichlorobenzene	93		-		70-130	-		
n-Butylbenzene	96		-		70-130	-		
1,2-Dibromo-3-chloropropane	96		-		70-130	-		
Undecane	99		-		70-130	-		
Dodecane (C12)	124		-		70-130	-		
1,2,4-Trichlorobenzene	110		-		70-130	-		
Naphthalene	106		-		70-130	-		
1,2,3-Trichlorobenzene	107		-		70-130	-		
Hexachlorobutadiene	102		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air by SIM - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG818337-5 QC Sample: L1521189-01 Client ID: HSF3-10000						
Vinyl chloride	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25
1,1-Dichloroethane	ND	ND	ppbV	NC		25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC		25
1,2-Dichloroethane	ND	ND	ppbV	NC		25
1,1,1-Trichloroethane	ND	ND	ppbV	NC		25
Trichloroethene	42.4	44.7	ppbV	5		25
Tetrachloroethene	0.382	0.387	ppbV	1		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG818339-5 QC Sample: L1521189-01 Client ID: HSF3-10000					
Propylene	ND	ND	ppbV	NC	25
Dichlorodifluoromethane	0.503	0.486	ppbV	3	25
Chloromethane	ND	ND	ppbV	NC	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	7.74	7.59	ppbV	2	25
Vinyl bromide	ND	ND	ppbV	NC	25
Acetone	12.3	12.3	ppbV	0	25
Trichlorofluoromethane	0.315	0.299	ppbV	5	25
iso-Propyl 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
Methyl tert butyl ether	ND	ND	ppbV	NC	25
Vinyl acetate	ND	ND	ppbV	NC	25
2-Butanone	1.49	1.38	ppbV	8	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG818339-5 QC Sample: L1521189-01 Client ID: HSF3-10000					
Ethyl Acetate	ND	ND	ppbV	NC	25
Chloroform	5.34	5.29	ppbV	1	25
Tetrahydrofuran	1.11	1.18	ppbV	6	25
n-Hexane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	0.201	0.233	ppbV	15	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	ND	ND	ppbV	NC	25
2-Hexanone	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG818339-5 QC Sample: L1521189-01 Client ID: HSF3-10000					
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	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
Naphthalene	ND	ND	ppbV	NC	25
Hexachlorobutadiene	ND	ND	ppbV	NC	25

Project Name: ESTCP

Project Number: TR0479

Lab Number: L1521189

Report Date: 09/08/15

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
L1521189-01	HSF3-10000	0015	#90 SV	08/28/15	208806		-	-	-	Pass	164	177	8
L1521189-01	HSF3-10000	149B	2.7L Can	08/28/15	208806	L1513470-01	Pass	-29.6	-0.5	-	-	-	-

Project Name:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 06/17/15 17:19
Analyst: RY

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**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
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
Ethyl Alcohol	ND	2.50	--	ND	4.71	--		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
iso-Propyl Alcohol	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
tert-Butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1

Project Name:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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								
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
1,1,2-Trichloro-1,2,2-Trifluoroethane	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
Isopropyl Ether	ND	0.200	--	ND	0.836	--		1
Ethyl-Tert-Butyl-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
Tertiary-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:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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								
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 (C9)	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
o-Chlorotoluene	ND	0.200	--	ND	1.04	--		1

Project Name: **Lab Number:** L1513470

Project Number: CANISTER QC BAT **Report Date:** 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01 Date Collected: 06/15/15 18:00

Client ID: CAN 138 SHELF 1 Date Received: 06/16/15

Sample Location: 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
p-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 (C10)	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 (C12)	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:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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	93		60-140
Bromochloromethane	92		60-140
chlorobenzene-d5	91		60-140

Project Name:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 06/17/15 17:19
Analyst: RY

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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
1,2-Dichloro-1,1,2,2-tetrafluoroethane	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
1,1,2-Trichloro-1,2,2-Trifluoroethane	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:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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								
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	0.020	--	ND	0.092	--		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-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name:

Lab Number: L1513470

Project Number: CANISTER QC BAT

Report Date: 09/08/15

Air Canister Certification Results

Lab ID: L1513470-01
Client ID: CAN 138 SHELF 1
Sample Location:

Date Collected: 06/15/15 18:00
Date Received: 06/16/15
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								
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	95		60-140
bromochloromethane	94		60-140
chlorobenzene-d5	93		60-140

Project Name: ESTCP
Project Number: TR0479

Lab Number: L1521189
Report Date: 09/08/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information	Custody Seal
Cooler	
N/A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1521189-01A	Canister - 2.7 Liter	N/A	N/A	N/A	Y	Absent	TO15-LL(30),TO15-SIM(30)

*Values in parentheses indicate holding time in days

Project Name:	ESTCP	**Lab Number:**	L1521189
Project Number:	TR0479	**Report Date:**	09/08/15

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.
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.
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

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.

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.

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 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.

Report Format: Data Usability Report

Project Name:	ESTCP	**Lab Number:**	L1521189
Project Number:	TR0479	**Report Date:**	09/08/15

Data Qualifiers

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

Last revised December 16, 2014

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

Westborough Facility
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 625: 4-Chloroaniline, 4-Methylphenol.
SM4500: Soil: Total Phosphorus, TKN, NO2, NO3.
EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility
EPA 8270D: Biphenyl.
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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: 9/1/15

ALPHA Job #: L1521189

Client Information

Client: Geosyntec
Address: 130 Research Ln
Guelph ON N1H 5G3
Phone: 519 822 2230
Fax:
Email: dmal@geosyntec.com
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: ESTCP
Project Location: B205 Fan 3
Project #: TR0479
Project Manager: T. McAlary
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)
pnicholson@geosyntec.com

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Other Project Specific Requirements/Comments:

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A by TO-15	TO-15	TO-15 SIM	APH	FIXED GASES	TO-13A	TO-4 / TO-10	Sample Comments (i.e. PID)
21189.01	HSF3-10000	08/28/15	1806	1821	29.34	0.00	SV	DM	2.7	1498	F0015		✓	✓					

ANALYSIS

*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:
Darias Mali	08/29/15 747		
	8-31-15 1830		8-31-15 1830
	9-1-15 0020		9/1/15 0020

ANALYTICAL REPORT

Lab Number:	L1533080
Client:	Geosyntec Consultants, Inc. 130 Stone Road West Guelph, ON N1G 3Z2
ATTN:	Paul Nicholson
Phone:	(519) 575-0864
Project Name:	RARITAN ARSENAL
Project Number:	TR0479-02B
Report Date:	12/21/15

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1533080-01	HSF-03	SOIL_VAPOR	EDISON, NJ	12/14/15 11:10	12/15/15
L1533080-02	HSF-08	SOIL_VAPOR	EDISON, NJ	12/14/15 11:41	12/15/15
L1533080-03	UNUSED CAN #815	SOIL_VAPOR	EDISON, NJ		12/15/15

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

NJ DEP Data of Known Quality Protocols
Conformance/Non-Conformance
Summary Questionnaire

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	YES
1a	Were the method specified handling, preservation, and holding time requirements met?	YES
1b	EPH Method: Was the EPH Method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	YES
3	Were all samples received at an appropriate temperature (4 ± 2° C)?	N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	YES
5a	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	YES
5b	Were these reporting limits met?	YES
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	YES
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	NO

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1a or #1b is "No", the data package does not meet the requirements for "Data of Known Quality".

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Case Narrative (continued)

NJDEP Volatile Organics in Air

Canisters were released from the laboratory on December 11, 2015. The canister certification results are provided as an addendum.

Any Manual integrations that were performed on L1533080 as well as its associated quality control samples and are noted on the individual quantitation reports. A listing of all manual integrations performed and the integration code definitions are provided in manual integration documentation section of the data package.

Please note, dilution analysis due to exceedance of the calibration range is not required for Ethanol or Isopropyl Alcohol.

GC column and trap information utilized for the analysis of this sample delivery group is detailed below:
Column Type: Restek RTX-1
Column Length: 60 Meters
Internal diameter: 0.52 mm
Film thickness: 1.00 um
Trap 1: Entech Cold Trap - no packing material
Trap 2: Entech Tenax - 20 cm packing material

Gaseous calibration standards were utilized for system calibration and quality control standards associated with this sample delivery group. These standards were purchased from Linde (formerly Spectra Gases).

Laboratory standard procedure for QC (i.e. method blanks, LCS) and sample analysis is to withdraw a 250 mL aliquot from the canister as the "1X" analysis. For some calibration levels and samples, subsequent dilutions will be performed as needed by decreasing aliquot volumes via the instrumentation, or performing a dilution using a second canister. Make-up air is not routinely added to canisters prior to sample analysis.

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Case Narrative (continued)

Samples L1533080-01 and -02: Prior to sample analysis, the canisters were pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the samples. The reporting limits have been elevated accordingly.

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: 12/21/15

AIR

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/17/15 22:20
Analyst: MB

Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	0.43	0.42	--	2	2	--		2.113
Chloromethane	ND	0.42	--	ND	0.9	--		2.113
Freon-114	ND	0.42	--	ND	3	--		2.113
Vinyl chloride	ND	0.42	--	ND	1	--		2.113
1,3-Butadiene	ND	0.42	--	ND	0.9	--		2.113
Bromomethane	ND	0.42	--	ND	2	--		2.113
Chloroethane	ND	0.42	--	ND	1	--		2.113
Ethanol	ND	10	--	ND	20	--		2.113
Vinyl bromide	ND	0.42	--	ND	2	--		2.113
Acetone	12	2.1	--	29	5.0	--		2.113
Trichlorofluoromethane	ND	0.42	--	ND	2	--		2.113
Isopropanol	1.3	1.0	--	3	2	--		2.113
1,1-Dichloroethene	ND	0.42	--	ND	2	--		2.113
Tertiary butyl Alcohol	27	1.0	--	82	3.0	--		2.113
Methylene chloride	ND	1.0	--	ND	3	--		2.113
3-Chloropropene	ND	0.42	--	ND	1	--		2.113
Carbon disulfide	ND	0.42	--	ND	1	--		2.113
Freon-113	ND	0.42	--	ND	3	--		2.113
trans-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.113
1,1-Dichloroethane	ND	0.42	--	ND	2	--		2.113
Methyl tert butyl ether	ND	0.42	--	ND	2	--		2.113
2-Butanone	ND	1.0	--	ND	3	--		2.113
cis-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.113
Chloroform	3.0	0.42	--	15	2.1	--		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	ND	1.0	--	ND	3	--		2.113
1,2-Dichloroethane	ND	0.42	--	ND	2	--		2.113
n-Hexane	ND	0.42	--	ND	1	--		2.113
1,1,1-Trichloroethane	ND	0.42	--	ND	2	--		2.113
Benzene	ND	0.42	--	ND	1	--		2.113
Carbon tetrachloride	ND	0.42	--	ND	3	--		2.113
Cyclohexane	ND	0.42	--	ND	1	--		2.113
1,2-Dichloropropane	ND	0.42	--	ND	2	--		2.113
Bromodichloromethane	ND	0.42	--	ND	3	--		2.113
1,4-Dioxane	ND	0.42	--	ND	2	--		2.113
Trichloroethene	46	0.42	--	250	2.3	--		2.113
2,2,4-Trimethylpentane	ND	0.42	--	ND	2	--		2.113
Methyl Methacrylate	ND	1.0	--	ND	4	--		2.113
Heptane	ND	0.42	--	ND	2	--		2.113
cis-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.113
4-Methyl-2-pentanone	ND	1.0	--	ND	4	--		2.113
trans-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.113
1,1,2-Trichloroethane	ND	0.42	--	ND	2	--		2.113
Toluene	ND	0.42	--	ND	2	--		2.113
Dibromochloromethane	ND	0.42	--	ND	4	--		2.113
1,2-Dibromoethane	ND	0.42	--	ND	3	--		2.113
Tetrachloroethene	0.42	0.42	--	3	3	--		2.113
Chlorobenzene	ND	0.42	--	ND	2	--		2.113
Ethylbenzene	ND	0.42	--	ND	2	--		2.113
p/m-Xylene	ND	0.84	--	ND	4	--		2.113
Bromoform	ND	0.42	--	ND	4	--		2.113
Styrene	ND	0.42	--	ND	2	--		2.113
1,1,2,2-Tetrachloroethane	ND	0.42	--	ND	3	--		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.42	--	ND	2	--		2.113
2-Chlorotoluene	ND	0.42	--	ND	2	--		2.113
4-Ethyltoluene	ND	0.42	--	ND	2	--		2.113
1,3,5-Trimethybenzene	ND	0.42	--	ND	2	--		2.113
1,2,4-Trimethylbenzene	ND	0.42	--	ND	2	--		2.113
1,3-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,4-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,2-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,2,4-Trichlorobenzene	ND	0.42	--	ND	3	--		2.113
Hexachlorobutadiene	ND	0.42	--	ND	4	--		2.113

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
unknown alkane	46	J	ppbV		2.113
unknown alkene	89	J	ppbV		2.113
unknown alkane	190	J	ppbV		2.113
unknown alkene	23	J	ppbV		2.113
Unknown Hydrocarbon	15	J	ppbV		2.113
unknown alkane	14	J	ppbV		2.113
unknown alkane	13	J	ppbV		2.113
unknown alkane	14	J	ppbV		2.113
unknown alkane	15	J	ppbV		2.113
unknown alkane	64	J	ppbV		2.113
unknown alkene	15	J	ppbV		2.113
unknown alkane	17	J	ppbV		2.113
unknown alkane	40	J	ppbV		2.113
unknown alkane	53	J	ppbV		2.113
unknown alkane	13	J	ppbV		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		60-140
Bromochloromethane	100		60-140
chlorobenzene-d5	106		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/17/15 23:28
Analyst: MB

Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	0.42	--	ND	2	--		2.129
Chloromethane	ND	0.42	--	ND	0.9	--		2.129
Freon-114	ND	0.42	--	ND	3	--		2.129
Vinyl chloride	ND	0.42	--	ND	1	--		2.129
1,3-Butadiene	ND	0.42	--	ND	0.9	--		2.129
Bromomethane	ND	0.42	--	ND	2	--		2.129
Chloroethane	ND	0.42	--	ND	1	--		2.129
Ethanol	ND	11	--	ND	20	--		2.129
Vinyl bromide	ND	0.42	--	ND	2	--		2.129
Acetone	19	2.1	--	45	5.0	--		2.129
Trichlorofluoromethane	ND	0.42	--	ND	2	--		2.129
Isopropanol	2.3	1.1	--	6	3	--		2.129
1,1-Dichloroethene	ND	0.42	--	ND	2	--		2.129
Tertiary butyl Alcohol	19	1.1	--	58	3.3	--		2.129
Methylene chloride	ND	1.1	--	ND	4	--		2.129
3-Chloropropene	ND	0.42	--	ND	1	--		2.129
Carbon disulfide	ND	0.42	--	ND	1	--		2.129
Freon-113	ND	0.42	--	ND	3	--		2.129
trans-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.129
1,1-Dichloroethane	ND	0.42	--	ND	2	--		2.129
Methyl tert butyl ether	ND	0.42	--	ND	2	--		2.129
2-Butanone	1.6	1.1	--	5	3	--		2.129
cis-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.129
Chloroform	0.47	0.42	--	2	2	--		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	1.4	1.1	--	4	3	--		2.129
1,2-Dichloroethane	ND	0.42	--	ND	2	--		2.129
n-Hexane	ND	0.42	--	ND	1	--		2.129
1,1,1-Trichloroethane	ND	0.42	--	ND	2	--		2.129
Benzene	ND	0.42	--	ND	1	--		2.129
Carbon tetrachloride	ND	0.42	--	ND	3	--		2.129
Cyclohexane	ND	0.42	--	ND	1	--		2.129
1,2-Dichloropropane	ND	0.42	--	ND	2	--		2.129
Bromodichloromethane	ND	0.42	--	ND	3	--		2.129
1,4-Dioxane	ND	0.42	--	ND	2	--		2.129
Trichloroethene	8.2	0.42	--	44	2.3	--		2.129
2,2,4-Trimethylpentane	ND	0.42	--	ND	2	--		2.129
Methyl Methacrylate	ND	1.1	--	ND	5	--		2.129
Heptane	ND	0.42	--	ND	2	--		2.129
cis-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.129
4-Methyl-2-pentanone	ND	1.1	--	ND	5	--		2.129
trans-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.129
1,1,2-Trichloroethane	ND	0.42	--	ND	2	--		2.129
Toluene	ND	0.42	--	ND	2	--		2.129
Dibromochloromethane	ND	0.42	--	ND	4	--		2.129
1,2-Dibromoethane	ND	0.42	--	ND	3	--		2.129
Tetrachloroethene	ND	0.42	--	ND	3	--		2.129
Chlorobenzene	ND	0.42	--	ND	2	--		2.129
Ethylbenzene	ND	0.42	--	ND	2	--		2.129
p/m-Xylene	ND	0.85	--	ND	4	--		2.129
Bromoform	ND	0.42	--	ND	4	--		2.129
Styrene	ND	0.42	--	ND	2	--		2.129
1,1,2,2-Tetrachloroethane	ND	0.42	--	ND	3	--		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.42	--	ND	2	--		2.129
2-Chlorotoluene	ND	0.42	--	ND	2	--		2.129
4-Ethyltoluene	ND	0.42	--	ND	2	--		2.129
1,3,5-Trimethybenzene	ND	0.42	--	ND	2	--		2.129
1,2,4-Trimethylbenzene	ND	0.42	--	ND	2	--		2.129
1,3-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,4-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,2-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,2,4-Trichlorobenzene	ND	0.42	--	ND	3	--		2.129
Hexachlorobutadiene	ND	0.42	--	ND	4	--		2.129

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
Unknown Hydrocarbon	16	J	ppbV		2.129
unknown alkene	60	J	ppbV		2.129
unknown alkane	44	J	ppbV		2.129
unknown alkane	13	J	ppbV		2.129
unknown alkane	35	J	ppbV		2.129
unknown alkane	160	J	ppbV		2.129
unknown alkane	11	J	ppbV		2.129
unknown alkane	42	J	ppbV		2.129
unknown alkane	14	J	ppbV		2.129
unknown alkane	11	J	ppbV		2.129
unknown alkane	13	J	ppbV		2.129
unknown alkane	58	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	102		60-140
Bromochloromethane	104		60-140
chlorobenzene-d5	107		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Dichlorodifluoromethane	ND	0.20	--	ND	1.	--		1
Chloromethane	ND	0.20	--	ND	0.4	--		1
Freon-114	ND	0.20	--	ND	1.	--		1
Vinyl chloride	ND	0.20	--	ND	0.5	--		1
1,3-Butadiene	ND	0.20	--	ND	0.4	--		1
Butane	ND	0.20	--	ND	0.5	--		1
Bromomethane	ND	0.20	--	ND	0.8	--		1
Chloroethane	ND	0.20	--	ND	0.5	--		1
Ethanol	ND	5.0	--	ND	9.	--		1
Vinyl bromide	ND	0.20	--	ND	0.9	--		1
Acetone	ND	1.0	--	ND	2.	--		1
Trichlorofluoromethane	ND	0.20	--	ND	1.	--		1
Isopropanol	ND	0.50	--	ND	1.	--		1
1,1-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Tertiary butyl Alcohol	ND	0.50	--	ND	2.	--		1
Methylene chloride	ND	0.50	--	ND	2.	--		1
3-Chloropropene	ND	0.20	--	ND	0.6	--		1
Carbon disulfide	ND	0.20	--	ND	0.6	--		1
Freon-113	ND	0.20	--	ND	2.	--		1
trans-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
1,1-Dichloroethane	ND	0.20	--	ND	0.8	--		1
Methyl tert butyl ether	ND	0.20	--	ND	0.7	--		1
2-Butanone	ND	0.50	--	ND	1.	--		1
cis-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Chloroform	ND	0.20	--	ND	1.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Tetrahydrofuran	ND	0.50	--	ND	1.	--		1
1,2-Dichloroethane	ND	0.20	--	ND	0.8	--		1
n-Hexane	ND	0.20	--	ND	0.7	--		1
1,1,1-Trichloroethane	ND	0.20	--	ND	1.	--		1
Benzene	ND	0.20	--	ND	0.6	--		1
Carbon tetrachloride	ND	0.20	--	ND	1.	--		1
Cyclohexane	ND	0.20	--	ND	0.7	--		1
1,2-Dichloropropane	ND	0.20	--	ND	0.9	--		1
Bromodichloromethane	ND	0.20	--	ND	1.	--		1
1,4-Dioxane	ND	0.20	--	ND	0.7	--		1
Trichloroethene	ND	0.20	--	ND	1.	--		1
2,2,4-Trimethylpentane	ND	0.20	--	ND	0.9	--		1
Methyl Methacrylate	ND	0.50	--	ND	2.	--		1
Heptane	ND	0.20	--	ND	0.8	--		1
cis-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
4-Methyl-2-pentanone	ND	0.50	--	ND	2.	--		1
trans-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
1,1,2-Trichloroethane	ND	0.20	--	ND	1.	--		1
Toluene	ND	0.20	--	ND	0.8	--		1
Dibromochloromethane	ND	0.20	--	ND	2.	--		1
1,2-Dibromoethane	ND	0.20	--	ND	2.	--		1
Tetrachloroethene	ND	0.20	--	ND	1.	--		1
Chlorobenzene	ND	0.20	--	ND	0.9	--		1
Ethylbenzene	ND	0.20	--	ND	0.9	--		1
p/m-Xylene	ND	0.40	--	ND	2.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Bromoform	ND	0.20	--	ND	2.	--		1
Styrene	ND	0.20	--	ND	0.9	--		1
1,1,2,2-Tetrachloroethane	ND	0.20	--	ND	1.	--		1
o-Xylene	ND	0.20	--	ND	0.9	--		1
2-Chlorotoluene	ND	0.20	--	ND	1.	--		1
4-Ethyltoluene	ND	0.20	--	ND	1.	--		1
1,3,5-Trimethybenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trimethylbenzene	ND	0.20	--	ND	1.	--		1
1,3-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,4-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trichlorobenzene	ND	0.20	--	ND	1.	--		1
Hexachlorobutadiene	ND	0.20	--	ND	2.	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Chlorodifluoromethane	82		-		70-130	-		
Propylene	97		-		70-130	-		
Dichlorodifluoromethane	67		-		40-160	-		
Chloromethane	97		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	93		-		70-130	-		
Methanol	92		-		70-130	-		
Vinyl chloride	99		-		70-130	-		
1,3-Butadiene	100		-		70-130	-		
Butane	94		-		70-130	-		
Bromomethane	100		-		70-130	-		
Chloroethane	99		-		70-130	-		
Ethyl Alcohol	102		-		70-130	-		
Dichlorofluoromethane	89		-		70-130	-		
Vinyl bromide	92		-		70-130	-		
Acrolein	100		-		70-130	-		
Acetone	98		-		40-160	-		
Acetonitrile	97		-		70-130	-		
Trichlorofluoromethane	92		-		70-130	-		
iso-Propyl Alcohol	104		-		70-130	-		
Acrylonitrile	97		-		70-130	-		
Pentane	97		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Ethyl ether	98		-		70-130	-		
1,1-Dichloroethene	97		-		70-130	-		
tert-Butyl Alcohol	95		-		70-130	-		
Methylene chloride	100		-		70-130	-		
3-Chloropropene	110		-		70-130	-		
Carbon disulfide	98		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	95		-		70-130	-		
trans-1,2-Dichloroethene	86		-		70-130	-		
1,1-Dichloroethane	91		-		70-130	-		
Methyl tert butyl ether	94		-		70-130	-		
Vinyl acetate	130		-		70-130	-		
2-Butanone	100		-		70-130	-		
cis-1,2-Dichloroethene	110		-		70-130	-		
Ethyl Acetate	96		-		70-130	-		
Chloroform	94		-		70-130	-		
Tetrahydrofuran	100		-		70-130	-		
2,2-Dichloropropane	86		-		70-130	-		
1,2-Dichloroethane	91		-		70-130	-		
n-Hexane	110		-		70-130	-		
Isopropyl Ether	100		-		70-130	-		
Ethyl-Tert-Butyl-Ether	100		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
1,1,1-Trichloroethane	100		-		70-130	-		
1,1-Dichloropropene	100		-		70-130	-		
Benzene	100		-		70-130	-		
Carbon tetrachloride	100		-		70-130	-		
Cyclohexane	110		-		70-130	-		
Tertiary-Amyl Methyl Ether	100		-		70-130	-		
Dibromomethane	99		-		70-130	-		
1,2-Dichloropropane	110		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	110		-		40-160	-		
Trichloroethene	100		-		70-130	-		
2,2,4-Trimethylpentane	110		-		70-130	-		
Methyl Methacrylate	120		-		70-130	-		
Heptane	120		-		70-130	-		
cis-1,3-Dichloropropene	120		-		70-130	-		
4-Methyl-2-pentanone	120		-		70-130	-		
trans-1,3-Dichloropropene	100		-		70-130	-		
1,1,2-Trichloroethane	110		-		70-130	-		
Toluene	100		-		70-130	-		
1,3-Dichloropropane	95		-		70-130	-		
2-Hexanone	120		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Dibromochloromethane	97		-		70-130	-		
1,2-Dibromoethane	100		-		70-130	-		
Butyl Acetate	96		-		70-130	-		
Octane	96		-		70-130	-		
Tetrachloroethene	94		-		70-130	-		
1,1,1,2-Tetrachloroethane	89		-		70-130	-		
Chlorobenzene	98		-		70-130	-		
Ethylbenzene	100		-		70-130	-		
p/m-Xylene	100		-		70-130	-		
Bromoform	95		-		70-130	-		
Styrene	100		-		70-130	-		
1,1,2,2-Tetrachloroethane	110		-		70-130	-		
o-Xylene	110		-		70-130	-		
1,2,3-Trichloropropane	95		-		70-130	-		
Nonane (C9)	110		-		70-130	-		
Isopropylbenzene	96		-		70-130	-		
Bromobenzene	95		-		70-130	-		
o-Chlorotoluene	93		-		70-130	-		
n-Propylbenzene	94		-		70-130	-		
p-Chlorotoluene	93		-		70-130	-		
4-Ethyltoluene	98		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
1,3,5-Trimethylbenzene	100		-		70-130	-		
tert-Butylbenzene	96		-		70-130	-		
1,2,4-Trimethylbenzene	110		-		70-130	-		
Decane (C10)	100		-		70-130	-		
Benzyl chloride	110		-		70-130	-		
1,3-Dichlorobenzene	100		-		70-130	-		
1,4-Dichlorobenzene	100		-		70-130	-		
sec-Butylbenzene	96		-		70-130	-		
p-Isopropyltoluene	90		-		70-130	-		
1,2-Dichlorobenzene	100		-		70-130	-		
n-Butylbenzene	100		-		70-130	-		
1,2-Dibromo-3-chloropropane	94		-		70-130	-		
Undecane	110		-		70-130	-		
Dodecane (C12)	120		-		70-130	-		
1,2,4-Trichlorobenzene	110		-		40-160	-		
Naphthalene	99		-		40-160	-		
1,2,3-Trichlorobenzene	93		-		70-130	-		
Hexachlorobutadiene	100		-		40-160	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03						
Dichlorodifluoromethane	0.43	ND	ppbV	NC		25
Chloromethane	ND	ND	ppbV	NC		25
Freon-114	ND	ND	ppbV	NC		25
Vinyl chloride	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
Ethanol	ND	ND	ppbV	NC		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	12	12	ppbV	0		25
Trichlorofluoromethane	ND	ND	ppbV	NC		25
Isopropanol	1.3	1.4	ppbV	7		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
Tertiary butyl Alcohol	27	26	ppbV	4		25
Methylene chloride	ND	ND	ppbV	NC		25
3-Chloropropene	ND	ND	ppbV	NC		25
Carbon disulfide	ND	ND	ppbV	NC		25
Freon-113	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Chloroform	3.0	3.0	ppbV	0	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	ND	ND	ppbV	NC	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	ND	ND	ppbV	NC	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
Trichloroethene	46	44	ppbV	4	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25
Methyl Methacrylate	ND	ND	ppbV	NC	25
Heptane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
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	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	0.42	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
2-Chlorotoluene	ND	ND	ppbV	NC	25
4-Ethyltoluene	ND	ND	ppbV	NC	25
1,3,5-Trimethybenzene	ND	ND	ppbV	NC	25
1,2,4-Trimethylbenzene	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
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: RARITAN ARSENAL

Lab Number: L1533080

Project Number: TR0479-02B

Report Date: 12/21/15

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
L1533080-01	HSF-03	723	1.0L Can	12/11/15	214177	L1532196-02	Pass	-29.6	0.0	-	-	-	-
L1533080-02	HSF-08	666	1.0L Can	12/11/15	214177	L1532196-02	Pass	-29.9	0.3	-	-	-	-
L1533080-03	UNUSED CAN #815	815	1.0L Can	12/11/15	214177	L1532196-02	Pass	-30.0	-29.4	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 12/08/15 19:03
Analyst: RY

Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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
Propane	ND	0.500	--	ND	0.902	--		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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: Field Prep: Not Specified

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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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 **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: 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	95		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	93		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 12/08/15 19:03
Analyst: RY

Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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	0.020	--	ND	0.092	--		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
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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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								
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	98		60-140
bromochloromethane	98		60-140
chlorobenzene-d5	93		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information **Custody Seal**

Cooler

N/A Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1533080-01A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)
L1533080-02A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)
L1533080-03A	Canister - 1 Liter	N/A	N/A		Y	Absent	CLEAN-FEE()

*Values in parentheses indicate holding time in days

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

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.

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

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.

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.

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 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).

Report Format: Data Usability Report

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Data Qualifiers

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 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

Alpha Analytical
320 Forbes Blvd
Mansfield, MA 02048-1806
Tel: 508-822-9300
Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab: 12/16/15 | ALPHA Job#: L1533080

1 of 1 COCs

Client Contact Information

Company: Geosyntec
Address: 130 Stone Rd West
City/State/Zip: Guelph ON N1G 3Z2
Phone: 519-575-0864
FAX:
Email: PNicholson@geosyntec.com
Site Contact: Matthew Mraw
Site Contact Phone: (609)-462-1108

Project Information

Project Name: Raritan Arsenal
Project No: TR0479-02B
Site/Location: Edison, NJ
Project Manager: Paul Nicholson

Analysis Turn-Around Time

Standard (Specify): 2 week
Rush (Specify):

NJ DEP Information

Bureau: Division: Contract No:

Report Information - Data Deliverables:

☐ FAX:
☐ ADEx ☐ Criteria Checker:
☑ EMail (standard pdf report)

Billing Information

☐ Same as Client Info PO #:

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field (Hg) (Start)	Canister Pressure in Field (Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure (Hg) (Note1)	Incoming Canister Pressure (Hg) (Note 2)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min) (Note1)	Batch Cert ID (Note 1)	Analysis: TO-15	Analysis: EPA 3C	Matrix: Indoor /Ambient Air	Matrix: Soil Gas
33080.01	HSF-03	12/14/15	1110	1110	29.6	0.8	55.4	55.4	-29.6		—	723	1	—	L1532196-02	✓			✓
.02	HSF-08	12/14/15	1141	1141	29.9	0.8	56.1	56.1	-29.9		—	6666	1	—	L1532196-02	✓			✓

mm

Custody Seals:
Outgoing Seal No: (refer to crate seal) VB 036027
Incoming Seal No: (if applicable) 233

Temperature (Fahrenheit)

	Ambient	Maximum	Minimum
Start	55.4	55.4	55.4
Stop	56.1	56.1	56.1

Pressure (inches of Hg)

	Ambient	Maximum	Minimum
Start	29.90	29.90	29.90
Stop	29.87	29.87	29.87

Individual Preparing Canister/Containers and Laboratory Canister Certification
Name: Lisa Barrett
Signature:

Footnotes:
(1) Refer to equipment tags for these readings.
(2) Readings provided in data deliverable package.

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by:	Date/Time: 12/15/15 1355	Received by:	Date/Time: 12/15/15 1355
Relinquished by:	Date/Time: 12/15/15 23:10	Received by: Albert Williams	Date/Time: 12-15-15 23:10
Albert Williams 12-16-15 04:50			12/16/15 04:50

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

Note: Combined External Chain of Custody and NJDEP Field Test Data Sheet

eurofins | Air Toxics

1/27/2016
Mr. Paul Nicholson
GeoSyntec Consultants
130 Stone Road West

Guelph, Ontario N1G3Z2

Project Name: ESTCP
Project #: TR0479
Workorder #: 1601166

Dear Mr. Paul Nicholson

The following report includes the data for the above referenced project for sample(s) received on 1/14/2016 at Air Toxics Ltd.

The data and associated QC analyzed by Passive S.E. WMS are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

eurofins | Air Toxics

WORK ORDER #: 1601166

Work Order Summary

CLIENT:	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	519-822-2230	**P.O. #**	TR0479
FAX:	519-822-3151	**PROJECT #**	TR0479 ESTCP
DATE RECEIVED:	01/14/2016	**CONTACT:**	Ausha Scott
DATE COMPLETED:	01/20/2016		

FRACTION #	NAME	TEST
01A	HSF-03	Passive S.E. WMS
02A	HSF-08	Passive S.E. WMS
03A	TB-01	Passive S.E. WMS
04A	Lab Blank	Passive S.E. WMS
05A	LCS	Passive S.E. WMS
05AA	LCSD	Passive S.E. WMS

CERTIFIED BY: DATE: 01/21/16

Technical Director

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180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Passive SE by Mod EPA TO-17
GeoSyntec Consultants
Workorder# 1601166

Three WMS-SE samples were received on January 14, 2016. The laboratory analyzed the charcoal sorbent bed of the passive sampler following modified method EPA TO-17. The VOCs were chemically extracted using carbon disulfide and an aliquot of the extract was injected into a GC/MS for identification and quantification of volatile organic compounds (VOCs).

The mass of each target compound adsorbed by the sampler was converted to units of concentration using the sample deployment time and the sampling rate for each VOC. If sampling rates were calculated by the lab or the manufacturer, the concentration result has been flagged as an estimated value. Results are not corrected for desorption efficiency.

The reference method used for this procedure is EPA TO-17, which describes the collection of VOCs in ambient air using sorbents and analysis by GC/MS. Because TO-17 describes active sample collection using a pump and thermal desorption as the preparation step, several modifications are required. Modifications to TO-17 are listed in the table below:

Requirement	***TO-17***	***ATL Modifications***
Sample Collection	Pump pulls measured air volume through sorbent tube	VOCs in air adsorbed onto sorbent bed passively through diffusion
Sample Preparation	Thermal extraction	Solvent extraction
Sorbent tube conditioning	Condition newly packed tubes prior to use	Charcoal-based sorbent is a single use media and conditioning is conducted by vendor.
Instrumentation	Thermal desorption introduction system	Liquid injection introduction system
Internal Standard	Gas-phase internal standard introduced on the tube or focusing trap during analysis	Liquid-phase internal standard introduced on the tube at the time of extraction
Media and sample storage	<4 deg C, 30 days	Media shelf life is determined by vendor; sample hold-time is 6 months for the RAD130 and WMS. Sample preservation requirements are storage in a cool, solvent-free refrigerator and optional use of ice during shipping.
Internal Standard Recovery	+/-40% of daily CCV area	-50% to +100% of daily CCV area

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

To calculate ug/m3 concentrations in the Lab Blank, a sampling duration of 43200 minutes was applied. The assumed temperature used for the uptake rate is listed on the data page. If the field

temperatures were provided, the rate was adjusted in the same manner as the field samples.

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page.

The Relative Percent Difference (RPD) of the LCS/LCSD exceeded acceptance limits for Hexane.

The Trip Blank sample TB-01 has reportable levels of target compounds present.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV
N - The identification is based on presumptive evidence.
C - Estimated concentration due to calculated sampling rate
CN - See case narrative explanation.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
VOC BY PASSIVE SAMPLER - GC/MS

Client Sample ID: HSF-03

Lab ID#: 1601166-01A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloroform	0.050	0.61	0.41	5.0
Trichloroethene	0.050	0.45	13	120
Toluene	0.050	0.37	0.092	0.69
Tetrachloroethene	0.050	0.30	0.32	1.9
1,4-Dichlorobenzene	0.050	0.16	0.051	0.16

Client Sample ID: HSF-08

Lab ID#: 1601166-02A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloroform	0.050	0.61	0.070	0.86
Trichloroethene	0.050	0.45	1.2	11
Toluene	0.050	0.37	0.13	0.94
Tetrachloroethene	0.050	0.30	0.20	1.2
m,p-Xylene	0.050	0.28	0.11	0.63
1,2,4-Trimethylbenzene	0.050	0.16	0.13	0.42
1,4-Dichlorobenzene	0.050	0.16	0.067	0.21
Naphthalene	0.050	0.26	0.14	0.74

Client Sample ID: TB-01

Lab ID#: 1601166-03A

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Toluene	0.050	0.37	0.089	0.66

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Client Sample ID: HSF-03

Lab ID#: 1601166-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011825sim**	**Date of Collection: 1/13/16 8:58:00 AM**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 04:45 PM**	
		Date of Extraction: 1/18/16	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	3.9	Not Detected	Not Detected
Vinyl Chloride	0.20	3.9	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.3	Not Detected	Not Detected
Acetone	0.20	3.6	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.72	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.4	Not Detected	Not Detected
Hexane	0.20	3.1	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.72	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.77	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.61	Not Detected	Not Detected
Chloroform	0.050	0.61	0.41	5.0
Cyclohexane	0.050	0.58	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.77	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.64	Not Detected	Not Detected
Benzene	0.20	2.1	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.53	Not Detected	Not Detected
Heptane	0.050	0.55	Not Detected	Not Detected
Trichloroethene	0.050	0.45	13	120
4-Methyl-2-pentanone	0.10	0.93	Not Detected	Not Detected
Toluene	0.050	0.37	0.092	0.69
1,1,2-Trichloroethane	0.050	0.45	Not Detected	Not Detected
Tetrachloroethene	0.050	0.30	0.32	1.9
Chlorobenzene	0.050	0.32	Not Detected	Not Detected
Ethyl Benzene	0.050	0.28	Not Detected	Not Detected
m,p-Xylene	0.050	0.28	Not Detected	Not Detected
o-Xylene	0.050	0.26	Not Detected	Not Detected
Styrene	0.050	0.26	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.26	Not Detected	Not Detected
Propylbenzene	0.050	0.20	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.16	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.16	0.051	0.16
1,2-Dichlorobenzene	0.050	0.14	Not Detected	Not Detected
Naphthalene	0.050	0.26	Not Detected	Not Detected

Temperature = 30F , duration time = 43058 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: HSF-03

Lab ID#: 1601166-01A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011825sim**	**Date of Collection: 1/13/16 8:58:00 AM**
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 04:45 PM**
		Date of Extraction: 1/18/16

Surrogates	%Recovery	Method Limits
Toluene-d8	105	70-130

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Client Sample ID: HSF-08

Lab ID#: 1601166-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011826sim**	**Date of Collection: 1/13/16 9:08:00 AM**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 05:09 PM**	
		Date of Extraction: 1/18/16	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	3.9	Not Detected	Not Detected
Vinyl Chloride	0.20	3.9	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.3	Not Detected	Not Detected
Acetone	0.20	3.6	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.73	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.4	Not Detected	Not Detected
Hexane	0.20	3.1	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.73	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.77	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.61	Not Detected	Not Detected
Chloroform	0.050	0.61	0.070	0.86
Cyclohexane	0.050	0.58	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.77	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.64	Not Detected	Not Detected
Benzene	0.20	2.1	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.53	Not Detected	Not Detected
Heptane	0.050	0.55	Not Detected	Not Detected
Trichloroethene	0.050	0.45	1.2	11
4-Methyl-2-pentanone	0.10	0.93	Not Detected	Not Detected
Toluene	0.050	0.37	0.13	0.94
1,1,2-Trichloroethane	0.050	0.45	Not Detected	Not Detected
Tetrachloroethene	0.050	0.30	0.20	1.2
Chlorobenzene	0.050	0.32	Not Detected	Not Detected
Ethyl Benzene	0.050	0.28	Not Detected	Not Detected
m,p-Xylene	0.050	0.28	0.11	0.63
o-Xylene	0.050	0.26	Not Detected	Not Detected
Styrene	0.050	0.26	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.26	Not Detected	Not Detected
Propylbenzene	0.050	0.20	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.16	0.13	0.42
1,3-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.16	0.067	0.21
1,2-Dichlorobenzene	0.050	0.14	Not Detected	Not Detected
Naphthalene	0.050	0.26	0.14	0.74

Temperature = 30F , duration time = 43037 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: HSF-08

Lab ID#: 1601166-02A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011826sim**	**Date of Collection: 1/13/16 9:08:00 AM**
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 05:09 PM**
		Date of Extraction: 1/18/16

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130

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Client Sample ID: TB-01

Lab ID#: 1601166-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011812sim**	**Date of Collection: 1/13/16 12:00:00 PM**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 11:32 AM**	
		Date of Extraction: 1/18/16	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	3.8	Not Detected	Not Detected
Vinyl Chloride	0.20	3.8	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.3	Not Detected	Not Detected
Acetone	0.20	3.6	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.72	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.4	Not Detected	Not Detected
Hexane	0.20	3.1	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.72	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.77	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.61	Not Detected	Not Detected
Chloroform	0.050	0.61	Not Detected	Not Detected
Cyclohexane	0.050	0.58	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.77	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.64	Not Detected	Not Detected
Benzene	0.20	2.1	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.53	Not Detected	Not Detected
Heptane	0.050	0.55	Not Detected	Not Detected
Trichloroethene	0.050	0.44	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.92	Not Detected	Not Detected
Toluene	0.050	0.37	0.089	0.66
1,1,2-Trichloroethane	0.050	0.44	Not Detected	Not Detected
Tetrachloroethene	0.050	0.30	Not Detected	Not Detected
Chlorobenzene	0.050	0.32	Not Detected	Not Detected
Ethyl Benzene	0.050	0.28	Not Detected	Not Detected
m,p-Xylene	0.050	0.28	Not Detected	Not Detected
o-Xylene	0.050	0.26	Not Detected	Not Detected
Styrene	0.050	0.26	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.26	Not Detected	Not Detected
Propylbenzene	0.050	0.20	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.16	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.14	Not Detected	Not Detected
Naphthalene	0.050	0.26	Not Detected	Not Detected

Temperature = 30F , duration time = 43200 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: TB-01

Lab ID#: 1601166-03A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011812sim**	**Date of Collection: 1/13/16 12:00:00 PM**
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 11:32 AM**
		Date of Extraction: 1/18/16

Surrogates	%Recovery	Method Limits
Toluene-d8	106	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1601166-04A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011810sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 10:44 AM**	
		Date of Extraction: 1/18/16	

Compound	Rpt. Limit (ug)	Rpt. Limit (ug/m3)	Amount (ug)	Amount (ug/m3)
Chloromethane	0.20	3.8	Not Detected	Not Detected
Vinyl Chloride	0.20	3.8	Not Detected	Not Detected
1,1-Dichloroethene	0.20	3.3	Not Detected	Not Detected
Acetone	0.20	3.6	Not Detected	Not Detected
Methyl tert-butyl ether	0.050	0.72	Not Detected	Not Detected
trans-1,2-Dichloroethene	0.10	1.4	Not Detected	Not Detected
Hexane	0.20	3.1	Not Detected	Not Detected
1,1-Dichloroethane	0.050	0.72	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.050	0.77	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.050	0.61	Not Detected	Not Detected
Chloroform	0.050	0.61	Not Detected	Not Detected
Cyclohexane	0.050	0.58	Not Detected	Not Detected
1,1,1-Trichloroethane	0.050	0.77	Not Detected	Not Detected
Carbon Tetrachloride	0.050	0.64	Not Detected	Not Detected
Benzene	0.20	2.1	Not Detected	Not Detected
1,2-Dichloroethane	0.050	0.53	Not Detected	Not Detected
Heptane	0.050	0.55	Not Detected	Not Detected
Trichloroethene	0.050	0.44	Not Detected	Not Detected
4-Methyl-2-pentanone	0.10	0.92	Not Detected	Not Detected
Toluene	0.050	0.37	Not Detected	Not Detected
1,1,2-Trichloroethane	0.050	0.44	Not Detected	Not Detected
Tetrachloroethene	0.050	0.30	Not Detected	Not Detected
Chlorobenzene	0.050	0.32	Not Detected	Not Detected
Ethyl Benzene	0.050	0.28	Not Detected	Not Detected
m,p-Xylene	0.050	0.28	Not Detected	Not Detected
o-Xylene	0.050	0.26	Not Detected	Not Detected
Styrene	0.050	0.26	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.050	0.26	Not Detected	Not Detected
Propylbenzene	0.050	0.20	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.050	0.18	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.050	0.16	Not Detected	Not Detected
1,3-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,4-Dichlorobenzene	0.050	0.16	Not Detected	Not Detected
1,2-Dichlorobenzene	0.050	0.14	Not Detected	Not Detected
Naphthalene	0.050	0.26	Not Detected	Not Detected

Temperature = 30F , duration time = 43200 minutes.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits

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Client Sample ID: Lab Blank

Lab ID#: 1601166-04A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011810sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 10:44 AM**	
		Date of Extraction: 1/18/16	

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130

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Client Sample ID: LCS

Lab ID#: 1601166-05A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011807sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 09:30 AM**	
		Date of Extraction: 1/18/16	

Compound	%Recovery	Method Limits
Chloromethane	119	50-140
Vinyl Chloride	69	50-140
1,1-Dichloroethene	73	70-130
Acetone	62 Q	70-130
Methyl tert-butyl ether	76	70-130
trans-1,2-Dichloroethene	70	70-130
Hexane	65 Q	70-130
1,1-Dichloroethane	77	70-130
2-Butanone (Methyl Ethyl Ketone)	73	70-130
cis-1,2-Dichloroethene	76	70-130
Chloroform	71	70-130
Cyclohexane	80	70-130
1,1,1-Trichloroethane	86	70-130
Carbon Tetrachloride	86	70-130
Benzene	71	70-130
1,2-Dichloroethane	83	70-130
Heptane	95	70-130
Trichloroethene	84	70-130
4-Methyl-2-pentanone	79	70-130
Toluene	79	70-130
1,1,2-Trichloroethane	80	70-130
Tetrachloroethene	82	70-130
Chlorobenzene	72	70-130
Ethyl Benzene	82	70-130
m,p-Xylene	78	70-130
o-Xylene	74	70-130
Styrene	55	20-100
1,1,2,2-Tetrachloroethane	75	60-130
Propylbenzene	78	70-130
1,3,5-Trimethylbenzene	80	70-130
1,2,4-Trimethylbenzene	76	70-130
1,3-Dichlorobenzene	66	60-130
1,4-Dichlorobenzene	69	60-130
1,2-Dichlorobenzene	58 Q	60-130
Naphthalene	17	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130

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Client Sample ID: LCS

Lab ID#: 1601166-05A

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011807sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 09:30 AM**
		Date of Extraction: 1/18/16

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Client Sample ID: LCSD

Lab ID#: 1601166-05AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011809sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 10:20 AM**	
		Date of Extraction: 1/18/16	

Compound	%Recovery	Method Limits
Chloromethane	127	50-140
Vinyl Chloride	72	50-140
1,1-Dichloroethene	73	70-130
Acetone	64 Q	70-130
Methyl tert-butyl ether	78	70-130
trans-1,2-Dichloroethene	77	70-130
Hexane	90	70-130
1,1-Dichloroethane	76	70-130
2-Butanone (Methyl Ethyl Ketone)	71	70-130
cis-1,2-Dichloroethene	76	70-130
Chloroform	77	70-130
Cyclohexane	79	70-130
1,1,1-Trichloroethane	78	70-130
Carbon Tetrachloride	79	70-130
Benzene	75	70-130
1,2-Dichloroethane	76	70-130
Heptane	87	70-130
Trichloroethene	84	70-130
4-Methyl-2-pentanone	78	70-130
Toluene	80	70-130
1,1,2-Trichloroethane	80	70-130
Tetrachloroethene	83	70-130
Chlorobenzene	73	70-130
Ethyl Benzene	84	70-130
m,p-Xylene	79	70-130
o-Xylene	76	70-130
Styrene	56	20-100
1,1,2,2-Tetrachloroethane	77	60-130
Propylbenzene	79	70-130
1,3,5-Trimethylbenzene	82	70-130
1,2,4-Trimethylbenzene	77	70-130
1,3-Dichlorobenzene	68	60-130
1,4-Dichlorobenzene	71	60-130
1,2-Dichlorobenzene	61	60-130
Naphthalene	19	5-80

Q = Exceeds Quality Control limits.

Container Type: WMS-SE

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130

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Client Sample ID: LCSD

Lab ID#: 1601166-05AA

VOC BY PASSIVE SAMPLER - GC/MS

File Name:	**c011809sim**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 1/18/16 10:20 AM**
		Date of Extraction: 1/18/16

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A TestAmerica Company

Radon Test Report

Geosyntec Consultants, Inc.
Paul Nicholson
130 Stone Road West
Guelph ON NI6563

EMLab ID#: 1480508
Project ID: TRO479
Date Received: January 18, 2016
Date Analyzed: January 19, 2020
Certification #: NRPP#102969AL
NRPP#106267RT

Methods: Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Long-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

Deployment Information

Start Test: 12/14/2015 12:00 AM
Finish Test: 1/13/2016 12:00 PM
Test State: NJ
Elevation (ft): 88

Project Description:
ESTCP

Results

Electret Serial #		Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
LR3105		IA-08	SLT	January 19, 2020	TEG	2.6	0.3
LR3133		IA-05	SLT	January 19, 2020	TEG	1.4	0.2
LR3136		OA-01	SLT	January 19, 2020	TEG	1.0	0.2
LR3142		IA-07	SLT	January 19, 2020	TEG	2.2	0.3
LR3148		IA-12	SLT	January 19, 2020	TEG	1.5	0.2
LR3277	*	HVAC-03	SLT	January 19, 2020	TEG	86.7	4.3
LR3321		IA-09	SLT	January 19, 2020	TEG	1.4	0.2
LR3329		IA-03	SLT	January 19, 2020	TEG	2.2	0.3
LR3459		IA-01	SLT	January 19, 2020	TEG	1.9	0.2
LR3471		IA-04	SLT	January 19, 2020	TEG	1.1	0.2

EMLab P&K
A TestAmerica Company

Radon Test Report

Geosyntec Consultants, Inc.
Paul Nicholson
130 Stone Road West
Guelph ON NI6563

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Deployment Information

Start Test: 12/14/2015 12:00 AM
Finish Test: 1/13/2016 12:00 PM
Test State: NJ
Elevation (ft): 88

Project Description:
ESTCP

Results

Electret Serial #		Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
LR3496		Dup-01	SLT	January 19, 2020	TEG	1.5	0.2
LR7717		IA-02	SLT	January 19, 2020	TEG	2.2	0.3
LR7812		Dup-02	SLT	January 19, 2020	TEG	1.2	0.2
LR7913		OA-02	SLT	January 19, 2020	TEG	1.0	0.2
LR7940		IA-06	SLT	January 19, 2020	TEG	1.4	0.2
LR8007		IA-11	SLT	January 19, 2020	TEG	2.1	0.3
LS3770	**	HVAC-02	SLT	January 19, 2020	TEG	112.7	5.6
LS3680		IA-10	SLT	January 19, 2020	TEG	2.2	0.3
LS3892		HVAC-01	SLT	January 19, 2020	TEG	1.3	0.2

Client has been informed that EMLab is not certified in this region.

* Radon canister returned with loose cap. Most likely contributed to the high readings

** Radon Canister Electret not tightly secured to the bottom of the canister. Also, the label on the electret was removed. Indicates possible corruption of the electret. Most likely reson for high readings.

Authorized Signature/Date:_____

Certified Radon Analyst

1501 W Knudsen Drive, Phoenix, AZ 85027 | 800-651-4802 | 623-780-4800 | Fax 623-780-7695 | www.emlabpk.com

EMLab P&K
A TestAmerica Company

What Do My Test Results Mean?

The concentration of radon is measured in picocuries per liter of air (pCi/L). If your average radon level is less than 4.0 pCi/L, no action is necessary. However, radon levels less than 4.0 pCi/L can still pose some health risk, and in many cases can be reduced. The national average indoor radon level is about 1.3 pCi/L while the average outdoor radon concentration is about 0.4 pCi/L. The higher the radon concentration in the test area, the greater the health risks are to those in the immediate area.

What Do I Do If My Test Results Are Greater than 4.0 pCi/L?

If the test results are 4.0 pCi/L or greater, the EPA recommends that you mitigate to reduce the radon concentrations to an acceptable level. There are simple ways to fix a radon problem that aren't too costly, and even very high concentrations can be reduced to acceptable levels.

What Is the Health Risk Associated with Radon Gas?

Radon is a radioactive gas that comes from the natural breakdown of uranium in the soil. Radon is estimated to cause many thousands of deaths each year from lung cancer, and in fact, it is the second leading cause of lung cancer after smoking. If you smoke, and the test area has high radon levels, your risk of lung cancer is especially high.

Where Can I Get Additional Information on Radon?

For more information, please refer to http://www.epa.gov/radon/index.html

Data Qualifiers

The *Data Qualifiers* identify issues or events that are relevant to your analytical results. A data qualifier includes information about the validity, the source of the data whether calculated, entered or estimated, and the value of an observation. In each case the data qualifiers provide significant information vital to the interpretation of the laboratory data.

Site #2: Building 200

Former Raritan Arsenal

EMLab P&K
A TestAmerica Company

Radon Test Report

Geosyntec Consultants, Inc
Paul Nicholson
130 Research Lane Suite 2
Guelph, ON N1G5A5 Canada

EMLab ID#: 1425076
Project ID: TR0479
Date Received: September 17, 2015
Date Analyzed: September 17, 2015
Certification #: NRPP#102969AL
NRPP#103751RT

Methods: Rad Elec E-PERM Electret Ion Chamber System samples were analyzed via a SPER-1 Electret Reader, Serial Number SIN00702. Short-term radon tests are intended to give you an indication of the radon levels during the measurement period in the areas tested. The results of the radon measurements that you performed are as follows:

Deployment Information

Start Test: 8/16/2015 2:15 PM
Finish Test: 9/15/2015 9:15 AM
Test State: NJ
Elevation (ft): 88

Project Description: **ESTCP**

Results

Electret Serial #	Sample Location	Device Type	Analysis Date	Analyst	Radon pCi/L	(+/-) pCi/L
SIE366	C-5	SST	September 17, 2015	TEG	0.4	0.1
SIE416	C-211	SST	September 17, 2015	TEG	0.3	0.1
SIE437	C-125	SST	September 17, 2015	TEG	0.3	0.1
SIE454	C-204	SST	September 17, 2015	TEG	0.5	0.1
SIE574	C-5	SST	September 17, 2015	TEG	0.3	0.1
SIE619	C-77	SST	September 17, 2015	TEG	0.6	0.1

Authorized Signature/Date:_____

Certified Radon Analyst

EMLab P&K
A TestAmerica Company

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What Do I Do If My Test Results Are Greater than 4.0 pCi/L?

If the test results are 4.0 pCi/L or greater, the EPA recommends that you mitigate to reduce the radon concentrations to an acceptable level. There are simple ways to fix a radon problem that aren't too costly, and even very high concentrations can be reduced to acceptable levels.

What Is the Health Risk Associated with Radon Gas?

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Where Can I Get Additional Information on Radon?

For more information, please refer to http://www.epa.gov/radon/index.html

Data Qualifiers

The *Data Qualifiers* identify issues or events that are relevant to your analytical results. A data qualifier includes information about the validity, the source of the data whether calculated, entered or estimated, and the value of an observation. In each case the data qualifiers provide significant information vital to the interpretation of the laboratory data.

~24 Radon in Building 200

Reading

Uncertainty

Time

1001 0.00±56.1 B Sniff
SAT 15-AUG-15 15:26
29.0°C RH: 7% B:6.82V

1002 60.3±68.0 B Sniff
SAT 15-AUG-15 15:56
29.0°C RH: 9% B:6.82V

1003 21.9±63.6 B Sniff
SAT 15-AUG-15 16:26
28.7°C RH: 5% B:6.42V

1004 32.9±65.8 B Sniff
SAT 15-AUG-15 16:56
28.7°C RH: 5% B:6.79V

1005 16.5±65.9 B Sniff
SAT 15-AUG-15 17:26
28.4°C RH: 4% B:6.76V

1006 0.00±60.0 B Sniff
SAT 15-AUG-15 17:56
27.7°C RH: 4% B:6.76V

1007 18.5±30.1 B Normal
SAT 15-AUG-15 18:26
26.5°C RH: 4% B:6.79V

1008 23.8±31.2 B Normal
SAT 15-AUG-15 18:56
26.5°C RH: 4% B:6.82V

1009 18.5±27.1 B Normal
SAT 15-AUG-15 19:26
27.1°C RH: 4% B:6.64V

1010 5.29±27.1 B Normal
SAT 15-AUG-15 19:56
26.2°C RH: 4% B:6.67V

1011 5.29±29.6 B Normal
SAT 15-AUG-15 20:26
26.2°C RH: 4% B:6.82V

1012 0.00±22.9 B Normal
SAT 15-AUG-15 20:56
26.8°C RH: 4% B:6.58V

1013 15.9±26.5 B Normal
SAT 15-AUG-15 21:26
27.1°C RH: 4% B:6.61V

1014 2.65±25.8 B Normal
SAT 15-AUG-15 21:56
26.5°C RH: 3% B:6.91V

1015 18.5±27.1 B Normal
SAT 15-AUG-15 22:26
26.2°C RH: 3% B:6.91V

1016 0.00±24.4 B Normal
SAT 15-AUG-15 22:56
26.5°C RH: 3% B:6.94V

1017 7.95±27.8 B Normal
SAT 15-AUG-15 23:26
26.8°C RH: 3% B:6.94V

1018 13.2±25.8 B Normal
SAT 15-AUG-15 23:56
26.8°C RH: 3% B:6.94V

1019 13.2±30.1 B Normal
SUN 16-AUG-15 00:26
26.5°C RH: 3% B:6.94V

1020 15.9±26.5 B Normal
SUN 16-AUG-15 00:56
26.5°C RH: 3% B:6.94V

1021 2.65±23.6 B Normal
SUN 16-AUG-15 01:26
26.5°C RH: 3% B:6.94V

1022 18.5±29.0 B Normal
SUN 16-AUG-15 01:56
26.8°C RH: 3% B:6.94V

1023 18.5±26.5 B Normal
SUN 16-AUG-15 02:26
26.8°C RH: 3% B:6.94V

1024 5.30±22.9 B Normal
SUN 16-AUG-15 02:56
27.1°C RH: 3% B:6.94V

1025 21.2±25.8 B Normal
SUN 16-AUG-15 03:26
26.8°C RH: 3% B:6.94V

1026 18.5±25.1 B Normal
SUN 16-AUG-15 03:56
26.2°C RH: 3% B:6.94V

1027 10.6±24.4 B Normal
SUN 16-AUG-15 04:26
26.5°C RH: 3% B:6.91V

1028 10.6±22.9 B Normal
SUN 16-AUG-15 04:56
26.5°C RH: 3% B:6.94V

1029 10.6±24.4 B Normal
SUN 16-AUG-15 05:26
26.8°C RH: 3% B:6.94V

1030 18.5±25.1 B Normal
SUN 16-AUG-15 05:56
26.8°C RH: 3% B:6.97V

1031 0.00±20.3 B Normal
SUN 16-AUG-15 06:26
27.1°C RH: 3% B:6.91V

1032 10.6±22.1 B Normal
SUN 16-AUG-15 06:56
27.1°C RH: 3% B:6.94V

1033 5.29±20.3 B Normal
SUN 16-AUG-15 07:26
27.1°C RH: 3% B:6.94V

1034 0.00±17.1 B Normal
SUN 16-AUG-15 07:56
26.5°C RH: 3% B:6.94V

1035 21.2±23.6 B Normal
SUN 16-AUG-15 08:26
26.2°C RH: 3% B:6.94V

1036 10.6±22.9 B Normal
SUN 16-AUG-15 08:56
25.9°C RH: 3% B:6.94V

1037 10.6±19.3 B Normal
SUN 16-AUG-15 09:27
26.2°C RH: 3% B:6.94V

1038 10.6±22.0 B Normal
SUN 16-AUG-15 09:57
26.5°C RH: 3% B:6.94V

1039 23.8±26.5 B Normal
SUN 16-AUG-15 10:27
26.5°C RH: 3% B:6.97V

1040 0.00±20.3 B Normal
SUN 16-AUG-15 10:57
26.2°C RH: 3% B:6.94V

1041 0.00±17.1 B Normal
SUN 16-AUG-15 11:27
25.9°C RH: 3% B:6.97V

1042 5.29±19.3 B Normal
SUN 16-AUG-15 11:57
25.6°C RH: 3% B:6.97V

08:37

SS3 overnight

POWER OFF
08-06-15 08:37:37

CURRENT JOB
rm 191

OMNIGUARD
08-13-15 21:31:05
ALARM 1 @ +0.040" WC
ALARM 2 @ -0.060" WC

NORMAL OP 21:31:10

NEW NORMAL LOG RATE
5 min

NEW ALARM LOG RATE
1 min

END JOB
rm 191

JOB SUMMARY

JOB NAME:
rm 191
JOB START:
05-11-15 08:11
JOB END:
08-13-15 21:35
TIME IN NORMAL OP:
22 days 15 hrs 17 mins
NUMBER OF ALARMS:
4
TIME IN ALARM:
7 mins 37 secs

START

START JOB
buildng 200 SS3

OMNIGUARD
08-13-15 21:36:20
ALARM 1 @ +0.040" WC
ALARM 2 @ -0.060" WC

NORMAL OP 21:36:24

PRINTER ON

JOB REPORT
ENTIRE JOB
08-14-15 07:51:25

JOB NAME:

buildng 200 SS3

CONTRACTOR:

Geosynvec

SUPERVISOR:

JOB SUMMARY

JOB START:
08-13-15 21:36
TIME IN NORMAL OP:
10 hrs 15 mins
NUMBER OF ALARMS:
0
TIME IN ALARM:
Never

START JOB
buildng 200 SS3

OMNIGUARD
08-13-15 21:36:20
ALARM 1 @ +0.040" WC
ALARM 2 @ -0.060" WC

NORMAL OP 21:36:24

PRINTER OFF

NEW UNITS
Pascals

NEW ALARM 1
+63.0Pa

NEW ALARM 2
-63.0Pa

TIME	HI Pa	LO Pa
21:41	0.0	-0.5
21:46	+2.5	-4.5
21:51	-2.0	-3.5
21:56	-2.0	-2.0
22:01	-2.0	-3.5
22:06	-2.0	-3.5
22:11	-2.0	-2.0
22:16	-2.0	-3.0
22:21	-2.0	-3.0
22:26	-2.0	-2.0
22:31	-2.0	-3.0
22:36	-2.0	-3.0
22:41	-2.0	-2.0
22:46	-2.0	-3.0
22:51	-2.0	-3.0
22:56	-2.0	-2.0
23:01	-2.0	-3.0
23:06	-2.0	-3.0
23:11	-2.0	-2.0
23:16	-2.0	-3.0
23:21	-2.0	-3.0
23:26	-2.0	-2.0
23:31	-2.0	-3.0
23:36	-1.5	-3.0
23:41	-1.5	-2.0
23:46	-2.0	-2.0
23:51	-1.5	-3.0
23:56	-2.0	-2.0

08-14-15

TIME	HI Pa	LO Pa
00:01	-1.5	-2.0
00:06	-1.5	-2.5
00:11	-2.0	-3.0
00:16	-2.0	-2.0
00:21	-1.5	-2.0
00:26	-1.5	-2.0
00:31	-2.0	-2.0
00:36	-1.5	-2.0
00:41	-1.5	-2.0
00:46	-2.0	-2.0
00:51	-2.0	-2.0
00:56	-1.5	-2.0
01:01	-1.5	-2.0
01:06	-2.0	-2.0
01:11	-2.0	-2.0
01:16	-1.5	-2.0
01:21	-2.0	-2.0
01:26	-1.5	-2.0
01:31	-1.5	-2.0
01:36	-1.5	-2.0
01:41	-1.5	-2.0
01:46	-1.5	-2.0
01:51	-1.5	-2.0
01:56	-1.5	-2.0
02:01	-1.5	-2.0
02:06	-1.5	-2.0
02:11	-1.5	-2.0
02:16	-1.5	-2.0
02:21	-1.5	-2.0
02:26	-1.5	-2.0
02:31	-1.5	-2.0
02:36	-1.5	-1.5
02:41	-1.5	-1.5
02:46	-1.5	-2.0
02:51	-1.5	-1.5
02:56	-1.5	-2.0
03:01	-1.5	-1.5
03:06	-1.5	-2.0
03:11	-1.5	-1.5
03:16	-1.5	-2.0
03:21	-1.5	-2.0
03:26	-1.5	-2.0
03:31	-1.5	-2.0
03:36	-1.5	-2.0
03:41	-1.5	-1.5
03:46	-1.5	-2.0
03:51	-2.0	-2.0
03:56	-1.5	-2.0
04:01	-1.5	-2.0
04:06	-1.5	-2.0
04:11	-1.5	-2.0
04:16	-1.5	-2.0
04:21	-1.5	-2.0
04:26	-1.5	-2.0
04:31	-1.5	-2.0
04:36	-1.5	-2.0
04:41	-1.5	-2.0
04:46	-1.5	-2.0
04:51	-1.5	-2.0
04:56	-1.5	-2.0
05:01	-1.5	-2.0
05:06	-1.5	-2.0
05:11	-1.5	-2.0
05:16	-1.5	-2.0

05:21	-1.5	-2.0
05:26	-1.5	-2.0
05:31	-1.5	-2.0
05:36	-1.5	-2.0
05:41	-1.5	-2.0
05:46	-1.5	-2.0
05:51	-1.5	-2.0
05:56	-1.5	-2.0
06:01	-1.5	-2.0
06:06	-1.5	-2.0
06:11	-1.5	-2.0
06:16	-1.5	-2.0
06:21	-1.5	-2.0
06:26	-2.0	-2.0
06:31	-2.0	-2.0
06:36	-1.5	-2.0
06:41	-1.5	-2.0
06:46	-1.5	-2.0
06:51	-1.5	-2.0
06:56	-1.5	-2.0
07:01	-1.5	-2.0
07:06	-1.5	-2.0
07:11	-1.5	-2.0
07:16	-1.5	-2.0
07:21	-1.5	-2.0
07:26	-1.5	-2.0
07:31	-1.5	-2.0
07:36	-1.5	-2.0
07:41	-1.5	-2.0
07:46	-1.5	-2.0

PRINTER ON

End of report.

07:54	-1.5	-2.0
07:59	-1.5	-2.0
08:04	-1.0	-1.5
08:09	-1.0	-2.0
08:14	-1.0	-2.0

JOB REPORT
ENTIRE JOB
08-14-15 08:18:36

JOB NAME: Phase 1

building 200 SS1

CONTRACTOR:

geosyntec

SUPERVISOR:

JOB SUMMARY

JOB START:
08-13-15 21:51
TIME IN NORMAL OP:
10 hrs 27 mins
NUMBER OF ALARMS:
0
TIME IN ALARM:
Never

START JOB
building 200 SS1

OMNIGUARD
08-13-15 21:51:48
ALARM 1 @ +64.0Pa
ALARM 2 @ -64.0Pa

NORMAL OP 21:51:49

TIME	HI Pa	LO Pa
21:56	-50.5	-52.0
22:01	-50.5	-52.0
22:06	-48.0	-50.5
22:11	-50.5	-51.5
22:16	-50.5	-51.5
22:21	-50.5	-50.5
22:26	-50.5	-51.5
22:31	-50.5	-51.5
22:36	-50.5	-51.0
22:41	-50.5	-51.5
22:46	-50.5	-51.5
22:51	-50.5	-51.0
22:56	-51.0	-52.0
23:01	-50.5	-51.5
23:06	-50.5	-51.0
23:11	-51.0	-52.0
23:16	-51.0	-52.0
23:21	-50.5	-51.0
23:26	-51.0	-52.0
23:31	-50.5	-52.0
23:36	-50.5	-51.0
23:41	-50.5	-51.0
23:46	-50.5	-52.0
23:51	-50.5	-51.0
23:56	-50.5	-51.0

08-14-15

TIME	HI Pa	LO Pa
00:01	-50.5	-52.0
00:06	-51.0	-52.0
00:11	-51.0	-51.0
00:16	-50.5	-51.0
00:21	-51.0	-51.0
00:26	-51.0	-51.0
00:31	-50.5	-51.0
00:36	-50.5	-51.0
00:41	-51.0	-51.0
00:46	-51.0	-51.0
00:51	-51.0	-51.0
00:56	-51.0	-51.0
01:01	-51.0	-51.0
01:06	-51.0	-51.5
01:11	-51.0	-51.0
01:16	-51.0	-51.0
01:21	-51.0	-51.0
01:26	-51.0	-51.0
01:31	-51.0	-51.0
01:36	-51.0	-51.0
01:41	-51.0	-51.0
01:46	-51.0	-51.5
01:51	-51.0	-51.5
01:56	-51.0	-51.5
02:01	-51.0	-51.5
02:06	-51.0	-51.0
02:11	-51.0	-51.5
02:16	-51.0	-51.5
02:21	-51.0	-51.5
02:26	-51.0	-51.5
02:31	-51.0	-51.5
02:36	-51.0	-51.5
02:41	-51.0	-51.5
02:46	-51.0	-51.5
02:51	-51.0	-51.5
02:56	-51.0	-51.5
03:01	-51.5	-51.5
03:06	-51.0	-51.5
03:11	-51.5	-51.5
03:16	-51.5	-51.5
03:21	-51.5	-51.5
03:26	-51.5	-51.5
03:31	-51.5	-51.5
03:36	-51.5	-51.5
03:41	-51.5	-51.5
03:46	-51.5	-52.0
03:51	-51.5	-52.0
03:56	-51.5	-52.0
04:01	-51.5	-51.5
04:06	-51.5	-51.5
04:11	-51.5	-51.5
04:16	-51.5	-51.5
04:21	-51.5	-52.0
04:26	-51.5	-52.0
04:31	-51.5	-52.0
04:36	-51.5	-52.0
04:41	-51.5	-52.0
04:46	-51.5	-52.0
04:51	-51.5	-52.0
04:56	-51.5	-52.0
05:01	-51.5	-52.0
05:06	-51.5	-52.0
05:11	-51.5	-52.0
05:16	-51.5	-52.0
05:21	-51.5	-52.0
05:26	-51.5	-52.0
05:31	-51.5	-52.0
05:36	-51.5	-52.0
05:41	-51.5	-52.0
05:46	-51.5	-52.0
05:51	-51.5	-52.0
05:56	-51.5	-52.0
06:01	-52.0	-52.5
06:06	-51.5	-52.0
06:11	-52.0	-52.0
06:16	-52.0	-52.0
06:21	-52.0	-52.5
06:26	-52.0	-52.0
06:31	-51.5	-52.0
06:36	-51.5	-52.0
06:41	-51.5	-52.0
06:46	-51.5	-52.0
06:51	-51.5	-52.0
06:56	-51.5	-52.0
07:01	-51.5	-52.0
07:06	-51.5	-51.5
07:11	-51.5	-52.0
07:16	-51.5	-51.5
07:21	-51.5	-51.5
07:26	-51.5	-51.5
07:31	-51.0	-51.5
07:36	-51.5	-51.5
07:41	-51.5	-51.5
07:46	-46.5	-51.5
07:51	-49.0	-51.0
07:56	-50.5	-51.0
08:01	-42.5	-51.0
08:06	0.0	-50.0
08:11	-37.5	-51.5
08:16	-34.0	-50.0

End of report.

ANALYTICAL REPORT

Lab Number:	L1533080
Client:	Geosyntec Consultants, Inc. 130 Stone Road West Guelph, ON N1G 3Z2
ATTN:	Paul Nicholson
Phone:	(519) 575-0864
Project Name:	RARITAN ARSENAL
Project Number:	TR0479-02B
Report Date:	12/21/15

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Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1533080-01	HSF-03	SOIL_VAPOR	EDISON, NJ	12/14/15 11:10	12/15/15
L1533080-02	HSF-08	SOIL_VAPOR	EDISON, NJ	12/14/15 11:41	12/15/15
L1533080-03	UNUSED CAN #815	SOIL_VAPOR	EDISON, NJ		12/15/15

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

NJ DEP Data of Known Quality Protocols
Conformance/Non-Conformance
Summary Questionnaire

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	YES
1a	Were the method specified handling, preservation, and holding time requirements met?	YES
1b	EPH Method: Was the EPH Method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	YES
3	Were all samples received at an appropriate temperature (4 ± 2° C)?	N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	YES
5a	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	YES
5b	Were these reporting limits met?	YES
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	YES
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	NO

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1a or #1b is "No", the data package does not meet the requirements for "Data of Known Quality".

Project Name: RARITAN ARSENAL
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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 all of the requirements of NELAC, for all NELAC accredited parameters. 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:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Case Narrative (continued)

NJDEP Volatile Organics in Air

Canisters were released from the laboratory on December 11, 2015. The canister certification results are provided as an addendum.

Any Manual integrations that were performed on L1533080 as well as its associated quality control samples and are noted on the individual quantitation reports. A listing of all manual integrations performed and the integration code definitions are provided in manual integration documentation section of the data package.

Please note, dilution analysis due to exceedance of the calibration range is not required for Ethanol or Isopropyl Alcohol.

GC column and trap information utilized for the analysis of this sample delivery group is detailed below:
Column Type: Restek RTX-1
Column Length: 60 Meters
Internal diameter: 0.52 mm
Film thickness: 1.00 um
Trap 1: Entech Cold Trap - no packing material
Trap 2: Entech Tenax - 20 cm packing material

Gaseous calibration standards were utilized for system calibration and quality control standards associated with this sample delivery group. These standards were purchased from Linde (formerly Spectra Gases).

Laboratory standard procedure for QC (i.e. method blanks, LCS) and sample analysis is to withdraw a 250 mL aliquot from the canister as the "1X" analysis. For some calibration levels and samples, subsequent dilutions will be performed as needed by decreasing aliquot volumes via the instrumentation, or performing a dilution using a second canister. Make-up air is not routinely added to canisters prior to sample analysis.

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Case Narrative (continued)

Samples L1533080-01 and -02: Prior to sample analysis, the canisters were pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the samples. The reporting limits have been elevated accordingly.

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: 12/21/15

AIR

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/17/15 22:20
Analyst: MB

Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	0.43	0.42	--	2	2	--		2.113
Chloromethane	ND	0.42	--	ND	0.9	--		2.113
Freon-114	ND	0.42	--	ND	3	--		2.113
Vinyl chloride	ND	0.42	--	ND	1	--		2.113
1,3-Butadiene	ND	0.42	--	ND	0.9	--		2.113
Bromomethane	ND	0.42	--	ND	2	--		2.113
Chloroethane	ND	0.42	--	ND	1	--		2.113
Ethanol	ND	10	--	ND	20	--		2.113
Vinyl bromide	ND	0.42	--	ND	2	--		2.113
Acetone	12	2.1	--	29	5.0	--		2.113
Trichlorofluoromethane	ND	0.42	--	ND	2	--		2.113
Isopropanol	1.3	1.0	--	3	2	--		2.113
1,1-Dichloroethene	ND	0.42	--	ND	2	--		2.113
Tertiary butyl Alcohol	27	1.0	--	82	3.0	--		2.113
Methylene chloride	ND	1.0	--	ND	3	--		2.113
3-Chloropropene	ND	0.42	--	ND	1	--		2.113
Carbon disulfide	ND	0.42	--	ND	1	--		2.113
Freon-113	ND	0.42	--	ND	3	--		2.113
trans-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.113
1,1-Dichloroethane	ND	0.42	--	ND	2	--		2.113
Methyl tert butyl ether	ND	0.42	--	ND	2	--		2.113
2-Butanone	ND	1.0	--	ND	3	--		2.113
cis-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.113
Chloroform	3.0	0.42	--	15	2.1	--		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	ND	1.0	--	ND	3	--		2.113
1,2-Dichloroethane	ND	0.42	--	ND	2	--		2.113
n-Hexane	ND	0.42	--	ND	1	--		2.113
1,1,1-Trichloroethane	ND	0.42	--	ND	2	--		2.113
Benzene	ND	0.42	--	ND	1	--		2.113
Carbon tetrachloride	ND	0.42	--	ND	3	--		2.113
Cyclohexane	ND	0.42	--	ND	1	--		2.113
1,2-Dichloropropane	ND	0.42	--	ND	2	--		2.113
Bromodichloromethane	ND	0.42	--	ND	3	--		2.113
1,4-Dioxane	ND	0.42	--	ND	2	--		2.113
Trichloroethene	46	0.42	--	250	2.3	--		2.113
2,2,4-Trimethylpentane	ND	0.42	--	ND	2	--		2.113
Methyl Methacrylate	ND	1.0	--	ND	4	--		2.113
Heptane	ND	0.42	--	ND	2	--		2.113
cis-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.113
4-Methyl-2-pentanone	ND	1.0	--	ND	4	--		2.113
trans-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.113
1,1,2-Trichloroethane	ND	0.42	--	ND	2	--		2.113
Toluene	ND	0.42	--	ND	2	--		2.113
Dibromochloromethane	ND	0.42	--	ND	4	--		2.113
1,2-Dibromoethane	ND	0.42	--	ND	3	--		2.113
Tetrachloroethene	0.42	0.42	--	3	3	--		2.113
Chlorobenzene	ND	0.42	--	ND	2	--		2.113
Ethylbenzene	ND	0.42	--	ND	2	--		2.113
p/m-Xylene	ND	0.84	--	ND	4	--		2.113
Bromoform	ND	0.42	--	ND	4	--		2.113
Styrene	ND	0.42	--	ND	2	--		2.113
1,1,2,2-Tetrachloroethane	ND	0.42	--	ND	3	--		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.42	--	ND	2	--		2.113
2-Chlorotoluene	ND	0.42	--	ND	2	--		2.113
4-Ethyltoluene	ND	0.42	--	ND	2	--		2.113
1,3,5-Trimethybenzene	ND	0.42	--	ND	2	--		2.113
1,2,4-Trimethylbenzene	ND	0.42	--	ND	2	--		2.113
1,3-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,4-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,2-Dichlorobenzene	ND	0.42	--	ND	3	--		2.113
1,2,4-Trichlorobenzene	ND	0.42	--	ND	3	--		2.113
Hexachlorobutadiene	ND	0.42	--	ND	4	--		2.113

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
unknown alkane	46	J	ppbV		2.113
unknown alkene	89	J	ppbV		2.113
unknown alkane	190	J	ppbV		2.113
unknown alkene	23	J	ppbV		2.113
Unknown Hydrocarbon	15	J	ppbV		2.113
unknown alkane	14	J	ppbV		2.113
unknown alkane	13	J	ppbV		2.113
unknown alkane	14	J	ppbV		2.113
unknown alkane	15	J	ppbV		2.113
unknown alkane	64	J	ppbV		2.113
unknown alkene	15	J	ppbV		2.113
unknown alkane	17	J	ppbV		2.113
unknown alkane	40	J	ppbV		2.113
unknown alkane	53	J	ppbV		2.113
unknown alkane	13	J	ppbV		2.113

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-01 D
Client ID: HSF-03
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:10
Date Received: 12/15/15
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		60-140
Bromochloromethane	100		60-140
chlorobenzene-d5	106		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/17/15 23:28
Analyst: MB

Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	0.42	--	ND	2	--		2.129
Chloromethane	ND	0.42	--	ND	0.9	--		2.129
Freon-114	ND	0.42	--	ND	3	--		2.129
Vinyl chloride	ND	0.42	--	ND	1	--		2.129
1,3-Butadiene	ND	0.42	--	ND	0.9	--		2.129
Bromomethane	ND	0.42	--	ND	2	--		2.129
Chloroethane	ND	0.42	--	ND	1	--		2.129
Ethanol	ND	11	--	ND	20	--		2.129
Vinyl bromide	ND	0.42	--	ND	2	--		2.129
Acetone	19	2.1	--	45	5.0	--		2.129
Trichlorofluoromethane	ND	0.42	--	ND	2	--		2.129
Isopropanol	2.3	1.1	--	6	3	--		2.129
1,1-Dichloroethene	ND	0.42	--	ND	2	--		2.129
Tertiary butyl Alcohol	19	1.1	--	58	3.3	--		2.129
Methylene chloride	ND	1.1	--	ND	4	--		2.129
3-Chloropropene	ND	0.42	--	ND	1	--		2.129
Carbon disulfide	ND	0.42	--	ND	1	--		2.129
Freon-113	ND	0.42	--	ND	3	--		2.129
trans-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.129
1,1-Dichloroethane	ND	0.42	--	ND	2	--		2.129
Methyl tert butyl ether	ND	0.42	--	ND	2	--		2.129
2-Butanone	1.6	1.1	--	5	3	--		2.129
cis-1,2-Dichloroethene	ND	0.42	--	ND	2	--		2.129
Chloroform	0.47	0.42	--	2	2	--		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	1.4	1.1	--	4	3	--		2.129
1,2-Dichloroethane	ND	0.42	--	ND	2	--		2.129
n-Hexane	ND	0.42	--	ND	1	--		2.129
1,1,1-Trichloroethane	ND	0.42	--	ND	2	--		2.129
Benzene	ND	0.42	--	ND	1	--		2.129
Carbon tetrachloride	ND	0.42	--	ND	3	--		2.129
Cyclohexane	ND	0.42	--	ND	1	--		2.129
1,2-Dichloropropane	ND	0.42	--	ND	2	--		2.129
Bromodichloromethane	ND	0.42	--	ND	3	--		2.129
1,4-Dioxane	ND	0.42	--	ND	2	--		2.129
Trichloroethene	8.2	0.42	--	44	2.3	--		2.129
2,2,4-Trimethylpentane	ND	0.42	--	ND	2	--		2.129
Methyl Methacrylate	ND	1.1	--	ND	5	--		2.129
Heptane	ND	0.42	--	ND	2	--		2.129
cis-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.129
4-Methyl-2-pentanone	ND	1.1	--	ND	5	--		2.129
trans-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.129
1,1,2-Trichloroethane	ND	0.42	--	ND	2	--		2.129
Toluene	ND	0.42	--	ND	2	--		2.129
Dibromochloromethane	ND	0.42	--	ND	4	--		2.129
1,2-Dibromoethane	ND	0.42	--	ND	3	--		2.129
Tetrachloroethene	ND	0.42	--	ND	3	--		2.129
Chlorobenzene	ND	0.42	--	ND	2	--		2.129
Ethylbenzene	ND	0.42	--	ND	2	--		2.129
p/m-Xylene	ND	0.85	--	ND	4	--		2.129
Bromoform	ND	0.42	--	ND	4	--		2.129
Styrene	ND	0.42	--	ND	2	--		2.129
1,1,2,2-Tetrachloroethane	ND	0.42	--	ND	3	--		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.42	--	ND	2	--		2.129
2-Chlorotoluene	ND	0.42	--	ND	2	--		2.129
4-Ethyltoluene	ND	0.42	--	ND	2	--		2.129
1,3,5-Trimethybenzene	ND	0.42	--	ND	2	--		2.129
1,2,4-Trimethylbenzene	ND	0.42	--	ND	2	--		2.129
1,3-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,4-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,2-Dichlorobenzene	ND	0.42	--	ND	3	--		2.129
1,2,4-Trichlorobenzene	ND	0.42	--	ND	3	--		2.129
Hexachlorobutadiene	ND	0.42	--	ND	4	--		2.129

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
Unknown Hydrocarbon	16	J	ppbV		2.129
unknown alkene	60	J	ppbV		2.129
unknown alkane	44	J	ppbV		2.129
unknown alkane	13	J	ppbV		2.129
unknown alkane	35	J	ppbV		2.129
unknown alkane	160	J	ppbV		2.129
unknown alkane	11	J	ppbV		2.129
unknown alkane	42	J	ppbV		2.129
unknown alkane	14	J	ppbV		2.129
unknown alkane	11	J	ppbV		2.129
unknown alkane	13	J	ppbV		2.129
unknown alkane	58	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129
unknown alkane	12	J	ppbV		2.129

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

SAMPLE RESULTS

Lab ID: L1533080-02 D
Client ID: HSF-08
Sample Location: EDISON, NJ
Date Collected: 12/14/15 11:41
Date Received: 12/15/15
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	102		60-140
Bromochloromethane	104		60-140
chlorobenzene-d5	107		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Dichlorodifluoromethane	ND	0.20	--	ND	1.	--		1
Chloromethane	ND	0.20	--	ND	0.4	--		1
Freon-114	ND	0.20	--	ND	1.	--		1
Vinyl chloride	ND	0.20	--	ND	0.5	--		1
1,3-Butadiene	ND	0.20	--	ND	0.4	--		1
Butane	ND	0.20	--	ND	0.5	--		1
Bromomethane	ND	0.20	--	ND	0.8	--		1
Chloroethane	ND	0.20	--	ND	0.5	--		1
Ethanol	ND	5.0	--	ND	9.	--		1
Vinyl bromide	ND	0.20	--	ND	0.9	--		1
Acetone	ND	1.0	--	ND	2.	--		1
Trichlorofluoromethane	ND	0.20	--	ND	1.	--		1
Isopropanol	ND	0.50	--	ND	1.	--		1
1,1-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Tertiary butyl Alcohol	ND	0.50	--	ND	2.	--		1
Methylene chloride	ND	0.50	--	ND	2.	--		1
3-Chloropropene	ND	0.20	--	ND	0.6	--		1
Carbon disulfide	ND	0.20	--	ND	0.6	--		1
Freon-113	ND	0.20	--	ND	2.	--		1
trans-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
1,1-Dichloroethane	ND	0.20	--	ND	0.8	--		1
Methyl tert butyl ether	ND	0.20	--	ND	0.7	--		1
2-Butanone	ND	0.50	--	ND	1.	--		1
cis-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Chloroform	ND	0.20	--	ND	1.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Tetrahydrofuran	ND	0.50	--	ND	1.	--		1
1,2-Dichloroethane	ND	0.20	--	ND	0.8	--		1
n-Hexane	ND	0.20	--	ND	0.7	--		1
1,1,1-Trichloroethane	ND	0.20	--	ND	1.	--		1
Benzene	ND	0.20	--	ND	0.6	--		1
Carbon tetrachloride	ND	0.20	--	ND	1.	--		1
Cyclohexane	ND	0.20	--	ND	0.7	--		1
1,2-Dichloropropane	ND	0.20	--	ND	0.9	--		1
Bromodichloromethane	ND	0.20	--	ND	1.	--		1
1,4-Dioxane	ND	0.20	--	ND	0.7	--		1
Trichloroethene	ND	0.20	--	ND	1.	--		1
2,2,4-Trimethylpentane	ND	0.20	--	ND	0.9	--		1
Methyl Methacrylate	ND	0.50	--	ND	2.	--		1
Heptane	ND	0.20	--	ND	0.8	--		1
cis-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
4-Methyl-2-pentanone	ND	0.50	--	ND	2.	--		1
trans-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
1,1,2-Trichloroethane	ND	0.20	--	ND	1.	--		1
Toluene	ND	0.20	--	ND	0.8	--		1
Dibromochloromethane	ND	0.20	--	ND	2.	--		1
1,2-Dibromoethane	ND	0.20	--	ND	2.	--		1
Tetrachloroethene	ND	0.20	--	ND	1.	--		1
Chlorobenzene	ND	0.20	--	ND	0.9	--		1
Ethylbenzene	ND	0.20	--	ND	0.9	--		1
p/m-Xylene	ND	0.40	--	ND	2.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1533080
Report Date: 12/21/15

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/17/15 15:34

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG850745-4								
Bromoform	ND	0.20	--	ND	2.	--		1
Styrene	ND	0.20	--	ND	0.9	--		1
1,1,2,2-Tetrachloroethane	ND	0.20	--	ND	1.	--		1
o-Xylene	ND	0.20	--	ND	0.9	--		1
2-Chlorotoluene	ND	0.20	--	ND	1.	--		1
4-Ethyltoluene	ND	0.20	--	ND	1.	--		1
1,3,5-Trimethybenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trimethylbenzene	ND	0.20	--	ND	1.	--		1
1,3-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,4-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trichlorobenzene	ND	0.20	--	ND	1.	--		1
Hexachlorobutadiene	ND	0.20	--	ND	2.	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Chlorodifluoromethane	82		-		70-130	-		
Propylene	97		-		70-130	-		
Dichlorodifluoromethane	67		-		40-160	-		
Chloromethane	97		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	93		-		70-130	-		
Methanol	92		-		70-130	-		
Vinyl chloride	99		-		70-130	-		
1,3-Butadiene	100		-		70-130	-		
Butane	94		-		70-130	-		
Bromomethane	100		-		70-130	-		
Chloroethane	99		-		70-130	-		
Ethyl Alcohol	102		-		70-130	-		
Dichlorofluoromethane	89		-		70-130	-		
Vinyl bromide	92		-		70-130	-		
Acrolein	100		-		70-130	-		
Acetone	98		-		40-160	-		
Acetonitrile	97		-		70-130	-		
Trichlorofluoromethane	92		-		70-130	-		
iso-Propyl Alcohol	104		-		70-130	-		
Acrylonitrile	97		-		70-130	-		
Pentane	97		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Ethyl ether	98		-		70-130	-		
1,1-Dichloroethene	97		-		70-130	-		
tert-Butyl Alcohol	95		-		70-130	-		
Methylene chloride	100		-		70-130	-		
3-Chloropropene	110		-		70-130	-		
Carbon disulfide	98		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	95		-		70-130	-		
trans-1,2-Dichloroethene	86		-		70-130	-		
1,1-Dichloroethane	91		-		70-130	-		
Methyl tert butyl ether	94		-		70-130	-		
Vinyl acetate	130		-		70-130	-		
2-Butanone	100		-		70-130	-		
cis-1,2-Dichloroethene	110		-		70-130	-		
Ethyl Acetate	96		-		70-130	-		
Chloroform	94		-		70-130	-		
Tetrahydrofuran	100		-		70-130	-		
2,2-Dichloropropane	86		-		70-130	-		
1,2-Dichloroethane	91		-		70-130	-		
n-Hexane	110		-		70-130	-		
Isopropyl Ether	100		-		70-130	-		
Ethyl-Tert-Butyl-Ether	100		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
1,1,1-Trichloroethane	100		-		70-130	-		
1,1-Dichloropropene	100		-		70-130	-		
Benzene	100		-		70-130	-		
Carbon tetrachloride	100		-		70-130	-		
Cyclohexane	110		-		70-130	-		
Tertiary-Amyl Methyl Ether	100		-		70-130	-		
Dibromomethane	99		-		70-130	-		
1,2-Dichloropropane	110		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	110		-		40-160	-		
Trichloroethene	100		-		70-130	-		
2,2,4-Trimethylpentane	110		-		70-130	-		
Methyl Methacrylate	120		-		70-130	-		
Heptane	120		-		70-130	-		
cis-1,3-Dichloropropene	120		-		70-130	-		
4-Methyl-2-pentanone	120		-		70-130	-		
trans-1,3-Dichloropropene	100		-		70-130	-		
1,1,2-Trichloroethane	110		-		70-130	-		
Toluene	100		-		70-130	-		
1,3-Dichloropropane	95		-		70-130	-		
2-Hexanone	120		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
Dibromochloromethane	97		-		70-130	-		
1,2-Dibromoethane	100		-		70-130	-		
Butyl Acetate	96		-		70-130	-		
Octane	96		-		70-130	-		
Tetrachloroethene	94		-		70-130	-		
1,1,1,2-Tetrachloroethane	89		-		70-130	-		
Chlorobenzene	98		-		70-130	-		
Ethylbenzene	100		-		70-130	-		
p/m-Xylene	100		-		70-130	-		
Bromoform	95		-		70-130	-		
Styrene	100		-		70-130	-		
1,1,2,2-Tetrachloroethane	110		-		70-130	-		
o-Xylene	110		-		70-130	-		
1,2,3-Trichloropropane	95		-		70-130	-		
Nonane (C9)	110		-		70-130	-		
Isopropylbenzene	96		-		70-130	-		
Bromobenzene	95		-		70-130	-		
o-Chlorotoluene	93		-		70-130	-		
n-Propylbenzene	94		-		70-130	-		
p-Chlorotoluene	93		-		70-130	-		
4-Ethyltoluene	98		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1533080

Report Date: 12/21/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG850745-3								
1,3,5-Trimethylbenzene	100		-		70-130	-		
tert-Butylbenzene	96		-		70-130	-		
1,2,4-Trimethylbenzene	110		-		70-130	-		
Decane (C10)	100		-		70-130	-		
Benzyl chloride	110		-		70-130	-		
1,3-Dichlorobenzene	100		-		70-130	-		
1,4-Dichlorobenzene	100		-		70-130	-		
sec-Butylbenzene	96		-		70-130	-		
p-Isopropyltoluene	90		-		70-130	-		
1,2-Dichlorobenzene	100		-		70-130	-		
n-Butylbenzene	100		-		70-130	-		
1,2-Dibromo-3-chloropropane	94		-		70-130	-		
Undecane	110		-		70-130	-		
Dodecane (C12)	120		-		70-130	-		
1,2,4-Trichlorobenzene	110		-		40-160	-		
Naphthalene	99		-		40-160	-		
1,2,3-Trichlorobenzene	93		-		70-130	-		
Hexachlorobutadiene	100		-		40-160	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03						
Dichlorodifluoromethane	0.43	ND	ppbV	NC		25
Chloromethane	ND	ND	ppbV	NC		25
Freon-114	ND	ND	ppbV	NC		25
Vinyl chloride	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
Ethanol	ND	ND	ppbV	NC		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	12	12	ppbV	0		25
Trichlorofluoromethane	ND	ND	ppbV	NC		25
Isopropanol	1.3	1.4	ppbV	7		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
Tertiary butyl Alcohol	27	26	ppbV	4		25
Methylene chloride	ND	ND	ppbV	NC		25
3-Chloropropene	ND	ND	ppbV	NC		25
Carbon disulfide	ND	ND	ppbV	NC		25
Freon-113	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Chloroform	3.0	3.0	ppbV	0	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	ND	ND	ppbV	NC	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	ND	ND	ppbV	NC	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
Trichloroethene	46	44	ppbV	4	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25
Methyl Methacrylate	ND	ND	ppbV	NC	25
Heptane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
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	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	0.42	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
2-Chlorotoluene	ND	ND	ppbV	NC	25
4-Ethyltoluene	ND	ND	ppbV	NC	25
1,3,5-Trimethybenzene	ND	ND	ppbV	NC	25
1,2,4-Trimethylbenzene	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG850745-5 QC Sample: L1533080-01 Client ID: HSF-03					
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: RARITAN ARSENAL

Lab Number: L1533080

Project Number: TR0479-02B

Report Date: 12/21/15

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
L1533080-01	HSF-03	723	1.0L Can	12/11/15	214177	L1532196-02	Pass	-29.6	0.0	-	-	-	-
L1533080-02	HSF-08	666	1.0L Can	12/11/15	214177	L1532196-02	Pass	-29.9	0.3	-	-	-	-
L1533080-03	UNUSED CAN #815	815	1.0L Can	12/11/15	214177	L1532196-02	Pass	-30.0	-29.4	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 12/08/15 19:03
Analyst: RY

Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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
Propane	ND	0.500	--	ND	0.902	--		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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: Field Prep: Not Specified

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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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 **Lab Number:** L1532196

Project Number: CANISTER QC BAT **Report Date:** 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02 Date Collected: 12/07/15 16:00

Client ID: CAN 562 SHELF 16 Date Received: 12/08/15

Sample Location: 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	95		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	93		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 12/08/15 19:03
Analyst: RY

Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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	0.020	--	ND	0.092	--		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
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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1532196
Report Date: 12/21/15

Air Canister Certification Results

Lab ID: L1532196-02
Client ID: CAN 562 SHELF 16
Sample Location:
Date Collected: 12/07/15 16:00
Date Received: 12/08/15
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								
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	98		60-140
bromochloromethane	98		60-140
chlorobenzene-d5	93		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1533080
Report Date: 12/21/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information **Custody Seal**

Cooler

N/A Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1533080-01A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)
L1533080-02A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)
L1533080-03A	Canister - 1 Liter	N/A	N/A		Y	Absent	CLEAN-FEE()

*Values in parentheses indicate holding time in days

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

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.

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

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.

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.

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 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).

Report Format: Data Usability Report

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1533080
Project Number:	TR0479-02B	**Report Date:**	12/21/15

Data Qualifiers

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 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

Alpha Analytical
320 Forbes Blvd
Mansfield, MA 02048-1806
Tel: 508-822-9300
Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab: 12/16/15 | ALPHA Job#: L1533080

1 of 1 COCs

Client Contact Information

Company: Geosyntec
Address: 130 Stone Rd West
City/State/Zip: Guelph ON N1G 3Z2
Phone: 519-575-0864
FAX:
Email: PNicholson@geosyntec.com
Site Contact: Matthew Mraw
Site Contact Phone: (609)-462-1108

Project Information

Project Name: Raritan Arsenal
Project No: TR0479-02B
Site/Location: Edison, NJ
Project Manager: Paul Nicholson

Analysis Turn-Around Time

Standard (Specify): 2 week
Rush (Specify):

NJ DEP Information

Bureau: Division: Contract No:

Report Information - Data Deliverables:

☐ FAX:
☐ ADEx ☐ Criteria Checker:
☑ EMail (standard pdf report)

Billing Information

☐ Same as Client Info PO #:

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field (Hg) (Start)	Canister Pressure in Field (Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure (Hg) (Note1)	Incoming Canister Pressure (Hg) (Note 2)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min) (Note1)	Batch Cert ID (Note 1)	Analysis: TO-15	Analysis: EPA 3C	Matrix: Indoor /Ambient Air	Matrix: Soil Gas
33080.01	HSF-03	12/14/15	1110	1110	29.6	0.8	55.4	55.4	-29.6		—	723	1	—	L1532196-02	✓			✓
.02	HSF-08	12/14/15	1141	1141	29.9	0.8	56.1	56.1	-29.9		—	6666	1	—	L1532196-02	✓			✓

mm

Custody Seals:
Outgoing Seal No: (refer to crate seal) VB 036027
Incoming Seal No: (if applicable) 233

Temperature (Fahrenheit)

	Ambient	Maximum	Minimum
Start	55.4	55.4	55.4
Stop	56.1	56.1	56.1

Pressure (inches of Hg)

	Ambient	Maximum	Minimum
Start	29.90	29.90	29.90
Stop	29.87	29.87	29.87

Individual Preparing Canister/Containers and Laboratory Canister Certification
Name: Lisa Barrett
Signature:

Footnotes:
(1) Refer to equipment tags for these readings.
(2) Readings provided in data deliverable package.

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by:	Date/Time: 12/15/15 1355	Received by:	Date/Time: 12/15/15 1355
Relinquished by:	Date/Time: 12/15/15 23:10	Received by: Albert Williams	Date/Time: 12-15-15 23:10
Albert Williams 12-16-15 04:50			12/16/15 04:50

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

Note: Combined External Chain of Custody and NJDEP Field Test Data Sheet

ANALYTICAL REPORT

Lab Number:	L1534153
Client:	Geosyntec Consultants, Inc. 130 Stone Road West Guelph, ON N1G 3Z2
ATTN:	Paul Nicholson
Phone:	(519) 575-0864
Project Name:	RARITAN ARSENAL
Project Number:	TR0479-02B
Report Date:	01/06/16

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1534153-01	4-SSDS-200	SOIL_VAPOR	EDISON, NJ	12/23/15 09:00	12/23/15

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

NJ DEP Data of Known Quality Protocols
Conformance/Non-Conformance
Summary Questionnaire

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	YES
1a	Were the method specified handling, preservation, and holding time requirements met?	YES
1b	EPH Method: Was the EPH Method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	YES
3	Were all samples received at an appropriate temperature (4 ± 2° C)?	N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	YES
5a	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	YES
5b	Were these reporting limits met?	YES
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	YES
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	NO

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1a or #1b is "No", the data package does not meet the requirements for "Data of Known Quality".

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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:	RARITAN ARSENAL	**Lab Number:**	L1534153
Project Number:	TR0479-02B	**Report Date:**	01/06/16

Case Narrative (continued)

NJDEP Volatile Organics in Air

Canisters were released from the laboratory on December 22, 2015. The canister certification results are provided as an addendum.

Any Manual integrations that were performed on L1534153 as well as its associated quality control samples and are noted on the individual quantitation reports. A listing of all manual integrations performed and the integration code definitions are provided in manual integration documentation section of the data package.

Please note, dilution analysis due to exceedance of the calibration range is not required for Ethanol or Isopropyl Alcohol.

GC column and trap information utilized for the analysis of this sample delivery group is detailed below:
Column Type: Restek RTX-1
Column Length: 60 Meters
Internal diameter: 0.52 mm
Film thickness: 1.00 um
Trap 1: Entech Cold Trap - no packing material
Trap 2: Entech Tenax - 20 cm packing material

Gaseous calibration standards were utilized for system calibration and quality control standards associated with this sample delivery group. These standards were purchased from Linde (formerly Spectra Gases).

Laboratory standard procedure for QC (i.e. method blanks, LCS) and sample analysis is to withdraw a 250 mL aliquot from the canister as the "1X" analysis. For some calibration levels and samples, subsequent dilutions will be performed as needed by decreasing aliquot volumes via the instrumentation, or performing a dilution using a second canister. Make-up air is not routinely added to canisters prior to sample analysis.

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1534153
Project Number:	TR0479-02B	**Report Date:**	01/06/16

Case Narrative (continued)

Prior to sample analysis, the canister was pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the sample. The reporting limits have been elevated accordingly.

The results for Acetone should be considered estimated due to co-elution with a non-target peak.

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: 01/06/16

AIR

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

SAMPLE RESULTS

Lab ID: L1534153-01 D
Client ID: 4-SSDS-200
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/31/15 18:23
Analyst: RY

Date Collected: 12/23/15 09:00
Date Received: 12/23/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	0.42	--	ND	2	--		2.085
Chloromethane	ND	0.42	--	ND	0.9	--		2.085
Freon-114	ND	0.42	--	ND	3	--		2.085
Vinyl chloride	ND	0.42	--	ND	1	--		2.085
1,3-Butadiene	ND	0.42	--	ND	0.9	--		2.085
Bromomethane	ND	0.42	--	ND	2	--		2.085
Chloroethane	ND	0.42	--	ND	1	--		2.085
Ethanol	ND	10	--	ND	20	--		2.085
Vinyl bromide	ND	0.42	--	ND	2	--		2.085
Acetone	5.0	2.1	--	12	5.0	--		2.085
Trichlorofluoromethane	ND	0.42	--	ND	2	--		2.085
Isopropanol	1.3	1.0	--	3	2	--		2.085
1,1-Dichloroethene	1.8	0.42	--	7	2	--		2.085
Tertiary butyl Alcohol	ND	1.0	--	ND	3	--		2.085
Methylene chloride	ND	1.0	--	ND	3	--		2.085
3-Chloropropene	ND	0.42	--	ND	1	--		2.085
Carbon disulfide	ND	0.42	--	ND	1	--		2.085
Freon-113	ND	0.42	--	ND	3	--		2.085
trans-1,2-Dichloroethene	2.5	0.42	--	10	2	--		2.085
1,1-Dichloroethane	ND	0.42	--	ND	2	--		2.085
Methyl tert butyl ether	ND	0.42	--	ND	2	--		2.085
2-Butanone	ND	1.0	--	ND	3	--		2.085
cis-1,2-Dichloroethene	13	0.42	--	52	1.7	--		2.085
Chloroform	ND	0.42	--	ND	2	--		2.085

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

SAMPLE RESULTS

Lab ID: L1534153-01 D
Client ID: 4-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 12/23/15 09:00
Date Received: 12/23/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	ND	1.0	--	ND	3	--		2.085
1,2-Dichloroethane	ND	0.42	--	ND	2	--		2.085
n-Hexane	ND	0.42	--	ND	1	--		2.085
1,1,1-Trichloroethane	ND	0.42	--	ND	2	--		2.085
Benzene	ND	0.42	--	ND	1	--		2.085
Carbon tetrachloride	ND	0.42	--	ND	3	--		2.085
Cyclohexane	ND	0.42	--	ND	1	--		2.085
1,2-Dichloropropane	ND	0.42	--	ND	2	--		2.085
Bromodichloromethane	ND	0.42	--	ND	3	--		2.085
1,4-Dioxane	ND	0.42	--	ND	2	--		2.085
Trichloroethene	190	0.42	--	1000	2.3	--		2.085
2,2,4-Trimethylpentane	ND	0.42	--	ND	2	--		2.085
Methyl Methacrylate	ND	1.0	--	ND	4	--		2.085
Heptane	ND	0.42	--	ND	2	--		2.085
cis-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.085
4-Methyl-2-pentanone	ND	1.0	--	ND	4	--		2.085
trans-1,3-Dichloropropene	ND	0.42	--	ND	2	--		2.085
1,1,2-Trichloroethane	ND	0.42	--	ND	2	--		2.085
Toluene	ND	0.42	--	ND	2	--		2.085
Dibromochloromethane	ND	0.42	--	ND	4	--		2.085
1,2-Dibromoethane	ND	0.42	--	ND	3	--		2.085
Tetrachloroethene	ND	0.42	--	ND	3	--		2.085
Chlorobenzene	ND	0.42	--	ND	2	--		2.085
Ethylbenzene	ND	0.42	--	ND	2	--		2.085
p/m-Xylene	ND	0.83	--	ND	4	--		2.085
Bromoform	ND	0.42	--	ND	4	--		2.085
Styrene	ND	0.42	--	ND	2	--		2.085
1,1,2,2-Tetrachloroethane	ND	0.42	--	ND	3	--		2.085

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

SAMPLE RESULTS

Lab ID: L1534153-01 D
Client ID: 4-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 12/23/15 09:00
Date Received: 12/23/15
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.42	--	ND	2	--		2.085
2-Chlorotoluene	ND	0.42	--	ND	2	--		2.085
4-Ethyltoluene	ND	0.42	--	ND	2	--		2.085
1,3,5-Trimethybenzene	ND	0.42	--	ND	2	--		2.085
1,2,4-Trimethylbenzene	ND	0.42	--	ND	2	--		2.085
1,3-Dichlorobenzene	ND	0.42	--	ND	3	--		2.085
1,4-Dichlorobenzene	ND	0.42	--	ND	3	--		2.085
1,2-Dichlorobenzene	ND	0.42	--	ND	3	--		2.085
1,2,4-Trichlorobenzene	ND	0.42	--	ND	3	--		2.085
Hexachlorobutadiene	ND	0.42	--	ND	4	--		2.085

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
Pentane, 2,4-dimethyl-	8.1	NJ	ppbV		2.085
Butane, 2,2-dimethyl-	37	NJ	ppbV		2.085
Butane, 2,2,3-trimethyl-	8.4	NJ	ppbV		2.085
unknown alkane	5.2	J	ppbV		2.085
unknown alkane	10	J	ppbV		2.085
Pentane, 2-methyl-	64	NJ	ppbV		2.085
Pentane, 3,3-dimethyl-	16	NJ	ppbV		2.085
unknown alkane	5.9	J	ppbV		2.085
Butane, 2,3-Dimethyl-	49	NJ	ppbV		2.085
Pentane, 2,2-dimethyl-	3.8	NJ	ppbV		2.085
Unknown	42	J	ppbV		2.085
unknown alkane	26	J	ppbV		2.085
Pentane, 2,3-dimethyl-	8.6	NJ	ppbV		2.085
Unknown	5.8	J	ppbV		2.085
unknown alkane	4.8	J	ppbV		2.085

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

SAMPLE RESULTS

Lab ID: L1534153-01 D
Client ID: 4-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 12/23/15 09:00
Date Received: 12/23/15
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	103		60-140
Bromochloromethane	97		60-140
chlorobenzene-d5	96		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/31/15 14:13

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG854315-4								
Dichlorodifluoromethane	ND	0.20	--	ND	1.	--		1
Chloromethane	ND	0.20	--	ND	0.4	--		1
Freon-114	ND	0.20	--	ND	1.	--		1
Vinyl chloride	ND	0.20	--	ND	0.5	--		1
1,3-Butadiene	ND	0.20	--	ND	0.4	--		1
Butane	ND	0.20	--	ND	0.5	--		1
Bromomethane	ND	0.20	--	ND	0.8	--		1
Chloroethane	ND	0.20	--	ND	0.5	--		1
Ethanol	ND	5.0	--	ND	9.	--		1
Vinyl bromide	ND	0.20	--	ND	0.9	--		1
Acetone	ND	1.0	--	ND	2.	--		1
Trichlorofluoromethane	ND	0.20	--	ND	1.	--		1
Isopropanol	ND	0.50	--	ND	1.	--		1
1,1-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Tertiary butyl Alcohol	ND	0.50	--	ND	2.	--		1
Methylene chloride	ND	0.50	--	ND	2.	--		1
3-Chloropropene	ND	0.20	--	ND	0.6	--		1
Carbon disulfide	ND	0.20	--	ND	0.6	--		1
Freon-113	ND	0.20	--	ND	2.	--		1
trans-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
1,1-Dichloroethane	ND	0.20	--	ND	0.8	--		1
Methyl tert butyl ether	ND	0.20	--	ND	0.7	--		1
2-Butanone	ND	0.50	--	ND	1.	--		1
cis-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Chloroform	ND	0.20	--	ND	1.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/31/15 14:13

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG854315-4								
Tetrahydrofuran	ND	0.50	--	ND	1.	--		1
1,2-Dichloroethane	ND	0.20	--	ND	0.8	--		1
n-Hexane	ND	0.20	--	ND	0.7	--		1
1,1,1-Trichloroethane	ND	0.20	--	ND	1.	--		1
Benzene	ND	0.20	--	ND	0.6	--		1
Carbon tetrachloride	ND	0.20	--	ND	1.	--		1
Cyclohexane	ND	0.20	--	ND	0.7	--		1
1,2-Dichloropropane	ND	0.20	--	ND	0.9	--		1
Bromodichloromethane	ND	0.20	--	ND	1.	--		1
1,4-Dioxane	ND	0.20	--	ND	0.7	--		1
Trichloroethene	ND	0.20	--	ND	1.	--		1
2,2,4-Trimethylpentane	ND	0.20	--	ND	0.9	--		1
Methyl Methacrylate	ND	0.50	--	ND	2.	--		1
Heptane	ND	0.20	--	ND	0.8	--		1
cis-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
4-Methyl-2-pentanone	ND	0.50	--	ND	2.	--		1
trans-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
1,1,2-Trichloroethane	ND	0.20	--	ND	1.	--		1
Toluene	ND	0.20	--	ND	0.8	--		1
Dibromochloromethane	ND	0.20	--	ND	2.	--		1
1,2-Dibromoethane	ND	0.20	--	ND	2.	--		1
Tetrachloroethene	ND	0.20	--	ND	1.	--		1
Chlorobenzene	ND	0.20	--	ND	0.9	--		1
Ethylbenzene	ND	0.20	--	ND	0.9	--		1
p/m-Xylene	ND	0.40	--	ND	2.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1534153
Report Date: 01/06/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/31/15 14:13

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG854315-4								
Bromoform	ND	0.20	--	ND	2.	--		1
Styrene	ND	0.20	--	ND	0.9	--		1
1,1,2,2-Tetrachloroethane	ND	0.20	--	ND	1.	--		1
o-Xylene	ND	0.20	--	ND	0.9	--		1
2-Chlorotoluene	ND	0.20	--	ND	1.	--		1
4-Ethyltoluene	ND	0.20	--	ND	1.	--		1
1,3,5-Trimethybenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trimethylbenzene	ND	0.20	--	ND	1.	--		1
1,3-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,4-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trichlorobenzene	ND	0.20	--	ND	1.	--		1
Hexachlorobutadiene	ND	0.20	--	ND	2.	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG854315-3								
Chlorodifluoromethane	82		-		70-130	-		
Propylene	83		-		70-130	-		
Dichlorodifluoromethane	90		-		40-160	-		
Chloromethane	84		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	100		-		70-130	-		
Methanol	80		-		70-130	-		
Vinyl chloride	80		-		70-130	-		
1,3-Butadiene	92		-		70-130	-		
Butane	84		-		70-130	-		
Bromomethane	80		-		70-130	-		
Chloroethane	80		-		70-130	-		
Ethyl Alcohol	72		-		70-130	-		
Dichlorofluoromethane	78		-		70-130	-		
Vinyl bromide	82		-		70-130	-		
Acrolein	83		-		70-130	-		
Acetone	98		-		40-160	-		
Acetonitrile	90		-		70-130	-		
Trichlorofluoromethane	93		-		70-130	-		
iso-Propyl Alcohol	92		-		70-130	-		
Acrylonitrile	88		-		70-130	-		
Pentane	91		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1534153

Report Date: 01/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG854315-3								
Ethyl ether	94		-		70-130	-		
1,1-Dichloroethene	91		-		70-130	-		
tert-Butyl Alcohol	79		-		70-130	-		
Methylene chloride	98		-		70-130	-		
3-Chloropropene	100		-		70-130	-		
Carbon disulfide	83		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	86		-		70-130	-		
trans-1,2-Dichloroethene	82		-		70-130	-		
1,1-Dichloroethane	90		-		70-130	-		
Methyl tert butyl ether	86		-		70-130	-		
Vinyl acetate	92		-		70-130	-		
2-Butanone	100		-		70-130	-		
cis-1,2-Dichloroethene	100		-		70-130	-		
Ethyl Acetate	88		-		70-130	-		
Chloroform	84		-		70-130	-		
Tetrahydrofuran	93		-		70-130	-		
2,2-Dichloropropane	77		-		70-130	-		
1,2-Dichloroethane	88		-		70-130	-		
n-Hexane	100		-		70-130	-		
Isopropyl Ether	94		-		70-130	-		
Ethyl-Tert-Butyl-Ether	94		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1534153

Report Date: 01/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG854315-3								
1,1,1-Trichloroethane	120		-		70-130	-		
1,1-Dichloropropene	98		-		70-130	-		
Benzene	93		-		70-130	-		
Carbon tetrachloride	110		-		70-130	-		
Cyclohexane	100		-		70-130	-		
Tertiary-Amyl Methyl Ether	88		-		70-130	-		
Dibromomethane	93		-		70-130	-		
1,2-Dichloropropane	100		-		70-130	-		
Bromodichloromethane	110		-		70-130	-		
1,4-Dioxane	91		-		40-160	-		
Trichloroethene	100		-		70-130	-		
2,2,4-Trimethylpentane	100		-		70-130	-		
Methyl Methacrylate	100		-		70-130	-		
Heptane	110		-		70-130	-		
cis-1,3-Dichloropropene	110		-		70-130	-		
4-Methyl-2-pentanone	110		-		70-130	-		
trans-1,3-Dichloropropene	92		-		70-130	-		
1,1,2-Trichloroethane	100		-		70-130	-		
Toluene	88		-		70-130	-		
1,3-Dichloropropane	83		-		70-130	-		
2-Hexanone	110		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG854315-3								
Dibromochloromethane	100		-		70-130	-		
1,2-Dibromoethane	94		-		70-130	-		
Butyl Acetate	86		-		70-130	-		
Octane	82		-		70-130	-		
Tetrachloroethene	88		-		70-130	-		
1,1,1,2-Tetrachloroethane	91		-		70-130	-		
Chlorobenzene	91		-		70-130	-		
Ethylbenzene	92		-		70-130	-		
p/m-Xylene	90		-		70-130	-		
Bromoform	99		-		70-130	-		
Styrene	91		-		70-130	-		
1,1,2,2-Tetrachloroethane	94		-		70-130	-		
o-Xylene	95		-		70-130	-		
1,2,3-Trichloropropane	85		-		70-130	-		
Nonane (C9)	100		-		70-130	-		
Isopropylbenzene	84		-		70-130	-		
Bromobenzene	83		-		70-130	-		
o-Chlorotoluene	81		-		70-130	-		
n-Propylbenzene	84		-		70-130	-		
p-Chlorotoluene	84		-		70-130	-		
4-Ethyltoluene	85		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1534153

Report Date: 01/06/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG854315-3								
1,3,5-Trimethylbenzene	90		-		70-130	-		
tert-Butylbenzene	85		-		70-130	-		
1,2,4-Trimethylbenzene	94		-		70-130	-		
Decane (C10)	90		-		70-130	-		
Benzyl chloride	100		-		70-130	-		
1,3-Dichlorobenzene	89		-		70-130	-		
1,4-Dichlorobenzene	89		-		70-130	-		
sec-Butylbenzene	85		-		70-130	-		
p-Isopropyltoluene	79		-		70-130	-		
1,2-Dichlorobenzene	92		-		70-130	-		
n-Butylbenzene	97		-		70-130	-		
1,2-Dibromo-3-chloropropane	100		-		70-130	-		
Undecane	100		-		70-130	-		
Dodecane (C12)	93		-		70-130	-		
1,2,4-Trichlorobenzene	92		-		40-160	-		
Naphthalene	87		-		40-160	-		
1,2,3-Trichlorobenzene	80		-		70-130	-		
Hexachlorobutadiene	87		-		40-160	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG854315-5 QC Sample: L1534153-01 Client ID: 4-SSDS-200						
Dichlorodifluoromethane	ND	ND	ppbV	NC		25
Chloromethane	ND	ND	ppbV	NC		25
Freon-114	ND	ND	ppbV	NC		25
Vinyl chloride	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
Ethanol	ND	ND	ppbV	NC		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	5.0	4.4	ppbV	13		25
Trichlorofluoromethane	ND	ND	ppbV	NC		25
Isopropanol	1.3	1.3	ppbV	0		25
1,1-Dichloroethene	1.8	1.8	ppbV	0		25
Tertiary 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
Freon-113	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	2.5	2.5	ppbV	0		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG854315-5 QC Sample: L1534153-01 Client ID: 4-SSDS-200					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	13	13	ppbV	0	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	ND	ND	ppbV	NC	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	ND	ND	ppbV	NC	25
Cyclohexane	ND	0.46	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
Trichloroethene	190	190	ppbV	0	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25
Methyl Methacrylate	ND	ND	ppbV	NC	25
Heptane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG854315-5 QC Sample: L1534153-01 Client ID: 4-SSDS-200					
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	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	ND	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
2-Chlorotoluene	ND	ND	ppbV	NC	25
4-Ethyltoluene	ND	ND	ppbV	NC	25
1,3,5-Trimethybenzene	ND	ND	ppbV	NC	25
1,2,4-Trimethylbenzene	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG854315-5 QC Sample: L1534153-01 Client ID: 4-SSDS-200					
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: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1534153

Report Date: 01/06/16

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
L1534153-01	4-SSDS-200	813	1.0L Can	12/22/15	214707	L1533196-01	Pass	-29.5	0.8	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 12/16/15 10:59
Analyst: AR

Date Collected: 12/15/15 16:00
Date Received: 12/16/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**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
Propane	ND	0.500	--	ND	0.902	--		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
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: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:
Date Collected: 12/15/15 16:00
Date Received: 12/16/15
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: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:
Date Collected: 12/15/15 16:00
Date Received: 12/16/15
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 **Lab Number:** L1533196

Project Number: CANISTER QC BAT **Report Date:** 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01 Date Collected: 12/15/15 16:00

Client ID: CAN 1946 SHELF 8 Date Received: 12/16/15

Sample Location: 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 **Lab Number:** L1533196

Project Number: CANISTER QC BAT **Report Date:** 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01 Date Collected: 12/15/15 16:00

Client ID: CAN 1946 SHELF 8 Date Received: 12/16/15

Sample Location: 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	99		60-140
Bromochloromethane	98		60-140
chlorobenzene-d5	99		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 12/16/15 10:59
Analyst: AR

Date Collected: 12/15/15 16:00
Date Received: 12/16/15
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: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:
Date Collected: 12/15/15 16:00
Date Received: 12/16/15
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	0.020	--	ND	0.092	--		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
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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

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

Lab Number: L1533196
Report Date: 01/06/16

Air Canister Certification Results

Lab ID: L1533196-01
Client ID: CAN 1946 SHELF 8
Sample Location:

Date Collected: 12/15/15 16:00
Date Received: 12/16/15
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								
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	98		60-140
bromochloromethane	113		60-140
chlorobenzene-d5	99		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1534153
Report Date: 01/06/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information	Custody Seal
Cooler	
N/A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1534153-01A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)

*Values in parentheses indicate holding time in days

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1534153
Project Number:	TR0479-02B	**Report Date:**	01/06/16

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.

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

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.

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.

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 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).

Report Format: Data Usability Report

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1534153
Project Number:	TR0479-02B	**Report Date:**	01/06/16

Data Qualifiers

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 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

Alpha Analytical
320 Forbes Blvd
Mansfield, MA 02048-1806
Tel: 508-822-9300
Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab 12/24/15 | ALPHA Job# L1534153

Client Contact Information

Company: Geosyntec
Address: 130 Stone Rd West
City/State/Zip Guelph ON N1G3Z2
Phone: 519-515-0864
FAX: —
Email: PNicholson@geosyntec.com
Site Contact: Matthew Mcaw
Site Contact Phone: 609-462-1198

Project Information

Project Name: Raritan Arsenal
Project No: TR0479-02B
Site/Location: Edison, NJ
Project Manager: Paul Nicholson

Analysis Turn-Around Time

Standard (Specify) 2-week
Rush (Specify)

NJ DEP Information

Bureau: Division: Contract No:

Report Information - Data Deliverables:

☐ FAX:
☐ ADEx ☒ Criteria Checker: Enviro Data
☑ EMail (standard pdf report)

Billing Information

☐ Same as Client Info PO #:

1 of 1 COCs

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field (Hg) (Start)	Canister Pressure in Field ~~(Hg)~~ H2O (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure (Hg) (Note1)	Incoming Canister Pressure (Hg) (Note 2)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min) (Note1)	Batch Cert ID (Note 1)	Analysis: TO-15	Analysis: EPA 3C	Analysis:	Analysis:	Analysis:	Matrix: Indoor/Ambient Air	Matrix: Soil Gas	Matrix:	Matrix:
-01	4-SSDS-200	12/23/15	0900	0900	-29.5	-3.7	58	58	-29.5		—	813	1	—	L1532196-01	X						X		
											mm	12/23/15												

Custody Seals:	Temperature (Fahrenheit)	Ambient	Maximum	Minimum
Outgoing Seal No: (refer to crate seal)	Start	58	58	58
Incoming Seal No: (if applicable)	Stop	58	58	58

Individual Preparing Canister/Containers and Laboratory Canister Certification
Name: Paul Walukevich
Signature: Paul O. Walukevich

	Pressure (inches of Hg)	Ambient	Maximum	Minimum
	Start	30.19	30.19	30.19
	Stop	30.19	30.19	30.19

Footnotes:
(1) Refer to equipment tags for these readings.
(2) Readings provided in data deliverable package.

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by: Matt M	Date/Time: 12/23/15 1707	Received by: AAL	Date/Time: 12/23/15 17:07
Relinquished by:	Date/Time: 12/23/15 2245	Received by: Al Williams	Date/Time: 12-23-15 2245
Al Williams	12-24-15 0415		12/24/15 4:15

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

Note: Combined External Chain of Custody and NJDEP Field Test Data Sheet

ANALYTICAL REPORT

Lab Number:	L1600329
Client:	Geosyntec Consultants, Inc. 130 Stone Road West Guelph, ON N1G 3Z2
ATTN:	Paul Nicholson
Phone:	(519) 575-0864
Project Name:	RARITAN ARSENAL
Project Number:	TR0479-02B
Report Date:	01/08/16

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1600329-01	8-SSDS-200	SOIL_VAPOR	EDISON, NJ	01/06/16 08:55	01/06/16

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

NJ DEP Data of Known Quality Protocols
Conformance/Non-Conformance
Summary Questionnaire

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	YES
1a	Were the method specified handling, preservation, and holding time requirements met?	YES
1b	EPH Method: Was the EPH Method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	YES
3	Were all samples received at an appropriate temperature (4 ± 2° C)?	N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	YES
5a	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	YES
5b	Were these reporting limits met?	YES
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	YES
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	NO

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1a or #1b is "No", the data package does not meet the requirements for "Data of Known Quality".

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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: RARITAN ARSENAL **Lab Number:** L1600329
Project Number: TR0479-02B **Report Date:** 01/08/16

Case Narrative (continued)

NJDEP Volatile Organics in Air
Canisters were released from the laboratory on January 5, 2016. The canister certification results are provided as an addendum.

Any Manual integrations that were performed on L1600329 as well as its associated quality control samples and are noted on the individual quantitation reports. A listing of all manual integrations performed and the integration code definitions are provided in manual integration documentation section of the data package.

Please note, dilution analysis due to exceedance of the calibration range is not required for Ethanol or Isopropyl Alcohol.

GC column and trap information utilized for the analysis of this sample delivery group is detailed below:
Column Type: Restek RTX-1
Column Length: 60 Meters
Internal diameter: 0.52 mm
Film thickness: 1.00 um
Trap 1: Entech Cold Trap - no packing material
Trap 2: Entech Tenax - 20 cm packing material

Gaseous calibration standards were utilized for system calibration and quality control standards associated with this sample delivery group. These standards were purchased from Linde (formerly Spectra Gases).

Laboratory standard procedure for QC (i.e. method blanks, LCS) and sample analysis is to withdraw a 250 mL aliquot from the canister as the "1X" analysis. For some calibration levels and samples, subsequent dilutions will be performed as needed by decreasing aliquot volumes via the instrumentation, or performing a dilution using a second canister. Make-up air is not routinely added to canisters prior to sample analysis.

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
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Case Narrative (continued)

Sample L1600329-01 results for Acetone should be considered estimated due to co-elution with a non-target peak.

Sample L1600329-01 The presence of 2,2,4-Trimethylpentane could not be determined in this sample due to a non-target compound interfering with the identification and quantification of this compound.

Sample L1600329-01: Prior to sample analysis, the canister was pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the sample. The reporting limits have been elevated accordingly.

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: 01/08/16

AIR

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

SAMPLE RESULTS

Lab ID: L1600329-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 01/07/16 17:40
Analyst: MB

Date Collected: 01/06/16 08:55
Date Received: 01/06/16
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	0.41	--	ND	2	--		2.07
Chloromethane	ND	0.41	--	ND	0.8	--		2.07
Freon-114	ND	0.41	--	ND	3	--		2.07
Vinyl chloride	ND	0.41	--	ND	1	--		2.07
1,3-Butadiene	ND	0.41	--	ND	0.9	--		2.07
Bromomethane	ND	0.41	--	ND	2	--		2.07
Chloroethane	ND	0.41	--	ND	1	--		2.07
Ethanol	ND	10	--	ND	20	--		2.07
Vinyl bromide	ND	0.41	--	ND	2	--		2.07
Acetone	8.2	2.1	--	19	5.0	--		2.07
Trichlorofluoromethane	ND	0.41	--	ND	2	--		2.07
Isopropanol	1.3	1.0	--	3	2	--		2.07
1,1-Dichloroethene	1.4	0.41	--	6	2	--		2.07
Tertiary butyl Alcohol	ND	1.0	--	ND	3	--		2.07
Methylene chloride	ND	1.0	--	ND	3	--		2.07
3-Chloropropene	ND	0.41	--	ND	1	--		2.07
Carbon disulfide	ND	0.41	--	ND	1	--		2.07
Freon-113	ND	0.41	--	ND	3	--		2.07
trans-1,2-Dichloroethene	1.9	0.41	--	8	2	--		2.07
1,1-Dichloroethane	ND	0.41	--	ND	2	--		2.07
Methyl tert butyl ether	ND	0.41	--	ND	1	--		2.07
2-Butanone	1.1	1.0	--	3	3	--		2.07
cis-1,2-Dichloroethene	9.9	0.41	--	39	1.6	--		2.07
Chloroform	ND	0.41	--	ND	2	--		2.07

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

SAMPLE RESULTS

Lab ID: L1600329-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/06/16 08:55
Date Received: 01/06/16
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	ND	1.0	--	ND	3	--		2.07
1,2-Dichloroethane	ND	0.41	--	ND	2	--		2.07
n-Hexane	ND	0.41	--	ND	1	--		2.07
1,1,1-Trichloroethane	ND	0.41	--	ND	2	--		2.07
Benzene	ND	0.41	--	ND	1	--		2.07
Carbon tetrachloride	ND	0.41	--	ND	3	--		2.07
Cyclohexane	1.1	0.41	--	4	1	--		2.07
1,2-Dichloropropane	ND	0.41	--	ND	2	--		2.07
Bromodichloromethane	ND	0.41	--	ND	3	--		2.07
1,4-Dioxane	ND	0.41	--	ND	1	--		2.07
Trichloroethene	170	0.41	--	910	2.2	--		2.07
2,2,4-Trimethylpentane	ND	0.41	--	ND	2	--		2.07
Methyl Methacrylate	ND	1.0	--	ND	4	--		2.07
Heptane	ND	0.41	--	ND	2	--		2.07
cis-1,3-Dichloropropene	ND	0.41	--	ND	2	--		2.07
4-Methyl-2-pentanone	ND	1.0	--	ND	4	--		2.07
trans-1,3-Dichloropropene	ND	0.41	--	ND	2	--		2.07
1,1,2-Trichloroethane	ND	0.41	--	ND	2	--		2.07
Toluene	ND	0.41	--	ND	2	--		2.07
Dibromochloromethane	ND	0.41	--	ND	3	--		2.07
1,2-Dibromoethane	ND	0.41	--	ND	3	--		2.07
Tetrachloroethene	ND	0.41	--	ND	3	--		2.07
Chlorobenzene	ND	0.41	--	ND	2	--		2.07
Ethylbenzene	ND	0.41	--	ND	2	--		2.07
p/m-Xylene	ND	0.83	--	ND	4	--		2.07
Bromoform	ND	0.41	--	ND	4	--		2.07
Styrene	ND	0.41	--	ND	2	--		2.07
1,1,2,2-Tetrachloroethane	ND	0.41	--	ND	3	--		2.07

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

SAMPLE RESULTS

Lab ID: L1600329-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/06/16 08:55
Date Received: 01/06/16
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.41	--	ND	2	--		2.07
2-Chlorotoluene	ND	0.41	--	ND	2	--		2.07
4-Ethyltoluene	ND	0.41	--	ND	2	--		2.07
1,3,5-Trimethybenzene	ND	0.41	--	ND	2	--		2.07
1,2,4-Trimethylbenzene	ND	0.41	--	ND	2	--		2.07
1,3-Dichlorobenzene	ND	0.41	--	ND	2	--		2.07
1,4-Dichlorobenzene	ND	0.41	--	ND	2	--		2.07
1,2-Dichlorobenzene	ND	0.41	--	ND	2	--		2.07
1,2,4-Trichlorobenzene	ND	0.41	--	ND	3	--		2.07
Hexachlorobutadiene	ND	0.41	--	ND	4	--		2.07

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
unknown alkane	47	J	ppbV		2.07
Butane, 2,3-Dimethyl-	130	NJ	ppbV		2.07
Pentane, 2-methyl-	200	NJ	ppbV		2.07
Pentane, 3,3-dimethyl-	88	NJ	ppbV		2.07
Hexane, 3-methyl-	67	NJ	ppbV		2.07
Pentane, 2,4-dimethyl-	120	NJ	ppbV		2.07
unknown alkane	14	J	ppbV		2.07
unknown alkane	150	J	ppbV		2.07
unknown cycloalkane	23	J	ppbV		2.07
Pentane, 2,3-dimethyl-	92	NJ	ppbV		2.07
unknown alkane	36	J	ppbV		2.07
unknown alkane	41	J	ppbV		2.07
Butane, 2,2-dimethyl-	140	NJ	ppbV		2.07
unknown alkane	15	J	ppbV		2.07
Pentane, 2,2-dimethyl-	68	NJ	ppbV		2.07

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

SAMPLE RESULTS

Lab ID: L1600329-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/06/16 08:55
Date Received: 01/06/16
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	96		60-140
Bromochloromethane	96		60-140
chlorobenzene-d5	102		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/07/16 13:09

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG855541-4								
Dichlorodifluoromethane	ND	0.20	--	ND	1.	--		1
Chloromethane	ND	0.20	--	ND	0.4	--		1
Freon-114	ND	0.20	--	ND	1.	--		1
Vinyl chloride	ND	0.20	--	ND	0.5	--		1
1,3-Butadiene	ND	0.20	--	ND	0.4	--		1
Butane	ND	0.20	--	ND	0.5	--		1
Bromomethane	ND	0.20	--	ND	0.8	--		1
Chloroethane	ND	0.20	--	ND	0.5	--		1
Ethanol	ND	5.0	--	ND	9.	--		1
Vinyl bromide	ND	0.20	--	ND	0.9	--		1
Acetone	ND	1.0	--	ND	2.	--		1
Trichlorofluoromethane	ND	0.20	--	ND	1.	--		1
Isopropanol	ND	0.50	--	ND	1.	--		1
1,1-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Tertiary butyl Alcohol	ND	0.50	--	ND	2.	--		1
Methylene chloride	ND	0.50	--	ND	2.	--		1
3-Chloropropene	ND	0.20	--	ND	0.6	--		1
Carbon disulfide	ND	0.20	--	ND	0.6	--		1
Freon-113	ND	0.20	--	ND	2.	--		1
trans-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
1,1-Dichloroethane	ND	0.20	--	ND	0.8	--		1
Methyl tert butyl ether	ND	0.20	--	ND	0.7	--		1
2-Butanone	ND	0.50	--	ND	1.	--		1
cis-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Chloroform	ND	0.20	--	ND	1.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/07/16 13:09

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG855541-4								
Tetrahydrofuran	ND	0.50	--	ND	1.	--		1
1,2-Dichloroethane	ND	0.20	--	ND	0.8	--		1
n-Hexane	ND	0.20	--	ND	0.7	--		1
1,1,1-Trichloroethane	ND	0.20	--	ND	1.	--		1
Benzene	ND	0.20	--	ND	0.6	--		1
Carbon tetrachloride	ND	0.20	--	ND	1.	--		1
Cyclohexane	ND	0.20	--	ND	0.7	--		1
1,2-Dichloropropane	ND	0.20	--	ND	0.9	--		1
Bromodichloromethane	ND	0.20	--	ND	1.	--		1
1,4-Dioxane	ND	0.20	--	ND	0.7	--		1
Trichloroethene	ND	0.20	--	ND	1.	--		1
2,2,4-Trimethylpentane	ND	0.20	--	ND	0.9	--		1
Methyl Methacrylate	ND	0.50	--	ND	2.	--		1
Heptane	ND	0.20	--	ND	0.8	--		1
cis-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
4-Methyl-2-pentanone	ND	0.50	--	ND	2.	--		1
trans-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
1,1,2-Trichloroethane	ND	0.20	--	ND	1.	--		1
Toluene	ND	0.20	--	ND	0.8	--		1
Dibromochloromethane	ND	0.20	--	ND	2.	--		1
1,2-Dibromoethane	ND	0.20	--	ND	2.	--		1
Tetrachloroethene	ND	0.20	--	ND	1.	--		1
Chlorobenzene	ND	0.20	--	ND	0.9	--		1
Ethylbenzene	ND	0.20	--	ND	0.9	--		1
p/m-Xylene	ND	0.40	--	ND	2.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1600329
Report Date: 01/08/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/07/16 13:09

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG855541-4								
Bromoform	ND	0.20	--	ND	2.	--		1
Styrene	ND	0.20	--	ND	0.9	--		1
1,1,2,2-Tetrachloroethane	ND	0.20	--	ND	1.	--		1
o-Xylene	ND	0.20	--	ND	0.9	--		1
2-Chlorotoluene	ND	0.20	--	ND	1.	--		1
4-Ethyltoluene	ND	0.20	--	ND	1.	--		1
1,3,5-Trimethybenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trimethylbenzene	ND	0.20	--	ND	1.	--		1
1,3-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,4-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trichlorobenzene	ND	0.20	--	ND	1.	--		1
Hexachlorobutadiene	ND	0.20	--	ND	2.	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG855541-3								
Chlorodifluoromethane	84		-		70-130	-		
Propylene	95		-		70-130	-		
Dichlorodifluoromethane	76		-		40-160	-		
Chloromethane	96		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	88		-		70-130	-		
Methanol	88		-		70-130	-		
Vinyl chloride	91		-		70-130	-		
1,3-Butadiene	97		-		70-130	-		
Butane	86		-		70-130	-		
Bromomethane	88		-		70-130	-		
Chloroethane	90		-		70-130	-		
Ethyl Alcohol	76		-		70-130	-		
Dichlorofluoromethane	80		-		70-130	-		
Vinyl bromide	88		-		70-130	-		
Acrolein	91		-		70-130	-		
Acetone	94		-		40-160	-		
Acetonitrile	94		-		70-130	-		
Trichlorofluoromethane	87		-		70-130	-		
iso-Propyl Alcohol	96		-		70-130	-		
Acrylonitrile	87		-		70-130	-		
Pentane	86		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG855541-3								
Ethyl ether	85		-		70-130	-		
1,1-Dichloroethene	82		-		70-130	-		
tert-Butyl Alcohol	79		-		70-130	-		
Methylene chloride	92		-		70-130	-		
3-Chloropropene	93		-		70-130	-		
Carbon disulfide	85		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	83		-		70-130	-		
trans-1,2-Dichloroethene	76		-		70-130	-		
1,1-Dichloroethane	85		-		70-130	-		
Methyl tert butyl ether	78		-		70-130	-		
Vinyl acetate	83		-		70-130	-		
2-Butanone	91		-		70-130	-		
cis-1,2-Dichloroethene	96		-		70-130	-		
Ethyl Acetate	88		-		70-130	-		
Chloroform	85		-		70-130	-		
Tetrahydrofuran	83		-		70-130	-		
2,2-Dichloropropane	73		-		70-130	-		
1,2-Dichloroethane	81		-		70-130	-		
n-Hexane	96		-		70-130	-		
Isopropyl Ether	85		-		70-130	-		
Ethyl-Tert-Butyl-Ether	90		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG855541-3								
1,1,1-Trichloroethane	92		-		70-130	-		
1,1-Dichloropropene	91		-		70-130	-		
Benzene	93		-		70-130	-		
Carbon tetrachloride	95		-		70-130	-		
Cyclohexane	96		-		70-130	-		
Tertiary-Amyl Methyl Ether	84		-		70-130	-		
Dibromomethane	89		-		70-130	-		
1,2-Dichloropropane	100		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	95		-		40-160	-		
Trichloroethene	97		-		70-130	-		
2,2,4-Trimethylpentane	100		-		70-130	-		
Methyl Methacrylate	91		-		70-130	-		
Heptane	100		-		70-130	-		
cis-1,3-Dichloropropene	100		-		70-130	-		
4-Methyl-2-pentanone	100		-		70-130	-		
trans-1,3-Dichloropropene	88		-		70-130	-		
1,1,2-Trichloroethane	100		-		70-130	-		
Toluene	98		-		70-130	-		
1,3-Dichloropropane	96		-		70-130	-		
2-Hexanone	110		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG855541-3								
Dibromochloromethane	110		-		70-130	-		
1,2-Dibromoethane	100		-		70-130	-		
Butyl Acetate	93		-		70-130	-		
Octane	93		-		70-130	-		
Tetrachloroethene	97		-		70-130	-		
1,1,1,2-Tetrachloroethane	96		-		70-130	-		
Chlorobenzene	100		-		70-130	-		
Ethylbenzene	100		-		70-130	-		
p/m-Xylene	100		-		70-130	-		
Bromoform	110		-		70-130	-		
Styrene	99		-		70-130	-		
1,1,2,2-Tetrachloroethane	110		-		70-130	-		
o-Xylene	100		-		70-130	-		
1,2,3-Trichloropropane	94		-		70-130	-		
Nonane (C9)	100		-		70-130	-		
Isopropylbenzene	97		-		70-130	-		
Bromobenzene	95		-		70-130	-		
o-Chlorotoluene	94		-		70-130	-		
n-Propylbenzene	96		-		70-130	-		
p-Chlorotoluene	95		-		70-130	-		
4-Ethyltoluene	99		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG855541-3								
1,3,5-Trimethylbenzene	100		-		70-130	-		
tert-Butylbenzene	100		-		70-130	-		
1,2,4-Trimethylbenzene	110		-		70-130	-		
Decane (C10)	100		-		70-130	-		
Benzyl chloride	100		-		70-130	-		
1,3-Dichlorobenzene	110		-		70-130	-		
1,4-Dichlorobenzene	110		-		70-130	-		
sec-Butylbenzene	100		-		70-130	-		
p-Isopropyltoluene	92		-		70-130	-		
1,2-Dichlorobenzene	110		-		70-130	-		
n-Butylbenzene	100		-		70-130	-		
1,2-Dibromo-3-chloropropane	96		-		70-130	-		
Undecane	110		-		70-130	-		
Dodecane (C12)	110		-		70-130	-		
1,2,4-Trichlorobenzene	120		-		40-160	-		
Naphthalene	100		-		40-160	-		
1,2,3-Trichlorobenzene	99		-		70-130	-		
Hexachlorobutadiene	100		-		40-160	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG855541-5 QC Sample: L1600337-01 Client ID: DUP Sample						
Dichlorodifluoromethane	ND	ND	ppbV	NC		25
Chloromethane	ND	ND	ppbV	NC		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ppbV	NC		25
Vinyl chloride	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	ND	ND	ppbV	NC		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	3.1	3.0	ppbV	3		25
Trichlorofluoromethane	ND	ND	ppbV	NC		25
iso-Propyl Alcohol	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		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	8.6	8.6	ppbV	0		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG855541-5 QC Sample: L1600337-01 Client ID: DUP Sample					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Chloroform	4.6	4.5	ppbV	2	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	ND	ND	ppbV	NC	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	ND	ND	ppbV	NC	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
Trichloroethene	ND	ND	ppbV	NC	25
2,2,4-Trimethylpentane	2.2	2.2	ppbV	0	25
Methyl Methacrylate	ND	ND	ppbV	NC	25
Heptane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG855541-5 QC Sample: L1600337-01 Client ID: DUP Sample					
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	1.7	1.8	ppbV	6	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	ND	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
o-Chlorotoluene	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

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG855541-5 QC Sample: L1600337-01 Client ID: DUP Sample					
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: RARITAN ARSENAL

Lab Number: L1600329

Project Number: TR0479-02B

Report Date: 01/08/16

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
L1600329-01	8-SSDS-200	834	1.0L Can	01/05/16	215093	L1533832-02	Pass	-29.7	0.6	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533832
Report Date: 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02
Client ID: CAN 873 SHELF 3
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 12/22/15 15:30
Analyst: MB

Date Collected: 12/21/15 16:00
Date Received: 12/22/15
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
Propane	ND	0.500	--	ND	0.902	--		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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1533832

Project Number: CANISTER QC BAT **Report Date:** 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02 Date Collected: 12/21/15 16:00

Client ID: CAN 873 SHELF 3 Date Received: 12/22/15

Sample Location: Field Prep: Not Specified

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

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1533832

Project Number: CANISTER QC BAT **Report Date:** 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02 Date Collected: 12/21/15 16:00

Client ID: CAN 873 SHELF 3 Date Received: 12/22/15

Sample Location: Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533832
Report Date: 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02
Client ID: CAN 873 SHELF 3
Sample Location:
Date Collected: 12/21/15 16:00
Date Received: 12/22/15
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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 **Lab Number:** L1533832

Project Number: CANISTER QC BAT **Report Date:** 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02 Date Collected: 12/21/15 16:00

Client ID: CAN 873 SHELF 3 Date Received: 12/22/15

Sample Location: 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	96		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	92		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533832
Report Date: 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02
Client ID: CAN 873 SHELF 3
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 12/22/15 15:30
Analyst: MB

Date Collected: 12/21/15 16:00
Date Received: 12/22/15
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: L1533832
Report Date: 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02
Client ID: CAN 873 SHELF 3
Sample Location:

Date Collected: 12/21/15 16:00
Date Received: 12/22/15
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	0.020	--	ND	0.092	--		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
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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1533832
Report Date: 01/08/16

Air Canister Certification Results

Lab ID: L1533832-02
Client ID: CAN 873 SHELF 3
Sample Location:
Date Collected: 12/21/15 16:00
Date Received: 12/22/15
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								
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	98		60-140
bromochloromethane	100		60-140
chlorobenzene-d5	98		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1600329
Report Date: 01/08/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information	Custody Seal
Cooler	
N/A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1600329-01A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)

*Values in parentheses indicate holding time in days

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1600329
Project Number:	TR0479-02B	**Report Date:**	01/08/16

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.

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

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.

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.

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 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).

Report Format: Data Usability Report

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1600329
Project Number:	TR0479-02B	**Report Date:**	01/08/16

Data Qualifiers

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 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

Alpha Analytical
320 Forbes Blvd
Mansfield, MA 02048-1806
Tel: 508-822-9300
Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab: 1/7/16 | ALPHA Job#: L1600329

Client Contact Information

Company: Geosyntec
Address: 130 Stone Rd West
City/State/Zip: Guelph ON N1G3Z2
Phone: 519-515-0864
FAX: —
Email: PNicholson@geosyntec.com
Site Contact: Matthew Mraw
Site Contact Phone: 609-462-1198

Project Information

Project Name: Raritan Arsenal
Project No: TR0479-02B
Site/Location: Edison, NJ
Project Manager: Paul Nicholson

Analysis Turn-Around Time

Standard (Specify): 2-week
Rush (Specify):

NJ DEP Information

Bureau: Division: Contract No:

Report Information - Data Deliverables:

☐ FAX:
☐ ADEx ☒ Criteria Checker: Enviro Data
☒ EMail (standard pdf report)

Billing Information

☐ Same as Client Info PO #:

1 of 1 COCs

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field (Hg) (Start)	Canister Pressure in Field (Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure (Hg) (Note1)	Incoming Canister Pressure (Hg) (Note 2)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min) (Note1)	Batch Cert ID (Note 1)	Analysis: TO-15	Analysis: EPA 3C	Matrix: Indoor/Ambient Air	Matrix: Soil Gas
00329-01	8-SSDS-200	1/6/16	0855	0855	-29.7	-11.9	20	20	-29.7		—	834	1	—	L1533832-02	X			X

mm/dd/yy

Custody Seals:
Outgoing Seal No: — (refer to crate seal)
Incoming Seal No: — (if applicable)

Temperature (Fahrenheit)

	Ambient	Maximum	Minimum
Start	25	38	20
Stop	25	38	20

Pressure (inches of Hg)

	Ambient	Maximum	Minimum
Start	30.06	30.06	30.06
Stop	30.06	30.06	30.06

Individual Preparing Canister/Containers and Laboratory Canister Certification
Name: Paul Walukevich
Signature: Paul D. Walukevich

Footnotes:
(1) Refer to equipment tags for these readings.
(2) Readings provided in data deliverable package.

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by: Matthew Mraw	Date/Time: 1/6/16 1400	Received by: [signature] (AK)	Date/Time: 1/6/16 1400
Relinquished by: [signature]	Date/Time: 1/6/16 1840	Received by: Tom Tobin	Date/Time: 1-6-16 1840
Tom Tobin	1-6-16 2140	AC Williams	1-6-16 2140
AC Williams	1-7-16 0110	[signature]	1/7/16 1:10

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

Note: Combined External Chain of Custody and NJDEP Field Test Data Sheet

ANALYTICAL REPORT

Lab Number:	L1601851
Client:	Geosyntec Consultants, Inc. 130 Stone Road West Guelph, ON N1G 3Z2
ATTN:	Paul Nicholson
Phone:	(519) 575-0864
Project Name:	RARITAN ARSENAL
Project Number:	TR0479-02B
Report Date:	01/28/16

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

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

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1601851-01	8-SSDS-200	SOIL_VAPOR	EDISON, NJ	01/20/16 09:50	01/21/16

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

NJ DEP Data of Known Quality Protocols
Conformance/Non-Conformance
Summary Questionnaire

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	YES
1a	Were the method specified handling, preservation, and holding time requirements met?	YES
1b	EPH Method: Was the EPH Method conducted without significant modifications (see Section 11.3 of respective DKQ methods)?	N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	YES
3	Were all samples received at an appropriate temperature (4 ± 2° C)?	N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	YES
5a	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	YES
5b	Were these reporting limits met?	YES
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	YES
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	NO

Note: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1a or #1b is "No", the data package does not meet the requirements for "Data of Known Quality".

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

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 all of the requirements of NELAC, for all NELAC accredited parameters. 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:	RARITAN ARSENAL	**Lab Number:**	L1601851
Project Number:	TR0479-02B	**Report Date:**	01/28/16

Case Narrative (continued)

NJDEP Volatile Organics in Air
Canisters were released from the laboratory on January 19, 2016. The canister certification results are provided as an addendum.

Any Manual integrations that were performed on L1601851 as well as its associated quality control samples and are noted on the individual quantitation reports. A listing of all manual integrations performed and the integration code definitions are provided in manual integration documentation section of the data package.

Please note, dilution analysis due to exceedance of the calibration range is not required for Ethanol or Isopropyl Alcohol.

GC column and trap information utilized for the analysis of this sample delivery group is detailed below:
Column Type: Restek RTX-1
Column Length: 60 Meters
Internal diameter: 0.52 mm
Film thickness: 1.00 um
Trap 1: Entech Cold Trap - no packing material
Trap 2: Entech Tenax - 20 cm packing material

Gaseous calibration standards were utilized for system calibration and quality control standards associated with this sample delivery group. These standards were purchased from Linde (formerly Spectra Gases).

Laboratory standard procedure for QC (i.e. method blanks, LCS) and sample analysis is to withdraw a 250 mL aliquot from the canister as the "1X" analysis. For some calibration levels and samples, subsequent dilutions will be performed as needed by decreasing aliquot volumes via the instrumentation, or performing a dilution using a second canister. Make-up air is not routinely added to canisters prior to sample analysis.

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1601851
Project Number:	TR0479-02B	**Report Date:**	01/28/16

Case Narrative (continued)

Sample L1601851-01: Prior to sample analysis, the canister was pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the sample. The reporting limits have been elevated accordingly.

Sample L1601851-01 The presence of Acetone and 2,2,4-Trimethylpentane could not be determined in this sample due to a non-target compounds interfering with the identification and quantification of these compounds.

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: 01/28/16

AIR

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

SAMPLE RESULTS

Lab ID: L1601851-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 01/26/16 22:40
Analyst: MB

Date Collected: 01/20/16 09:50
Date Received: 01/21/16
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	0.41	--	ND	2	--		2.055
Chloromethane	ND	0.41	--	ND	0.8	--		2.055
Freon-114	ND	0.41	--	ND	3	--		2.055
Vinyl chloride	ND	0.41	--	ND	1	--		2.055
1,3-Butadiene	ND	0.41	--	ND	0.9	--		2.055
Bromomethane	ND	0.41	--	ND	2	--		2.055
Chloroethane	ND	0.41	--	ND	1	--		2.055
Ethanol	ND	10	--	ND	20	--		2.055
Vinyl bromide	ND	0.41	--	ND	2	--		2.055
Acetone	ND	2.0	--	ND	5	--		2.055
Trichlorofluoromethane	ND	0.41	--	ND	2	--		2.055
Isopropanol	3.7	1.0	--	9	2	--		2.055
1,1-Dichloroethene	1.3	0.41	--	5	2	--		2.055
Tertiary butyl Alcohol	ND	1.0	--	ND	3	--		2.055
Methylene chloride	ND	1.0	--	ND	3	--		2.055
3-Chloropropene	ND	0.41	--	ND	1	--		2.055
Carbon disulfide	ND	0.41	--	ND	1	--		2.055
Freon-113	ND	0.41	--	ND	3	--		2.055
trans-1,2-Dichloroethene	2.1	0.41	--	8	2	--		2.055
1,1-Dichloroethane	ND	0.41	--	ND	2	--		2.055
Methyl tert butyl ether	ND	0.41	--	ND	1	--		2.055
2-Butanone	ND	1.0	--	ND	3	--		2.055
cis-1,2-Dichloroethene	9.8	0.41	--	39	1.6	--		2.055
Chloroform	ND	0.41	--	ND	2	--		2.055

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

SAMPLE RESULTS

Lab ID: L1601851-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/20/16 09:50
Date Received: 01/21/16
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
NJ Volatile Organics in Air - Mansfield Lab								
Tetrahydrofuran	ND	1.0	--	ND	3	--		2.055
1,2-Dichloroethane	ND	0.41	--	ND	2	--		2.055
n-Hexane	ND	0.41	--	ND	1	--		2.055
1,1,1-Trichloroethane	ND	0.41	--	ND	2	--		2.055
Benzene	ND	0.41	--	ND	1	--		2.055
Carbon tetrachloride	ND	0.41	--	ND	3	--		2.055
Cyclohexane	0.47	0.41	--	2	1	--		2.055
1,2-Dichloropropane	ND	0.41	--	ND	2	--		2.055
Bromodichloromethane	ND	0.41	--	ND	3	--		2.055
1,4-Dioxane	ND	0.41	--	ND	1	--		2.055
Trichloroethene	130	0.41	--	700	2.2	--		2.055
2,2,4-Trimethylpentane	ND	0.41	--	ND	2	--		2.055
Methyl Methacrylate	ND	1.0	--	ND	4	--		2.055
Heptane	ND	0.41	--	ND	2	--		2.055
cis-1,3-Dichloropropene	ND	0.41	--	ND	2	--		2.055
4-Methyl-2-pentanone	ND	1.0	--	ND	4	--		2.055
trans-1,3-Dichloropropene	ND	0.41	--	ND	2	--		2.055
1,1,2-Trichloroethane	ND	0.41	--	ND	2	--		2.055
Toluene	ND	0.41	--	ND	2	--		2.055
Dibromochloromethane	ND	0.41	--	ND	3	--		2.055
1,2-Dibromoethane	ND	0.41	--	ND	3	--		2.055
Tetrachloroethene	ND	0.41	--	ND	3	--		2.055
Chlorobenzene	ND	0.41	--	ND	2	--		2.055
Ethylbenzene	ND	0.41	--	ND	2	--		2.055
p/m-Xylene	ND	0.82	--	ND	4	--		2.055
Bromoform	ND	0.41	--	ND	4	--		2.055
Styrene	ND	0.41	--	ND	2	--		2.055
1,1,2,2-Tetrachloroethane	ND	0.41	--	ND	3	--		2.055

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

SAMPLE RESULTS

Lab ID: L1601851-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/20/16 09:50
Date Received: 01/21/16
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.41	--	ND	2	--		2.055
2-Chlorotoluene	ND	0.41	--	ND	2	--		2.055
4-Ethyltoluene	ND	0.41	--	ND	2	--		2.055
1,3,5-Trimethybenzene	ND	0.41	--	ND	2	--		2.055
1,2,4-Trimethylbenzene	ND	0.41	--	ND	2	--		2.055
1,3-Dichlorobenzene	ND	0.41	--	ND	2	--		2.055
1,4-Dichlorobenzene	ND	0.41	--	ND	2	--		2.055
1,2-Dichlorobenzene	ND	0.41	--	ND	2	--		2.055
1,2,4-Trichlorobenzene	ND	0.41	--	ND	3	--		2.055
Hexachlorobutadiene	ND	0.41	--	ND	4	--		2.055

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
unknown alkane	34	J	ppbV		2.055
Pentane, 2-methyl-	35	NJ	ppbV		2.055
Cyclotrisiloxane, Hexamethyl-	6.4	NJ	ppbV		2.055
unknown alkane	10	J	ppbV		2.055
unknown alkane	19	J	ppbV		2.055
unknown alkane	8.7	J	ppbV		2.055
unknown alkane	28	J	ppbV		2.055
Butane, 2-Methyl-	32	NJ	ppbV		2.055
unknown alkane	18	J	ppbV		2.055
unknown alkane	26	J	ppbV		2.055
unknown alkane	6.4	J	ppbV		2.055
unknown alkane	90	J	ppbV		2.055
unknown alkane	32	J	ppbV		2.055
unknown alkane	42	J	ppbV		2.055
Butane, 2,2-dimethyl-	160	NJ	ppbV		2.055

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

SAMPLE RESULTS

Lab ID: L1601851-01 D
Client ID: 8-SSDS-200
Sample Location: EDISON, NJ
Date Collected: 01/20/16 09:50
Date Received: 01/21/16
Field Prep: Not Specified

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

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	97		60-140
Bromochloromethane	94		60-140
chlorobenzene-d5	100		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/26/16 14:02

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG860384-4								
Dichlorodifluoromethane	ND	0.20	--	ND	1.	--		1
Chloromethane	ND	0.20	--	ND	0.4	--		1
Freon-114	ND	0.20	--	ND	1.	--		1
Vinyl chloride	ND	0.20	--	ND	0.5	--		1
1,3-Butadiene	ND	0.20	--	ND	0.4	--		1
Butane	ND	0.20	--	ND	0.5	--		1
Bromomethane	ND	0.20	--	ND	0.8	--		1
Chloroethane	ND	0.20	--	ND	0.5	--		1
Ethanol	ND	5.0	--	ND	9.	--		1
Vinyl bromide	ND	0.20	--	ND	0.9	--		1
Acetone	ND	1.0	--	ND	2.	--		1
Trichlorofluoromethane	ND	0.20	--	ND	1.	--		1
Isopropanol	ND	0.50	--	ND	1.	--		1
1,1-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Tertiary butyl Alcohol	ND	0.50	--	ND	2.	--		1
Methylene chloride	ND	0.50	--	ND	2.	--		1
3-Chloropropene	ND	0.20	--	ND	0.6	--		1
Carbon disulfide	ND	0.20	--	ND	0.6	--		1
Freon-113	ND	0.20	--	ND	2.	--		1
trans-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
1,1-Dichloroethane	ND	0.20	--	ND	0.8	--		1
Methyl tert butyl ether	ND	0.20	--	ND	0.7	--		1
2-Butanone	ND	0.50	--	ND	1.	--		1
cis-1,2-Dichloroethene	ND	0.20	--	ND	0.8	--		1
Chloroform	ND	0.20	--	ND	1.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/26/16 14:02

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG860384-4								
Tetrahydrofuran	ND	0.50	--	ND	1.	--		1
1,2-Dichloroethane	ND	0.20	--	ND	0.8	--		1
n-Hexane	ND	0.20	--	ND	0.7	--		1
1,1,1-Trichloroethane	ND	0.20	--	ND	1.	--		1
Benzene	ND	0.20	--	ND	0.6	--		1
Carbon tetrachloride	ND	0.20	--	ND	1.	--		1
Cyclohexane	ND	0.20	--	ND	0.7	--		1
1,2-Dichloropropane	ND	0.20	--	ND	0.9	--		1
Bromodichloromethane	ND	0.20	--	ND	1.	--		1
1,4-Dioxane	ND	0.20	--	ND	0.7	--		1
Trichloroethene	ND	0.20	--	ND	1.	--		1
2,2,4-Trimethylpentane	ND	0.20	--	ND	0.9	--		1
Methyl Methacrylate	ND	0.50	--	ND	2.	--		1
Heptane	ND	0.20	--	ND	0.8	--		1
cis-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
4-Methyl-2-pentanone	ND	0.50	--	ND	2.	--		1
trans-1,3-Dichloropropene	ND	0.20	--	ND	0.9	--		1
1,1,2-Trichloroethane	ND	0.20	--	ND	1.	--		1
Toluene	ND	0.20	--	ND	0.8	--		1
Dibromochloromethane	ND	0.20	--	ND	2.	--		1
1,2-Dibromoethane	ND	0.20	--	ND	2.	--		1
Tetrachloroethene	ND	0.20	--	ND	1.	--		1
Chlorobenzene	ND	0.20	--	ND	0.9	--		1
Ethylbenzene	ND	0.20	--	ND	0.9	--		1
p/m-Xylene	ND	0.40	--	ND	2.	--		1

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B
Lab Number: L1601851
Report Date: 01/28/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 01/26/16 14:02

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
NJ Volatile Organics in Air - Mansfield Lab for sample(s): 01 Batch: WG860384-4								
Bromoform	ND	0.20	--	ND	2.	--		1
Styrene	ND	0.20	--	ND	0.9	--		1
1,1,2,2-Tetrachloroethane	ND	0.20	--	ND	1.	--		1
o-Xylene	ND	0.20	--	ND	0.9	--		1
2-Chlorotoluene	ND	0.20	--	ND	1.	--		1
4-Ethyltoluene	ND	0.20	--	ND	1.	--		1
1,3,5-Trimethybenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trimethylbenzene	ND	0.20	--	ND	1.	--		1
1,3-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,4-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2-Dichlorobenzene	ND	0.20	--	ND	1.	--		1
1,2,4-Trichlorobenzene	ND	0.20	--	ND	1.	--		1
Hexachlorobutadiene	ND	0.20	--	ND	2.	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG860384-3								
Chlorodifluoromethane	73		-		70-130	-		
Propylene	71		-		70-130	-		
Dichlorodifluoromethane	73		-		40-160	-		
Chloromethane	79		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	85		-		70-130	-		
Methanol	80		-		70-130	-		
Vinyl chloride	76		-		70-130	-		
1,3-Butadiene	87		-		70-130	-		
Butane	82		-		70-130	-		
Bromomethane	74		-		70-130	-		
Chloroethane	76		-		70-130	-		
Ethyl Alcohol	74		-		70-130	-		
Dichlorofluoromethane	76		-		70-130	-		
Vinyl bromide	78		-		70-130	-		
Acrolein	83		-		70-130	-		
Acetone	100		-		40-160	-		
Acetonitrile	90		-		70-130	-		
Trichlorofluoromethane	91		-		70-130	-		
iso-Propyl Alcohol	92		-		70-130	-		
Acrylonitrile	91		-		70-130	-		
Pentane	96		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1601851

Report Date: 01/28/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG860384-3								
Ethyl ether	100		-		70-130	-		
1,1-Dichloroethene	91		-		70-130	-		
tert-Butyl Alcohol	79		-		70-130	-		
Methylene chloride	100		-		70-130	-		
3-Chloropropene	110		-		70-130	-		
Carbon disulfide	85		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	86		-		70-130	-		
trans-1,2-Dichloroethene	84		-		70-130	-		
1,1-Dichloroethane	92		-		70-130	-		
Methyl tert butyl ether	86		-		70-130	-		
Vinyl acetate	100		-		70-130	-		
2-Butanone	110		-		70-130	-		
cis-1,2-Dichloroethene	100		-		70-130	-		
Ethyl Acetate	82		-		70-130	-		
Chloroform	82		-		70-130	-		
Tetrahydrofuran	96		-		70-130	-		
2,2-Dichloropropane	78		-		70-130	-		
1,2-Dichloroethane	89		-		70-130	-		
n-Hexane	96		-		70-130	-		
Isopropyl Ether	86		-		70-130	-		
Ethyl-Tert-Butyl-Ether	94		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1601851

Report Date: 01/28/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG860384-3								
1,1,1-Trichloroethane	100		-		70-130	-		
1,1-Dichloropropene	94		-		70-130	-		
Benzene	91		-		70-130	-		
Carbon tetrachloride	110		-		70-130	-		
Cyclohexane	99		-		70-130	-		
Tertiary-Amyl Methyl Ether	86		-		70-130	-		
Dibromomethane	93		-		70-130	-		
1,2-Dichloropropane	100		-		70-130	-		
Bromodichloromethane	100		-		70-130	-		
1,4-Dioxane	92		-		40-160	-		
Trichloroethene	96		-		70-130	-		
2,2,4-Trimethylpentane	100		-		70-130	-		
Methyl Methacrylate	110		-		70-130	-		
Heptane	110		-		70-130	-		
cis-1,3-Dichloropropene	100		-		70-130	-		
4-Methyl-2-pentanone	120		-		70-130	-		
trans-1,3-Dichloropropene	92		-		70-130	-		
1,1,2-Trichloroethane	96		-		70-130	-		
Toluene	83		-		70-130	-		
1,3-Dichloropropane	81		-		70-130	-		
2-Hexanone	110		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG860384-3								
Dibromochloromethane	93		-		70-130	-		
1,2-Dibromoethane	88		-		70-130	-		
Butyl Acetate	85		-		70-130	-		
Octane	76		-		70-130	-		
Tetrachloroethene	82		-		70-130	-		
1,1,1,2-Tetrachloroethane	87		-		70-130	-		
Chlorobenzene	85		-		70-130	-		
Ethylbenzene	86		-		70-130	-		
p/m-Xylene	90		-		70-130	-		
Bromoform	93		-		70-130	-		
Styrene	85		-		70-130	-		
1,1,2,2-Tetrachloroethane	87		-		70-130	-		
o-Xylene	89		-		70-130	-		
1,2,3-Trichloropropane	81		-		70-130	-		
Nonane (C9)	96		-		70-130	-		
Isopropylbenzene	78		-		70-130	-		
Bromobenzene	78		-		70-130	-		
o-Chlorotoluene	75		-		70-130	-		
n-Propylbenzene	79		-		70-130	-		
p-Chlorotoluene	79		-		70-130	-		
4-Ethyltoluene	78		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 Batch: WG860384-3								
1,3,5-Trimethylbenzene	84		-		70-130	-		
tert-Butylbenzene	80		-		70-130	-		
1,2,4-Trimethylbenzene	90		-		70-130	-		
Decane (C10)	85		-		70-130	-		
Benzyl chloride	93		-		70-130	-		
1,3-Dichlorobenzene	82		-		70-130	-		
1,4-Dichlorobenzene	82		-		70-130	-		
sec-Butylbenzene	78		-		70-130	-		
p-Isopropyltoluene	74		-		70-130	-		
1,2-Dichlorobenzene	84		-		70-130	-		
n-Butylbenzene	91		-		70-130	-		
1,2-Dibromo-3-chloropropane	96		-		70-130	-		
Undecane	96		-		70-130	-		
Dodecane (C12)	98		-		70-130	-		
1,2,4-Trichlorobenzene	93		-		40-160	-		
Naphthalene	88		-		40-160	-		
1,2,3-Trichlorobenzene	83		-		70-130	-		
Hexachlorobutadiene	85		-		40-160	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG860384-5 QC Sample: L1602080-02 Client ID: DUP Sample						
Dichlorodifluoromethane	0.43	0.46	ppbV	7		25
Chloromethane	0.54	0.51	ppbV	6		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ppbV	NC		25
Vinyl chloride	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	ND	ND	ppbV	NC		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	ND	ND	ppbV	NC		25
Trichlorofluoromethane	ND	0.21	ppbV	NC		25
iso-Propyl Alcohol	ND	ND	ppbV	NC		25
1,1-Dichloroethene	ND	ND	ppbV	NC		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

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG860384-5 QC Sample: L1602080-02 Client ID: DUP Sample					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	ND	ND	ppbV	NC	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	ND	ND	ppbV	NC	25
Carbon tetrachloride	ND	ND	ppbV	NC	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
Trichloroethene	ND	ND	ppbV	NC	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25
Methyl Methacrylate	ND	ND	ppbV	NC	25
Heptane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG860384-5 QC Sample: L1602080-02 Client ID: DUP Sample					
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	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	ND	ND	ppbV	NC	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	ND	ND	ppbV	NC	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
o-Chlorotoluene	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

Lab Duplicate Analysis
Batch Quality Control

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
NJ Volatile Organics in Air - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG860384-5 QC Sample: L1602080-02 Client ID: DUP Sample					
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: RARITAN ARSENAL

Project Number: TR0479-02B

Lab Number: L1601851

Report Date: 01/28/16

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
L1601851-01	8-SSDS-200	1959	1.0L Can	01/19/16	215930	L1600953-02	Pass	-29.3	0.9	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 01/13/16 16:57
Analyst: RY

Date Collected: 01/12/16 15:00
Date Received: 01/13/16
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
Propane	ND	0.500	--	ND	0.902	--		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

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

Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:

Date Collected: 01/12/16 15:00
Date Received: 01/13/16
Field Prep: Not Specified

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

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

Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:

Date Collected: 01/12/16 15:00
Date Received: 01/13/16
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
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

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:
Date Collected: 01/12/16 15:00
Date Received: 01/13/16
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
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 **Lab Number:** L1600953

Project Number: CANISTER QC BAT **Report Date:** 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02 Date Collected: 01/12/16 15:00

Client ID: CAN 1920 SHELF 8 Date Received: 01/13/16

Sample Location: 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	97		60-140
Bromochloromethane	89		60-140
chlorobenzene-d5	91		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 01/13/16 16:57
Analyst: RY

Date Collected: 01/12/16 15:00
Date Received: 01/13/16
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								
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
Bromodichloromethane	ND	0.020	--	ND	0.134	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:
Date Collected: 01/12/16 15:00
Date Received: 01/13/16
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								
1,4-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	0.020	--	ND	0.092	--		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
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
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L1600953
Report Date: 01/28/16

Air Canister Certification Results

Lab ID: L1600953-02
Client ID: CAN 1920 SHELF 8
Sample Location:
Date Collected: 01/12/16 15:00
Date Received: 01/13/16
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								
1,2,4-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	96		60-140
bromochloromethane	91		60-140
chlorobenzene-d5	97		60-140

Project Name: RARITAN ARSENAL
Project Number: TR0479-02B

Lab Number: L1601851
Report Date: 01/28/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information	Custody Seal
Cooler	
N/A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1601851-01A	Canister - 1 Liter	N/A	N/A	N/A	Y	Absent	NJ-TO15(30)

*Values in parentheses indicate holding time in days

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1601851
Project Number:	TR0479-02B	**Report Date:**	01/28/16

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.

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

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.

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.

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 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).

Report Format: Data Usability Report

Project Name:	RARITAN ARSENAL	**Lab Number:**	L1601851
Project Number:	TR0479-02B	**Report Date:**	01/28/16

Data Qualifiers

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 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl
EPA 2540D: TSS
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.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
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.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, 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, SM9222D-MF**.

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

Serial_No:01281615:49

Alpha Analytical
320 Forbes Blvd
Mansfield, MA 02048-1806
Tel: 508-822-9300
Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab 1/22/16 | ALPHA Job# L1601851

1 of 1 COCs

Client Contact Information

Company: Geosyntec
Address: 130 Stone Road West
City/State/Zip Guelph ON N1G3Z2
Phone: 519-515-0864
FAX: —
Email: PNicholson@geosyntec.com
Site Contact: Matthew Mraw
Site Contact Phone: 609-462-1198

Project Information

Project Name: Raritan Arsenal
Project No: ~~TR0479~~ TR0479-02B
Site/Location: Edison, NJ
Project Manager: Paul Nicholson

Analysis Turn-Around Time

Standard (Specify) 5 day
Rush (Specify)

NJ DEP Information

Bureau: Division: Contract No:

Report Information - Data Deliverables:

☐ FAX:
☒ ADEx ☐ Criteria Checker: _____
☒ EMail (standard pdf report)

Billing Information

☐ Same as Client Info PO #:

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field (Hg) (Start)	Canister Pressure in Field ~~(Hg)~~ (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure (Hg) (Note1)	Incoming Canister Pressure (Hg) (Note 2)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min) (Note1)	Batch Cert ID (Note 1)	Analysis: TO-15	Analysis: EPA 3C	Matrix: Indoor /Ambient Air	Matrix: Soil Gas
1601851-01	8-SSDS-200	1/22/16	0950	0950	NM	-8.0	20	20	NA		NA	NA	1	NA	NA	X			X

mm 1/20/16

Custody Seals:
Outgoing Seal No: _____ (refer to crate seal)
Incoming Seal No: _____ (if applicable)

Temperature (Fahrenheit)

	Ambient	Maximum	Minimum	
Start	20	20	20	
Stop	20	20	20	

Pressure (inches of Hg)

	Ambient	Maximum	Minimum	
Start	30.16	30.16	30.16	
Stop	30.16	30.16	30.16	

Individual Preparing Canister/Containers and Laboratory Canister Certification
Name: Lisa Barrett
Signature: Lisa B

Footnotes:
(1) Refer to equipment tags for these readings.
(2) Readings provided in data deliverable package.

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by: Matt Mraw	Date/Time: 1/20/16 11:23	Received by: Lisa Barrett - AAL	Date/Time: 1/21/16 11:23
Relinquished by: Lisa Barrett - AAL	Date/Time: 1/21/16 1850	Received by: Tom Tobin	Date/Time: 1-21-16 1850
Tom Tobin	1-21-16 2315	GE Williams	1-21-16 2315
GE Williams	1-22-16 02:15	Pete Boehm	1/22/16 02:15

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

Note: Combined External Chain of Custody and NJDEP Field Test Data Sheet

Site #3: Sun Devil Manor

Hill Air Force Base

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6/22/2016
Mr. Paul Nicholson
GeoSyntec Consultants
130 Stone Road West

Guelph, Ontario N1G3Z2

Project Name: SDM Optimization
Project #: TR0479
Workorder #: 1606235

Dear Mr. Paul Nicholson

The following report includes the data for the above referenced project for sample(s) received on 6/10/2016 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1606235

Work Order Summary

CLIENT:	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	519-822-2230	**P.O. #**	
FAX:	519-822-3151	**PROJECT #**	TR0479 SDM Optimization
DATE RECEIVED:	06/10/2016	**CONTACT:**	Ausha Scott
DATE COMPLETED:	06/22/2016		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	ST-LDO-120-53	Modified TO-15	9 "Hg	5 psi
01B	ST-LDO-120-53	Modified TO-15	9 "Hg	5 psi
02A	Lab Blank	Modified TO-15	NA	NA
02B	Lab Blank	Modified TO-15	NA	NA
03A	CCV	Modified TO-15	NA	NA
03B	CCV	Modified TO-15	NA	NA
04A	LCS	Modified TO-15	NA	NA
04AA	LCSD	Modified TO-15	NA	NA
04B	LCS	Modified TO-15	NA	NA
04BB	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Heidi Mayo DATE: 06/22/16

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-15-9, UT NELAP CA0093332015-6, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2015, Expiration date: 10/17/2016.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, Inc.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified TO-15 Full Scan/SIM
GeoSyntec Consultants
Workorder# 1606235

One 6 Liter Summa Canister (SIM Certified) samples were received on June 10, 2016. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the Full Scan and SIM acquisition modes. The method involves concentrating up to 1.0 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-15***	***ATL Modifications***
ICAL %RSD acceptance criteria	</=30% RSD with 2 compounds allowed out to < 40% RSD	For Full Scan: 30% RSD with 4 compounds allowed out to < 40% RSD For SIM: Project specific; default criteria is </=30% RSD with 10% of compounds allowed out to < 40% RSD
Daily Calibration	+- 30% Difference	For Full Scan: </= 30% Difference with four allowed out up to </=40%.; flag and narrate outliers For SIM: Project specific; default criteria is </= 30% Difference with 10% of compounds allowed out up to </=40%.; flag and narrate outliers
Blank and standards	Zero air	Nitrogen
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The results for each sample in this report were acquired from two separate data files originating from the same analytical run. The two data files have the same base file name and are differentiated with a "sim" extension on the SIM data file.

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is

defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Definition of Data Qualifying Flags

Nine qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

CN - See case narrative explanation

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

Client Sample ID: ST-LDO-120-53

Lab ID#: 1606235-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 11	0.19	0.42	1.1	2.3
Ethanol	0.96	28	1.8	52
Freon 113	0.19	0.49	1.5	3.8
Acetone	0.96	16	2.3	38
2-Propanol	0.96	1.8	2.3	4.5
Methylene Chloride	0.38	0.54	1.3	1.9
Hexane	0.19	0.33	0.67	1.2
2-Butanone (Methyl Ethyl Ketone)	0.96	1.1	2.8	3.2
Cyclohexane	0.19	0.32	0.66	1.1
Heptane	0.19	0.27	0.78	1.1
Styrene	0.19	0.22	0.81	0.95

Client Sample ID: ST-LDO-120-53

Lab ID#: 1606235-01B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.038	0.52	0.19	2.6
Chloromethane	0.096	0.51	0.20	1.0
1,1-Dichloroethene	0.019	3.8	0.076	15
1,1-Dichloroethane	0.038	1.1	0.15	4.3
cis-1,2-Dichloroethene	0.038	0.90	0.15	3.6
Chloroform	0.038	3.7	0.19	18
1,1,1-Trichloroethane	0.038	1.9	0.21	10
Carbon Tetrachloride	0.038	0.071	0.24	0.45
Benzene	0.096	0.18	0.30	0.58
1,2-Dichloroethane	0.038	0.21	0.15	0.85
Trichloroethene	0.038	7.9	0.20	42
Toluene	0.038	1.4	0.14	5.2
Tetrachloroethene	0.038	2.0	0.26	13
Ethyl Benzene	0.038	0.12	0.16	0.54
m,p-Xylene	0.076	0.36	0.33	1.5
o-Xylene	0.038	0.15	0.16	0.64

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Client Sample ID: ST-LDO-120-53

Lab ID#: 1606235-01A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061609**	**Date of Collection: 6/7/16 6:55:00 PM**	
Dil. Factor:	**1.91**	**Date of Analysis: 6/16/16 05:05 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.19	Not Detected	0.42	Not Detected
Bromomethane	0.96	Not Detected	3.7	Not Detected
Freon 11	0.19	0.42	1.1	2.3
Ethanol	0.96	28	1.8	52
Freon 113	0.19	0.49	1.5	3.8
Acetone	0.96	16	2.3	38
2-Propanol	0.96	1.8	2.3	4.5
Carbon Disulfide	0.96	Not Detected	3.0	Not Detected
3-Chloropropene	0.96	Not Detected	3.0	Not Detected
Methylene Chloride	0.38	0.54	1.3	1.9
Hexane	0.19	0.33	0.67	1.2
2-Butanone (Methyl Ethyl Ketone)	0.96	1.1	2.8	3.2
Tetrahydrofuran	0.96	Not Detected	2.8	Not Detected
Cyclohexane	0.19	0.32	0.66	1.1
2,2,4-Trimethylpentane	0.96	Not Detected	4.5	Not Detected
Heptane	0.19	0.27	0.78	1.1
1,2-Dichloropropane	0.19	Not Detected	0.88	Not Detected
1,4-Dioxane	0.19	Not Detected	0.69	Not Detected
Bromodichloromethane	0.19	Not Detected	1.3	Not Detected
cis-1,3-Dichloropropene	0.19	Not Detected	0.87	Not Detected
4-Methyl-2-pentanone	0.19	Not Detected	0.78	Not Detected
trans-1,3-Dichloropropene	0.19	Not Detected	0.87	Not Detected
2-Hexanone	0.96	Not Detected	3.9	Not Detected
Dibromochloromethane	0.19	Not Detected	1.6	Not Detected
Chlorobenzene	0.19	Not Detected	0.88	Not Detected
Styrene	0.19	0.22	0.81	0.95
Bromoform	0.19	Not Detected	2.0	Not Detected
Cumene	0.19	Not Detected	0.94	Not Detected
Propylbenzene	0.19	Not Detected	0.94	Not Detected
4-Ethyltoluene	0.19	Not Detected	0.94	Not Detected
1,3,5-Trimethylbenzene	0.19	Not Detected	0.94	Not Detected
1,2,4-Trimethylbenzene	0.19	Not Detected	0.94	Not Detected
1,3-Dichlorobenzene	0.19	Not Detected	1.1	Not Detected
alpha-Chlorotoluene	0.19	Not Detected	0.99	Not Detected
1,2-Dichlorobenzene	0.19	Not Detected	1.1	Not Detected
1,2,4-Trichlorobenzene	0.96	Not Detected	7.1	Not Detected
Hexachlorobutadiene	0.96	Not Detected	10	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130

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Client Sample ID: ST-LDO-120-53

Lab ID#: 1606235-01A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061609**	**Date of Collection: 6/7/16 6:55:00 PM**	
Dil. Factor:	**1.91**	**Date of Analysis: 6/16/16 05:05 PM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: ST-LDO-120-53

Lab ID#: 1606235-01B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061609sim**	**Date of Collection:**	**6/7/16 6:55:00 PM**
Dil. Factor:	**1.91**	**Date of Analysis:**	**6/16/16 05:05 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.038	0.52	0.19	2.6
Freon 114	0.038	Not Detected	0.27	Not Detected
Chloromethane	0.096	0.51	0.20	1.0
Vinyl Chloride	0.019	Not Detected	0.049	Not Detected
Chloroethane	0.096	Not Detected	0.25	Not Detected
1,1-Dichloroethene	0.019	3.8	0.076	15
trans-1,2-Dichloroethene	0.19	Not Detected	0.76	Not Detected
Methyl tert-butyl ether	0.19	Not Detected	0.69	Not Detected
1,1-Dichloroethane	0.038	1.1	0.15	4.3
cis-1,2-Dichloroethene	0.038	0.90	0.15	3.6
Chloroform	0.038	3.7	0.19	18
1,1,1-Trichloroethane	0.038	1.9	0.21	10
Carbon Tetrachloride	0.038	0.071	0.24	0.45
Benzene	0.096	0.18	0.30	0.58
1,2-Dichloroethane	0.038	0.21	0.15	0.85
Trichloroethene	0.038	7.9	0.20	42
Toluene	0.038	1.4	0.14	5.2
1,1,2-Trichloroethane	0.038	Not Detected	0.21	Not Detected
Tetrachloroethene	0.038	2.0	0.26	13
1,2-Dibromoethane (EDB)	0.038	Not Detected	0.29	Not Detected
Ethyl Benzene	0.038	0.12	0.16	0.54
m,p-Xylene	0.076	0.36	0.33	1.5
o-Xylene	0.038	0.15	0.16	0.64
1,1,2,2-Tetrachloroethane	0.038	Not Detected	0.26	Not Detected
1,4-Dichlorobenzene	0.038	Not Detected	0.23	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1606235-02A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061606**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 02:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1606235-02A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061606**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 02:07 PM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
4-Bromofluorobenzene	92	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1606235-02B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061606sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 02:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.020	Not Detected	0.099	Not Detected
Freon 114	0.020	Not Detected	0.14	Not Detected
Chloromethane	0.050	Not Detected	0.10	Not Detected
Vinyl Chloride	0.010	Not Detected	0.026	Not Detected
Chloroethane	0.050	Not Detected	0.13	Not Detected
1,1-Dichloroethene	0.010	Not Detected	0.040	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
1,1-Dichloroethane	0.020	Not Detected	0.081	Not Detected
cis-1,2-Dichloroethene	0.020	Not Detected	0.079	Not Detected
Chloroform	0.020	Not Detected	0.098	Not Detected
1,1,1-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Carbon Tetrachloride	0.020	Not Detected	0.12	Not Detected
Benzene	0.050	Not Detected	0.16	Not Detected
1,2-Dichloroethane	0.020	Not Detected	0.081	Not Detected
Trichloroethene	0.020	Not Detected	0.11	Not Detected
Toluene	0.020	Not Detected	0.075	Not Detected
1,1,2-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Tetrachloroethene	0.020	Not Detected	0.14	Not Detected
1,2-Dibromoethane (EDB)	0.020	Not Detected	0.15	Not Detected
Ethyl Benzene	0.020	Not Detected	0.087	Not Detected
m,p-Xylene	0.040	Not Detected	0.17	Not Detected
o-Xylene	0.020	Not Detected	0.087	Not Detected
1,1,2,2-Tetrachloroethane	0.020	Not Detected	0.14	Not Detected
1,4-Dichlorobenzene	0.020	Not Detected	0.12	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	115	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	95	70-130

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Client Sample ID: CCV

Lab ID#: 1606235-03A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061602**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 11:18 AM**	

Compound	%Recovery
1,3-Butadiene	106
Bromomethane	120
Freon 11	108
Ethanol	112
Freon 113	99
Acetone	101
2-Propanol	103
Carbon Disulfide	108
3-Chloropropene	101
Methylene Chloride	98
Hexane	108
2-Butanone (Methyl Ethyl Ketone)	107
Tetrahydrofuran	111
Cyclohexane	103
2,2,4-Trimethylpentane	108
Heptane	108
1,2-Dichloropropane	109
1,4-Dioxane	106
Bromodichloromethane	108
cis-1,3-Dichloropropene	109
4-Methyl-2-pentanone	112
trans-1,3-Dichloropropene	113
2-Hexanone	104
Dibromochloromethane	107
Chlorobenzene	108
Styrene	97
Bromoform	109
Cumene	104
Propylbenzene	97
4-Ethyltoluene	92
1,3,5-Trimethylbenzene	100
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	97
alpha-Chlorotoluene	109
1,2-Dichlorobenzene	95
1,2,4-Trichlorobenzene	102
Hexachlorobutadiene	90

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130

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Client Sample ID: CCV

Lab ID#: 1606235-03A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061602**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 11:18 AM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: CCV

Lab ID#: 1606235-03B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061602sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 11:18 AM**	

Compound	%Recovery
Freon 12	110
Freon 114	104
Chloromethane	98
Vinyl Chloride	97
Chloroethane	113
1,1-Dichloroethene	97
trans-1,2-Dichloroethene	100
Methyl tert-butyl ether	102
1,1-Dichloroethane	108
cis-1,2-Dichloroethene	101
Chloroform	109
1,1,1-Trichloroethane	106
Carbon Tetrachloride	137
Benzene	103
1,2-Dichloroethane	109
Trichloroethene	101
Toluene	106
1,1,2-Trichloroethane	110
Tetrachloroethene	101
1,2-Dibromoethane (EDB)	108
Ethyl Benzene	105
m,p-Xylene	102
o-Xylene	102
1,1,2,2-Tetrachloroethane	112
1,4-Dichlorobenzene	85

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: LCS

Lab ID#: 1606235-04A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061603**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:05 PM**	

Compound	%Recovery	Method Limits
1,3-Butadiene	108	70-130
Bromomethane	133 Q	70-130
Freon 11	117	70-130
Ethanol	120	70-130
Freon 113	102	70-130
Acetone	106	70-130
2-Propanol	112	70-130
Carbon Disulfide	99	70-130
3-Chloropropene	99	70-130
Methylene Chloride	100	70-130
Hexane	109	70-130
2-Butanone (Methyl Ethyl Ketone)	109	70-130
Tetrahydrofuran	115	70-130
Cyclohexane	106	70-130
2,2,4-Trimethylpentane	112	70-130
Heptane	112	70-130
1,2-Dichloropropane	109	70-130
1,4-Dioxane	103	70-130
Bromodichloromethane	113	70-130
cis-1,3-Dichloropropene	102	70-130
4-Methyl-2-pentanone	114	70-130
trans-1,3-Dichloropropene	112	70-130
2-Hexanone	108	70-130
Dibromochloromethane	110	70-130
Chlorobenzene	107	70-130
Styrene	98	70-130
Bromoform	113	70-130
Cumene	103	70-130
Propylbenzene	97	70-130
4-Ethyltoluene	90	70-130
1,3,5-Trimethylbenzene	99	70-130
1,2,4-Trimethylbenzene	102	70-130
1,3-Dichlorobenzene	98	70-130
alpha-Chlorotoluene	109	70-130
1,2-Dichlorobenzene	96	70-130
1,2,4-Trichlorobenzene	102	70-130
Hexachlorobutadiene	90	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

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Client Sample ID: LCS

Lab ID#: 1606235-04A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061603**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:05 PM**	

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: LCSD

Lab ID#: 1606235-04AA

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061604**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:51 PM**	

Compound	%Recovery	Method Limits
1,3-Butadiene	107	70-130
Bromomethane	132 Q	70-130
Freon 11	115	70-130
Ethanol	120	70-130
Freon 113	101	70-130
Acetone	104	70-130
2-Propanol	110	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	98	70-130
Methylene Chloride	98	70-130
Hexane	108	70-130
2-Butanone (Methyl Ethyl Ketone)	105	70-130
Tetrahydrofuran	113	70-130
Cyclohexane	105	70-130
2,2,4-Trimethylpentane	111	70-130
Heptane	107	70-130
1,2-Dichloropropane	109	70-130
1,4-Dioxane	105	70-130
Bromodichloromethane	114	70-130
cis-1,3-Dichloropropene	102	70-130
4-Methyl-2-pentanone	114	70-130
trans-1,3-Dichloropropene	112	70-130
2-Hexanone	108	70-130
Dibromochloromethane	110	70-130
Chlorobenzene	106	70-130
Styrene	97	70-130
Bromoform	113	70-130
Cumene	104	70-130
Propylbenzene	96	70-130
4-Ethyltoluene	88	70-130
1,3,5-Trimethylbenzene	97	70-130
1,2,4-Trimethylbenzene	99	70-130
1,3-Dichlorobenzene	97	70-130
alpha-Chlorotoluene	110	70-130
1,2-Dichlorobenzene	95	70-130
1,2,4-Trichlorobenzene	101	70-130
Hexachlorobutadiene	89	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits

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Client Sample ID: LCSD

Lab ID#: 1606235-04AA

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061604**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:51 PM**	

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: LCS

Lab ID#: 1606235-04B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061603sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:05 PM**	

Compound	%Recovery	Method Limits
Freon 12	114	70-130
Freon 114	111	70-130
Chloromethane	100	70-130
Vinyl Chloride	101	70-130
Chloroethane	121	70-130
1,1-Dichloroethene	100	70-130
trans-1,2-Dichloroethene	105	70-130
Methyl tert-butyl ether	102	70-130
1,1-Dichloroethane	110	70-130
cis-1,2-Dichloroethene	101	70-130
Chloroform	110	70-130
1,1,1-Trichloroethane	107	70-130
Carbon Tetrachloride	137	60-140
Benzene	103	70-130
1,2-Dichloroethane	110	70-130
Trichloroethene	101	70-130
Toluene	106	70-130
1,1,2-Trichloroethane	110	70-130
Tetrachloroethene	102	70-130
1,2-Dibromoethane (EDB)	110	70-130
Ethyl Benzene	106	70-130
m,p-Xylene	102	70-130
o-Xylene	105	70-130
1,1,2,2-Tetrachloroethane	114	70-130
1,4-Dichlorobenzene	85	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: LCSD

Lab ID#: 1606235-04BB

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**20061604sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/16/16 12:51 PM**	

Compound	%Recovery	Method Limits
Freon 12	114	70-130
Freon 114	110	70-130
Chloromethane	99	70-130
Vinyl Chloride	100	70-130
Chloroethane	121	70-130
1,1-Dichloroethene	99	70-130
trans-1,2-Dichloroethene	104	70-130
Methyl tert-butyl ether	102	70-130
1,1-Dichloroethane	109	70-130
cis-1,2-Dichloroethene	100	70-130
Chloroform	109	70-130
1,1,1-Trichloroethane	107	70-130
Carbon Tetrachloride	137	60-140
Benzene	102	70-130
1,2-Dichloroethane	109	70-130
Trichloroethene	100	70-130
Toluene	105	70-130
1,1,2-Trichloroethane	109	70-130
Tetrachloroethene	100	70-130
1,2-Dibromoethane (EDB)	109	70-130
Ethyl Benzene	105	70-130
m,p-Xylene	101	70-130
o-Xylene	103	70-130
1,1,2,2-Tetrachloroethane	114	70-130
1,4-Dichlorobenzene	83	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	100	70-130

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LABORATORY REPORT

June 27, 2016

Darius Mali
GeoSyntec Consultants
130 Research Lane, Suite 2
Guelph, ON N1G 5G3

Dear Darius:

Enclosed are the results of the samples submitted to our laboratory on June 14, 2016. For your reference, these analyses have been assigned our service request number P1602971.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Kelly Horiuchi at 4:56 pm, Jun 27, 2016

Kelly Horiuchi
Laboratory Director

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www.alsglobal.com

Client: GeoSyntec Consultants Service Request No: P1602971

CASE NARRATIVE

The samples were received intact under chain of custody on June 14, 2016 and were stored in accordance with the analytical method requirements. The samples were received past the recommended holding time. The analysis was performed as soon as possible after receipt by the laboratory. The data is flagged to indicate the holding time exceedance. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Fixed Gases Analysis

The samples were analyzed for fixed gases (hydrogen, oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP or AIHA-LAP accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA-LAP, LLC	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	977273
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-003
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-15-6
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272015-5
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: GeoSyntec Consultants Service Request: P1602971

Date Received: 6/14/2016
Time Received: 10:00

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	3C Modified - Fxd Gases Bag
ST-LDC-80	P1602971-001	Air	6/6/2016	11:30	X
ST-LDC-40	P1602971-002	Air	6/6/2016	11:25	X
ST-LDC-20	P1602971-003	Air	6/6/2016	18:56	X
ST-LDC-10	P1602971-004	Air	6/7/2016	07:30	X
ST-LDO-80	P1602971-005	Air	6/9/2016	07:30	X
ST-LDO-20	P1602971-006	Air	6/7/2016	16:20	X
ST-LDO-60	P1602971-007	Air	6/7/2016	17:40	X

Columbia Analytical Services

Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

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Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

CAS Project No. P1602971

CAS Contact:

Company Name & Address (Reporting Information): Geosyntec, Hester Groenevelt

Project Name

Project Number

Project Manager

P.O. # / Billing Information

Phone: 519-515-0853

Fax

Email Address for Result Reporting: HGroenevelt@Geosyntec.com

Sampler (Print & Sign): Darius Mali

Analysis Method/Analytes

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Sample Type (Air/Tube/ Solid)	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller (Bar code - FC #)	Sample Volume	Comments e.g. Actual Preservative or specific instructions
ST-LDC-80	1	6/6/16	11:30	Air				
ST-LDC-40	2	6/6/16	13:25					
ST-LDC-20	3	6/6/16	18:56					
ST-LDC-10	4	6/7/16	7:30					
ST-LDO-80	5	6/7/16	7:30					
ST-LDO-20	6	6/7/16	16:20					
ST-LDO-60	7	6/7/16	17:40					
All in Tedlar bags								

5 of 15

Report Tier Levels - please select

Tier I - (Results/Default if not specified) _____
Tier II (Results + QC) _____
Tier III (Data Validation Package) 10% Surcharge _____
Tier V (client specified) _____

EDD required Yes / No
Type: _____ EDD Units: _____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
			Doug Hammond Douglas E. Ham	6/14/16	1030
Doug Hammond Doug Ham	6/13/16	1520			
				6/14/16	1000

Cooler / Blank Temperature _____ °C

ALS Environmental

Sample Acceptance Check Form

Client: GeoSyntec Consultants Work order: P1602971

Project:

Sample(s) received on: 6/14/16 Date opened: 6/14/16 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☐	☒	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1602971-001.01	1.0 L Tedlar Bag					
P1602971-002.01	1.0 L Tedlar Bag					
P1602971-003.01	1.0 L Tedlar Bag					
P1602971-004.01	1.0 L Tedlar Bag					
P1602971-005.01	1.0 L Tedlar Bag					
P1602971-006.01	1.0 L Tedlar Bag					
P1602971-007.01	1.0 L Tedlar Bag					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDC-80**

ALS Project ID: P1602971
ALS Sample ID: P1602971-001

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes: **H3**

Date Collected: 6/6/16
Date Received: 6/14/16
Date Analyzed: 6/14/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**22.0**	0.10	
7727-37-9	**Nitrogen**	**78.0**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDC-40**

ALS Project ID: P1602971
ALS Sample ID: P1602971-002

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes: **H3**

Date Collected: 6/6/16
Date Received: 6/14/16
Date Analyzed: 6/14/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**22.0**	0.10	
7727-37-9	**Nitrogen**	**77.9**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDC-20**

ALS Project ID: P1602971
ALS Sample ID: P1602971-003

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes: **H3**

Date Collected: 6/6/16
Date Received: 6/14/16
Date Analyzed: 6/14/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**21.9**	0.10	
7727-37-9	**Nitrogen**	**78.0**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDC-10**

ALS Project ID: P1602971
ALS Sample ID: P1602971-004

Test Code:	EPA Method 3C Modified	Date Collected:	6/7/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	6/14/16
Analyst:	Wade Henton	Date Analyzed:	6/14/16
Sample Type:	1.0 L Tedlar Bag	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:	**H3**		

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**22.0**	0.10	
7727-37-9	**Nitrogen**	**77.9**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDO-80**

ALS Project ID: P1602971
ALS Sample ID: P1602971-005

Test Code:	EPA Method 3C Modified	Date Collected:	6/9/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	6/14/16
Analyst:	Wade Henton	Date Analyzed:	6/14/16
Sample Type:	1.0 L Tedlar Bag	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:	**H3**		

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**22.0**	0.10	
7727-37-9	**Nitrogen**	**77.9**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDO-20**

ALS Project ID: P1602971
ALS Sample ID: P1602971-006

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes: **H3**

Date Collected: 6/7/16
Date Received: 6/14/16
Date Analyzed: 6/14/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**22.0**	0.10	
7727-37-9	**Nitrogen**	**77.9**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **ST-LDO-60**

ALS Project ID: P1602971
ALS Sample ID: P1602971-007

Test Code:	EPA Method 3C Modified	Date Collected:	6/7/16
Instrument ID:	HP5890 II/GC1/TCD	Date Received:	6/14/16
Analyst:	Wade Henton	Date Analyzed:	6/14/16
Sample Type:	1.0 L Tedlar Bag	Volume(s) Analyzed:	0.10 ml(s)
Test Notes:	**H3**		

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	**Oxygen***	**21.9**	0.10	
7727-37-9	**Nitrogen**	**77.9**	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	**Carbon Dioxide**	**0.114**	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.
H3 = Sample was received and analyzed past holding time.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **Method Blank**

ALS Project ID: P1602971
ALS Sample ID: P160614-MB

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 6/14/16
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
1333-74-0	Hydrogen	ND	0.10	
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **GeoSyntec Consultants**
Client Sample ID: **Lab Control Sample**

ALS Project ID: P1602971
ALS Sample ID: P160614-LCS

Test Code: EPA Method 3C Modified
Instrument ID: HP5890 II/GC1/TCD
Analyst: Wade Henton
Sample Type: 1.0 L Tedlar Bag
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 6/14/16
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
1333-74-0	Hydrogen	40,000	**39,400**	**99**	83-114	
7782-44-7	Oxygen*	25,000	**25,300**	**101**	84-121	
7727-37-9	Nitrogen	50,000	**50,000**	**100**	88-122	
630-08-0	Carbon Monoxide	50,000	**50,900**	**102**	87-118	
74-82-8	Methane	40,000	**41,500**	**104**	85-116	
124-38-9	Carbon Dioxide	50,000	**49,600**	**99**	84-117	

* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

Radon Analysis (EPA Method GS: Grab Sample/Scintillation Cell counting)

For Geosyntec

Client Project Number: TR0479

Samples Collected by: Darius Mali

Sample Dates: 06/06/16 to 06/09/16

Sample containers: Tedlar bags

Site: ESTCP: Layton, Utah

Assumed Site Pressure **0.85** atm

Analysts: Doug Hammond

based on an elevation of 4350 ft

Phone: 310-490-7896

Time Zone adjustment: add to decay time

email: dhammond@usc.edu

1 hours Collect (MDT)

Run (PDT)

Gas Sample Summary

		Collection		Analysis					Lab Duplicates		
	ID	Date	time (MDT)	Date	time (PDT)	Vol run (cc)	Conc. pCi/L	±1 sig pCi/L	mean pCi/L	±1ssd pCi/L	Notes
Received 6/10/16											
1	ST-LDC-80	6/6/16	11:30	6/10/16	13:43	40	4.7	0.4	4.6	0.2	
	Lab dupe	6/6/16	11:30	6/13/16	9:21	120	4.4	0.2			
2	ST-LDC-40	6/6/16	13:25	6/10/16	13:39	40	4.4	0.3			
3	ST-LDC-20	6/6/16	18:56	6/10/16	13:35	40	3.5	0.4			
4	ST-LDC-10	6/7/16	7:30	6/10/16	13:31	40	2.6	0.7			Less reliable, High background cell
	Lab dupe	6/7/16	7:30	6/13/16	9:16	60	4.0	0.3			More reliable, Low background cell
5	ST-LDO-80	6/9/16	7:30	6/13/16	9:25	120	11.2	0.6			
6	ST-LDO-20	6/7/16	16:20	6/13/16	9:31	60	4.8	0.3			
7	ST-LDO-60	6/7/16	17:40	6/10/16	13:55	40	13.9	0.7			

Uncertainty given in pCi/liter is based on counting statistics for low activity samples. For high activity samples uncertainty is ±5%.

The Lower Limit of Detection for Rn (95% confidence level as recommended by EPA 402-R-95-012, Oct. 97) is 0.14 pCi/liter.

Results are reported based on standardization with NIST-traceable radon sources.

These results are for application of naturally-occurring radon as a tracer of soil vapor intrusion, but are not intended for evaluation of radon hazards.

Results corrected to in situ pressure as noted above

Note Details: First run on Sample 4 was in high background cell, and result is less reliable than 2nd analysis.

Raw Data, Calculation factors, and Analytical Details

		Collection		Analysis													count
	Sample ID	Date	Time (MDT)	Date	Time (PDT)	Count in cell/ch	He eff	Air/He eff	Vol run (cc)	Press factor	obs dpm	sig dpm	Decay T (hours)	Decay factor	Concentration dpm/liter	pCi/liter	stats pCi/liter ±1 sig	Notes
Received 6/10/16																		
1	ST-LDC-80	6/6/16	11:30	6/10/16	13:43	58/31	0.885	0.99	40	0.85	0.20	0.02	99.2	2.116	10.5	4.7	0.4	
	Lab dupe	6/6/16	11:30	6/13/16	9:21	81/31	0.788	0.96	120	0.85	0.30	0.02	166.9	3.527	9.8	4.4	0.2	
2	ST-LDC-40	6/6/16	13:25	6/10/16	13:39	77/32	0.915	0.99	40	0.85	0.20	0.02	97.2	2.084	9.7	4.4	0.3	
3	ST-LDC-20	6/6/16	18:56	6/10/16	13:35	Z17/11	0.710	0.99	40	0.85	0.13	0.02	91.7	1.998	7.9	3.5	0.4	
4	ST-LDC-10	6/7/16	7:30	6/10/16	13:31	Z13/22	0.811	0.99	40	0.85	0.12	0.03	79.0	1.816	5.7	2.6	0.7	
	Lab dupe	6/7/16	7:30	6/13/16	9:16	77/32	0.915	0.98	60	0.85	0.19	0.01	146.8	3.030	8.9	4.0	0.3	
5	ST-LDO-80	6/9/16	7:30	6/13/16	9:25	83/33	0.806	0.96	120	0.85	1.29	0.06	98.9	2.111	24.9	11.2	0.5	
6	ST-LDO-20	6/7/16	16:20	6/13/16	9:31	72/34	0.928	0.98	60	0.85	0.24	0.01	138.2	2.840	10.6	4.8	0.3	
7	ST-LDO-60	6/7/16	17:40	6/10/16	13:55	61/33	0.822	0.99	40	0.85	0.70	0.03	69.3	1.687	30.9	13.9	0.5	

Decay correctiions based on Rn decay constant of 0.1813 per day

Radon Conc = [(0.4504)(1000)(obs dpm)(decay factor)(Press factor)]/[(cc used)(He eff)(Air/He)]

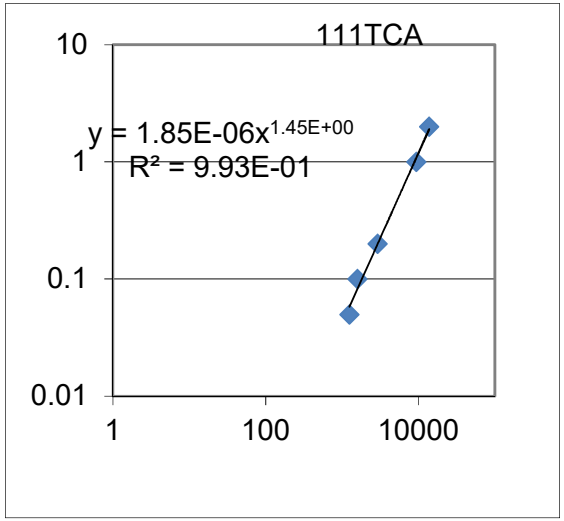
Conversion from dpm based on 0.4504 pCi/dpm (in pCi/liter)

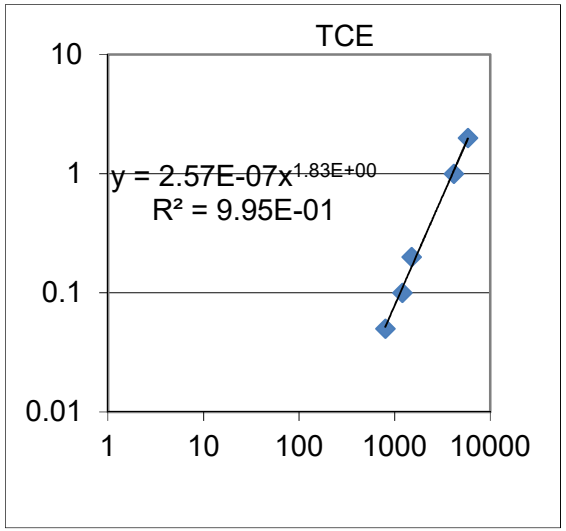
Blanks are negligible.

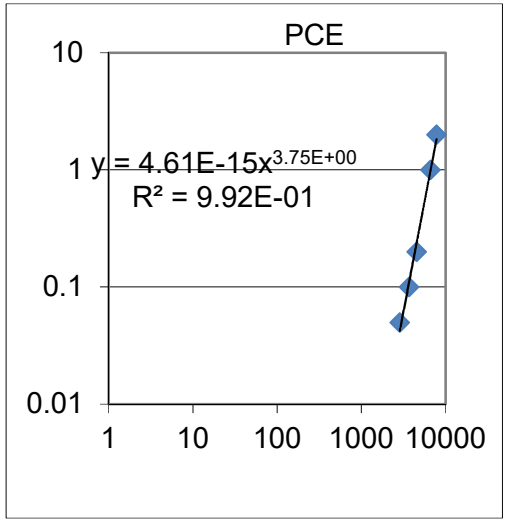
Definitions:

Cell/ch:	Counting cell and channel used	sig dpm	uncertainty (± 1 sig) in dpm based on counting statistics
He eff:	Cell and counter efficiency using helium matrix	Decay T:	time elapsed from sampling to analysis
Air/He:	Correction for matrix counting gas density	Decay factor:	Correction factor for decay from collection to analysis
Sample vol:	Volume analyzed (cc)	dpm/liter:	Radon concentration in disintigrations per minute per liter of sample
Press factor:	Correction to in situ pressure based on collection altitude	piC/liter:	Radon concentration in picoCuries per liter
obs dpm:	observed radon activity (disintigrations per minute) when analyzed	count stats:	uncertainty in observed radon based on counting statistics

6/5/2016		RT				Area			
File ID	Conc.	11DCE	111TCA	TCE	PCE	11DCE	111TCA	TCE	PCE
TO-14-ECD-Cal-8	0.1		17.9	19.383	22.433		1596.28	1206.59	3686.966
TO-14-ECD-Cal-9	0.2		17.916	19.4	22.45		2941.16	1500.76	4534.938
TO-14-ECD-Cal-10	1		17.916	19.383	22.433		9368.688	4161.327	6595.066
TO-14-ECD-Cal-11	2		17.916	19.4	22.45		13802.86	5820.081	7789.808
TO-14-ECD-Cal-13	0.05		17.833	19.333	22.4		1249.666	796.758	2854.238







35 315

5.25

Date	Analysis ID	Sample ID	Retention time			Area Count			Conc. [ppbv]		
			111TCA	TCE	PCE	111TCA	TCE	PCE	111TCA	TCE	PCE
6/6/2016	TO-14-ECD-01	ST-LDC-80-9m		19.333	22.416		977.577	1419.896		0.076192	0.003053
	TO-14-ECD-02	ST-LDC-80-45m		19.35	22.416		991.1505	2264.05		0.078139	0.01756
	TO-14-ECD-03	ST-LDC-40-18m		19.366	22.433		1023.733	1819.726		0.082904	0.00774
	TO-14-ECD-04	ST-LDC-40-60m	17.883	19.366	22.433	288.44	898.927	2139.931		0.06535	0.014213
	TO-14-ECD-05	ST-LDC-40-90m	17.883	19.35	22.416	348.286	1087.118	2282.169		0.092538	0.018093
	TO-14-ECD-06	ST-LDC-20-16m	17.9	19.366	22.45	352.85	1047.82	2216.348		0.086508	0.016212
	TO-14-ECD-07	ST-LDC-20-36m	17.816	19.316	22.4	716.9365	1057.963	2110.173		0.088047	0.013486
	TO-14-ECD-08	ST-LDC-20-85m	17.833	19.333		378.1465	1059.363			0.08826	
	TO-14-ECD-09	ST-LDC-20-140m	17.866	19.35	22.433	279.8495	1097.825	1887.357		0.094213	0.008875
	TO-14-ECD-10	ST-LDC-20-245m	17.883	19.333	22.416	693.9075	1264.183	2157.163		0.121968	0.014647

Site #4: Building 11193

Vandenberg Air Force Base

eurofins | Air Toxics

6/30/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: UDB 11193
Project #: TR0626
Workorder #: 1706400A

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 6/19/2017 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1706400A

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Accounts Payable (NJ) GeoSyntec Consultants 7 Graphics Drive Suite 106 Ewing, NJ 08628
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0626 UDB 11193
DATE RECEIVED:	06/19/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	06/30/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	B11193-061017-SVP-4-SS	TO-15	2.2 "Hg	14.6 psi
02A	B11193-061017-SVP-4-5	TO-15	3.5 "Hg	14.9 psi
03A	B11193-061017-SVP-4-10	TO-15	1.6 "Hg	14.6 psi
08A	B11193-060917-SVP-1SS	TO-15	1.8 "Hg	14.8 psi
09A	B11193-060917-SVP-1-5	TO-15	3.1 "Hg	15 psi
10A	B11193-060917-SVP-1-10	TO-15	2 "Hg	14.7 psi
11A	B11193-060917-SVP-2-SS	TO-15	2 "Hg	14.5 psi
12A	B11193-060917-SVP-2-5	TO-15	3.3 "Hg	15.1 psi
13A	B11193-060917-SVP-2-10	TO-15	3.1 "Hg	15 psi
14A	B11193-060917-SVP-3-SS	TO-15	4.1 "Hg	15.1 psi
15A	B11193-060917-SVP-3-5	TO-15	2 "Hg	15.2 psi
16A	B11193-060917-SVP-3-10	TO-15	0 psi	15.1 psi
17A	Lab Blank	TO-15	NA	NA
17B	Lab Blank	TO-15	NA	NA
17C	Lab Blank	TO-15	NA	NA
18A	CCV	TO-15	NA	NA
18B	CCV	TO-15	NA	NA
18C	CCV	TO-15	NA	NA
19A	LCS	TO-15	NA	NA
19AA	LCSD	TO-15	NA	NA
19B	LCS	TO-15	NA	NA
19BB	LCSD	TO-15	NA	NA
19C	LCS	TO-15	NA	NA

Continued on next page

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WORK ORDER #: 1706400A

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Accounts Payable (NJ) GeoSyntec Consultants 7 Graphics Drive Suite 106 Ewing, NJ 08628
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0626 UDB 11193
DATE RECEIVED:	06/19/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	06/30/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
19CC	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 06/30/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
EPA Method TO-15
GeoSyntec Consultants
Workorder# 1706400A

Twelve 1 Liter Summa Canister samples were received on June 19, 2017. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

Despite the use of flow controllers for sample collection, the final canister vacuum for sample B11193-060917-SVP-3-10 was measured at ambient pressure at the laboratory.

Analytical Notes

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page (analytical batch from 06/23-24/17 instrument MSD-14).

Dilution was performed on samples B11193-061017-SVP-4-SS, B11193-061017-SVP-4-5, B11193-061017-SVP-4-10, B11193-060917-SVP-1SS, B11193-060917-SVP-1-5, B11193-060917-SVP-1-10, B11193-060917-SVP-2-SS, B11193-060917-SVP-2-5, B11193-060917-SVP-2-10, B11193-060917-SVP-3-SS, B11193-060917-SVP-3-5 and B11193-060917-SVP-3-10 due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-061017-SVP-4-SS

Lab ID#: 1706400A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	270	4900	1100	20000
Trichloroethene	270	3700	1400	20000
Tetrachloroethene	270	170000	1800	1200000

Client Sample ID: B11193-061017-SVP-4-5

Lab ID#: 1706400A-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1-Dichloroethene	570	1000	2300	4200
trans-1,2-Dichloroethene	570	8600	2200	34000
cis-1,2-Dichloroethene	570	150000	2200	600000
Trichloroethene	570	74000	3100	400000
Tetrachloroethene	570	410000	3900	2800000

Client Sample ID: B11193-061017-SVP-4-10

Lab ID#: 1706400A-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1-Dichloroethene	530	950	2100	3800
trans-1,2-Dichloroethene	530	7900	2100	31000
cis-1,2-Dichloroethene	530	150000	2100	600000
Trichloroethene	530	75000	2800	400000
Tetrachloroethene	530	430000	3600	2900000

Client Sample ID: B11193-060917-SVP-1SS

Lab ID#: 1706400A-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Ethanol	21	120	40	220
Hexane	5.4	300	19	1100
Cyclohexane	5.4	160	18	570
Trichloroethene	5.4	74	29	400

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: B11193-060917-SVP-1SS

Lab ID#: 1706400A-08A

Tetrachloroethene	5.4	1700	36	12000

Client Sample ID: B11193-060917-SVP-1-5

Lab ID#: 1706400A-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1-Dichloroethene	22	50	89	200
trans-1,2-Dichloroethene	22	620	89	2500
cis-1,2-Dichloroethene	22	1100	89	4500
Chloroform	22	42	110	200
Trichloroethene	22	3000	120	16000
Toluene	22	48	85	180
Tetrachloroethene	22	20000	150	130000

Client Sample ID: B11193-060917-SVP-1-10

Lab ID#: 1706400A-10A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1-Dichloroethene	22	48	85	190
trans-1,2-Dichloroethene	22	640	85	2600
cis-1,2-Dichloroethene	22	1600	85	6100
Chloroform	22	36	100	180
Trichloroethene	22	3300	120	18000
Tetrachloroethene	22	20000	140	140000

Client Sample ID: B11193-060917-SVP-2-SS

Lab ID#: 1706400A-11A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Trichloroethene	11	24	57	130
Tetrachloroethene	11	7600	72	51000

Client Sample ID: B11193-060917-SVP-2-5

Lab ID#: 1706400A-12A

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-060917-SVP-2-5

Lab ID#: 1706400A-12A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	23	36	90	140
Trichloroethene	23	310	120	1700
Tetrachloroethene	23	16000	150	110000

Client Sample ID: B11193-060917-SVP-2-10

Lab ID#: 1706400A-13A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	22	30	89	120
Trichloroethene	22	300	120	1600
Tetrachloroethene	22	15000	150	100000

Client Sample ID: B11193-060917-SVP-3-SS

Lab ID#: 1706400A-14A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	24	33	93	130
cis-1,2-Dichloroethene	24	30	93	120
Trichloroethene	24	890	130	4800
Tetrachloroethene	24	18000	160	120000

Client Sample ID: B11193-060917-SVP-3-5

Lab ID#: 1706400A-15A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	140	150	540	600
cis-1,2-Dichloroethene	140	390	540	1600
Trichloroethene	140	2800	730	15000
Tetrachloroethene	140	55000	920	370000

Client Sample ID: B11193-060917-SVP-3-10

Lab ID#: 1706400A-16A

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-060917-SVP-3-10

Lab ID#: 1706400A-16A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	130	180	500	730
cis-1,2-Dichloroethene	130	360	500	1400
Trichloroethene	130	2800	680	15000
Tetrachloroethene	130	57000	860	380000

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Client Sample ID: B11193-061017-SVP-4-SS

Lab ID#: 1706400A-01A

EPA METHOD TO-15 GC/MS

File Name:	**14062329**	**Date of Collection:**	**6/10/17**
Dil. Factor:	**53.8**	**Date of Analysis:**	**6/23/17 10:20 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	270	Not Detected	1300	Not Detected
Freon 114	270	Not Detected	1900	Not Detected
Chloromethane	1100	Not Detected	2200	Not Detected
Vinyl Chloride	270	Not Detected	690	Not Detected
1,3-Butadiene	270	Not Detected	600	Not Detected
Bromomethane	1100	Not Detected	4200	Not Detected
Chloroethane	1100	Not Detected	2800	Not Detected
Freon 11	270	Not Detected	1500	Not Detected
Ethanol	1100	Not Detected	2000	Not Detected
Freon 113	270	Not Detected	2100	Not Detected
1,1-Dichloroethene	270	Not Detected	1100	Not Detected
Acetone	1100	Not Detected	2600	Not Detected
2-Propanol	1100	Not Detected	2600	Not Detected
Carbon Disulfide	1100	Not Detected	3400	Not Detected
3-Chloropropene	1100	Not Detected	3400	Not Detected
Methylene Chloride	1100	Not Detected	3700	Not Detected
Methyl tert-butyl ether	270	Not Detected	970	Not Detected
trans-1,2-Dichloroethene	270	Not Detected	1100	Not Detected
Hexane	270	Not Detected	950	Not Detected
1,1-Dichloroethane	270	Not Detected	1100	Not Detected
2-Butanone (Methyl Ethyl Ketone)	1100	Not Detected	3200	Not Detected
cis-1,2-Dichloroethene	270	4900	1100	20000
Tetrahydrofuran	270	Not Detected	790	Not Detected
Chloroform	270	Not Detected	1300	Not Detected
1,1,1-Trichloroethane	270	Not Detected	1500	Not Detected
Cyclohexane	270	Not Detected	920	Not Detected
Carbon Tetrachloride	270	Not Detected	1700	Not Detected
2,2,4-Trimethylpentane	270	Not Detected	1200	Not Detected
Benzene	270	Not Detected	860	Not Detected
1,2-Dichloroethane	270	Not Detected	1100	Not Detected
Heptane	270	Not Detected	1100	Not Detected
Trichloroethene	270	3700	1400	20000
1,2-Dichloropropane	270	Not Detected	1200	Not Detected
1,4-Dioxane	1100	Not Detected	3900	Not Detected
Bromodichloromethane	270	Not Detected	1800	Not Detected
cis-1,3-Dichloropropene	270	Not Detected	1200	Not Detected
4-Methyl-2-pentanone	270	Not Detected	1100	Not Detected
Toluene	270	Not Detected	1000	Not Detected
trans-1,3-Dichloropropene	270	Not Detected	1200	Not Detected
1,1,2-Trichloroethane	270	Not Detected	1500	Not Detected
Tetrachloroethene	270	170000	1800	1200000
2-Hexanone	1100	Not Detected	4400	Not Detected

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Client Sample ID: B11193-061017-SVP-4-SS

Lab ID#: 1706400A-01A

EPA METHOD TO-15 GC/MS

File Name:	**14062329**	**Date of Collection:**	**6/10/17**
Dil. Factor:	**53.8**	**Date of Analysis:**	**6/23/17 10:20 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	270	Not Detected	2300	Not Detected
1,2-Dibromoethane (EDB)	270	Not Detected	2100	Not Detected
Chlorobenzene	270	Not Detected	1200	Not Detected
Ethyl Benzene	270	Not Detected	1200	Not Detected
m,p-Xylene	270	Not Detected	1200	Not Detected
o-Xylene	270	Not Detected	1200	Not Detected
Styrene	270	Not Detected	1100	Not Detected
Bromoform	270	Not Detected	2800	Not Detected
Cumene	270	Not Detected	1300	Not Detected
1,1,2,2-Tetrachloroethane	270	Not Detected	1800	Not Detected
Propylbenzene	270	Not Detected	1300	Not Detected
4-Ethyltoluene	270	Not Detected	1300	Not Detected
1,3,5-Trimethylbenzene	270	Not Detected	1300	Not Detected
1,2,4-Trimethylbenzene	270	Not Detected	1300	Not Detected
1,3-Dichlorobenzene	270	Not Detected	1600	Not Detected
1,4-Dichlorobenzene	270	Not Detected	1600	Not Detected
alpha-Chlorotoluene	270	Not Detected	1400	Not Detected
1,2-Dichlorobenzene	270	Not Detected	1600	Not Detected
1,2,4-Trichlorobenzene	1100	Not Detected	8000	Not Detected
Hexachlorobutadiene	1100	Not Detected	11000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	95	70-130

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Client Sample ID: B11193-061017-SVP-4-5

Lab ID#: 1706400A-02A

EPA METHOD TO-15 GC/MS

File Name:	**14062330**	**Date of Collection:**	**6/10/17 2:53:00 PM**
Dil. Factor:	**114**	**Date of Analysis:**	**6/23/17 10:46 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	570	Not Detected	2800	Not Detected
Freon 114	570	Not Detected	4000	Not Detected
Chloromethane	2300	Not Detected	4700	Not Detected
Vinyl Chloride	570	Not Detected	1400	Not Detected
1,3-Butadiene	570	Not Detected	1300	Not Detected
Bromomethane	2300	Not Detected	8800	Not Detected
Chloroethane	2300	Not Detected	6000	Not Detected
Freon 11	570	Not Detected	3200	Not Detected
Ethanol	2300	Not Detected	4300	Not Detected
Freon 113	570	Not Detected	4400	Not Detected
1,1-Dichloroethene	570	1000	2300	4200
Acetone	2300	Not Detected	5400	Not Detected
2-Propanol	2300	Not Detected	5600	Not Detected
Carbon Disulfide	2300	Not Detected	7100	Not Detected
3-Chloropropene	2300	Not Detected	7100	Not Detected
Methylene Chloride	2300	Not Detected	7900	Not Detected
Methyl tert-butyl ether	570	Not Detected	2000	Not Detected
trans-1,2-Dichloroethene	570	8600	2200	34000
Hexane	570	Not Detected	2000	Not Detected
1,1-Dichloroethane	570	Not Detected	2300	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2300	Not Detected	6700	Not Detected
cis-1,2-Dichloroethene	570	150000	2200	600000
Tetrahydrofuran	570	Not Detected	1700	Not Detected
Chloroform	570	Not Detected	2800	Not Detected
1,1,1-Trichloroethane	570	Not Detected	3100	Not Detected
Cyclohexane	570	Not Detected	2000	Not Detected
Carbon Tetrachloride	570	Not Detected	3600	Not Detected
2,2,4-Trimethylpentane	570	Not Detected	2700	Not Detected
Benzene	570	Not Detected	1800	Not Detected
1,2-Dichloroethane	570	Not Detected	2300	Not Detected
Heptane	570	Not Detected	2300	Not Detected
Trichloroethene	570	74000	3100	400000
1,2-Dichloropropane	570	Not Detected	2600	Not Detected
1,4-Dioxane	2300	Not Detected	8200	Not Detected
Bromodichloromethane	570	Not Detected	3800	Not Detected
cis-1,3-Dichloropropene	570	Not Detected	2600	Not Detected
4-Methyl-2-pentanone	570	Not Detected	2300	Not Detected
Toluene	570	Not Detected	2100	Not Detected
trans-1,3-Dichloropropene	570	Not Detected	2600	Not Detected
1,1,2-Trichloroethane	570	Not Detected	3100	Not Detected
Tetrachloroethene	570	410000	3900	2800000
2-Hexanone	2300	Not Detected	9300	Not Detected

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Client Sample ID: B11193-061017-SVP-4-5

Lab ID#: 1706400A-02A

EPA METHOD TO-15 GC/MS

File Name:	**14062330**	**Date of Collection: 6/10/17 2:53:00 PM**	
Dil. Factor:	**114**	**Date of Analysis: 6/23/17 10:46 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	570	Not Detected	4800	Not Detected
1,2-Dibromoethane (EDB)	570	Not Detected	4400	Not Detected
Chlorobenzene	570	Not Detected	2600	Not Detected
Ethyl Benzene	570	Not Detected	2500	Not Detected
m,p-Xylene	570	Not Detected	2500	Not Detected
o-Xylene	570	Not Detected	2500	Not Detected
Styrene	570	Not Detected	2400	Not Detected
Bromoform	570	Not Detected	5900	Not Detected
Cumene	570	Not Detected	2800	Not Detected
1,1,2,2-Tetrachloroethane	570	Not Detected	3900	Not Detected
Propylbenzene	570	Not Detected	2800	Not Detected
4-Ethyltoluene	570	Not Detected	2800	Not Detected
1,3,5-Trimethylbenzene	570	Not Detected	2800	Not Detected
1,2,4-Trimethylbenzene	570	Not Detected	2800	Not Detected
1,3-Dichlorobenzene	570	Not Detected	3400	Not Detected
1,4-Dichlorobenzene	570	Not Detected	3400	Not Detected
alpha-Chlorotoluene	570	Not Detected	3000	Not Detected
1,2-Dichlorobenzene	570	Not Detected	3400	Not Detected
1,2,4-Trichlorobenzene	2300	Not Detected	17000	Not Detected
Hexachlorobutadiene	2300	Not Detected	24000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-061017-SVP-4-10

Lab ID#: 1706400A-03A

EPA METHOD TO-15 GC/MS

File Name:	**14062422**	**Date of Collection:**	**6/10/17 4:42:00 PM**
Dil. Factor:	**106**	**Date of Analysis:**	**6/24/17 08:39 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	530	Not Detected	2600	Not Detected
Freon 114	530	Not Detected	3700	Not Detected
Chloromethane	2100	Not Detected	4400	Not Detected
Vinyl Chloride	530	Not Detected	1400	Not Detected
1,3-Butadiene	530	Not Detected	1200	Not Detected
Bromomethane	2100	Not Detected	8200	Not Detected
Chloroethane	2100	Not Detected	5600	Not Detected
Freon 11	530	Not Detected	3000	Not Detected
Ethanol	2100	Not Detected	4000	Not Detected
Freon 113	530	Not Detected	4100	Not Detected
1,1-Dichloroethene	530	950	2100	3800
Acetone	2100	Not Detected	5000	Not Detected
2-Propanol	2100	Not Detected	5200	Not Detected
Carbon Disulfide	2100	Not Detected	6600	Not Detected
3-Chloropropene	2100	Not Detected	6600	Not Detected
Methylene Chloride	2100	Not Detected	7400	Not Detected
Methyl tert-butyl ether	530	Not Detected	1900	Not Detected
trans-1,2-Dichloroethene	530	7900	2100	31000
Hexane	530	Not Detected	1900	Not Detected
1,1-Dichloroethane	530	Not Detected	2100	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2100	Not Detected	6200	Not Detected
cis-1,2-Dichloroethene	530	150000	2100	600000
Tetrahydrofuran	530	Not Detected	1600	Not Detected
Chloroform	530	Not Detected	2600	Not Detected
1,1,1-Trichloroethane	530	Not Detected	2900	Not Detected
Cyclohexane	530	Not Detected	1800	Not Detected
Carbon Tetrachloride	530	Not Detected	3300	Not Detected
2,2,4-Trimethylpentane	530	Not Detected	2500	Not Detected
Benzene	530	Not Detected	1700	Not Detected
1,2-Dichloroethane	530	Not Detected	2100	Not Detected
Heptane	530	Not Detected	2200	Not Detected
Trichloroethene	530	75000	2800	400000
1,2-Dichloropropane	530	Not Detected	2400	Not Detected
1,4-Dioxane	2100	Not Detected	7600	Not Detected
Bromodichloromethane	530	Not Detected	3600	Not Detected
cis-1,3-Dichloropropene	530	Not Detected	2400	Not Detected
4-Methyl-2-pentanone	530	Not Detected	2200	Not Detected
Toluene	530	Not Detected	2000	Not Detected
trans-1,3-Dichloropropene	530	Not Detected	2400	Not Detected
1,1,2-Trichloroethane	530	Not Detected	2900	Not Detected
Tetrachloroethene	530	430000	3600	2900000
2-Hexanone	2100	Not Detected	8700	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-061017-SVP-4-10

Lab ID#: 1706400A-03A

EPA METHOD TO-15 GC/MS

File Name:	**14062422**	**Date of Collection: 6/10/17 4:42:00 PM**	
Dil. Factor:	**106**	**Date of Analysis: 6/24/17 08:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	530	Not Detected	4500	Not Detected
1,2-Dibromoethane (EDB)	530	Not Detected	4100	Not Detected
Chlorobenzene	530	Not Detected	2400	Not Detected
Ethyl Benzene	530	Not Detected	2300	Not Detected
m,p-Xylene	530	Not Detected	2300	Not Detected
o-Xylene	530	Not Detected	2300	Not Detected
Styrene	530	Not Detected	2200	Not Detected
Bromoform	530	Not Detected	5500	Not Detected
Cumene	530	Not Detected	2600	Not Detected
1,1,2,2-Tetrachloroethane	530	Not Detected	3600	Not Detected
Propylbenzene	530	Not Detected	2600	Not Detected
4-Ethyltoluene	530	Not Detected	2600	Not Detected
1,3,5-Trimethylbenzene	530	Not Detected	2600	Not Detected
1,2,4-Trimethylbenzene	530	Not Detected	2600	Not Detected
1,3-Dichlorobenzene	530	Not Detected	3200	Not Detected
1,4-Dichlorobenzene	530	Not Detected	3200	Not Detected
alpha-Chlorotoluene	530	Not Detected	2700	Not Detected
1,2-Dichlorobenzene	530	Not Detected	3200	Not Detected
1,2,4-Trichlorobenzene	2100	Not Detected	16000	Not Detected
Hexachlorobutadiene	2100	Not Detected	23000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: B11193-060917-SVP-1SS

Lab ID#: 1706400A-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062317**	**Date of Collection: 6/9/17 10:15:00 AM**	
Dil. Factor:	**10.7**	**Date of Analysis: 6/23/17 11:55 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.4	Not Detected	26	Not Detected
Freon 114	5.4	Not Detected	37	Not Detected
Chloromethane	54	Not Detected	110	Not Detected
Vinyl Chloride	5.4	Not Detected	14	Not Detected
1,3-Butadiene	5.4	Not Detected	12	Not Detected
Bromomethane	54	Not Detected	210	Not Detected
Chloroethane	21	Not Detected	56	Not Detected
Freon 11	5.4	Not Detected	30	Not Detected
Ethanol	21	120	40	220
Freon 113	5.4	Not Detected	41	Not Detected
1,1-Dichloroethene	5.4	Not Detected	21	Not Detected
Acetone	54	Not Detected	130	Not Detected
2-Propanol	21	Not Detected	52	Not Detected
Carbon Disulfide	21	Not Detected	67	Not Detected
3-Chloropropene	21	Not Detected	67	Not Detected
Methylene Chloride	54	Not Detected	180	Not Detected
Methyl tert-butyl ether	21	Not Detected	77	Not Detected
trans-1,2-Dichloroethene	5.4	Not Detected	21	Not Detected
Hexane	5.4	300	19	1100
1,1-Dichloroethane	5.4	Not Detected	22	Not Detected
2-Butanone (Methyl Ethyl Ketone)	21	Not Detected	63	Not Detected
cis-1,2-Dichloroethene	5.4	Not Detected	21	Not Detected
Tetrahydrofuran	5.4	Not Detected	16	Not Detected
Chloroform	5.4	Not Detected	26	Not Detected
1,1,1-Trichloroethane	5.4	Not Detected	29	Not Detected
Cyclohexane	5.4	160	18	570
Carbon Tetrachloride	5.4	Not Detected	34	Not Detected
2,2,4-Trimethylpentane	5.4	Not Detected	25	Not Detected
Benzene	5.4	Not Detected	17	Not Detected
1,2-Dichloroethane	5.4	Not Detected	22	Not Detected
Heptane	5.4	Not Detected	22	Not Detected
Trichloroethene	5.4	74	29	400
1,2-Dichloropropane	5.4	Not Detected	25	Not Detected
1,4-Dioxane	21	Not Detected	77	Not Detected
Bromodichloromethane	5.4	Not Detected	36	Not Detected
cis-1,3-Dichloropropene	5.4	Not Detected	24	Not Detected
4-Methyl-2-pentanone	5.4	Not Detected	22	Not Detected
Toluene	5.4	Not Detected	20	Not Detected
trans-1,3-Dichloropropene	5.4	Not Detected	24	Not Detected
1,1,2-Trichloroethane	5.4	Not Detected	29	Not Detected
Tetrachloroethene	5.4	1700	36	12000
2-Hexanone	21	Not Detected	88	Not Detected

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Client Sample ID: B11193-060917-SVP-1SS

Lab ID#: 1706400A-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062317**	**Date of Collection:**	**6/9/17 10:15:00 AM**
Dil. Factor:	**10.7**	**Date of Analysis:**	**6/23/17 11:55 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.4	Not Detected	46	Not Detected
1,2-Dibromoethane (EDB)	5.4	Not Detected	41	Not Detected
Chlorobenzene	5.4	Not Detected	25	Not Detected
Ethyl Benzene	5.4	Not Detected	23	Not Detected
m,p-Xylene	5.4	Not Detected	23	Not Detected
o-Xylene	5.4	Not Detected	23	Not Detected
Styrene	5.4	Not Detected	23	Not Detected
Bromoform	5.4	Not Detected	55	Not Detected
Cumene	5.4	Not Detected	26	Not Detected
1,1,2,2-Tetrachloroethane	5.4	Not Detected	37	Not Detected
Propylbenzene	5.4	Not Detected	26	Not Detected
4-Ethyltoluene	5.4	Not Detected	26	Not Detected
1,3,5-Trimethylbenzene	5.4	Not Detected	26	Not Detected
1,2,4-Trimethylbenzene	5.4	Not Detected	26	Not Detected
1,3-Dichlorobenzene	5.4	Not Detected	32	Not Detected
1,4-Dichlorobenzene	5.4	Not Detected	32	Not Detected
alpha-Chlorotoluene	5.4	Not Detected	28	Not Detected
1,2-Dichlorobenzene	5.4	Not Detected	32	Not Detected
1,2,4-Trichlorobenzene	21	Not Detected	160	Not Detected
Hexachlorobutadiene	21	Not Detected	230	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	84	70-130
4-Bromofluorobenzene	108	70-130

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Client Sample ID: B11193-060917-SVP-1-5

Lab ID#: 1706400A-09A

EPA METHOD TO-15 GC/MS

File Name:	**14062420**	**Date of Collection: 6/9/17 11:19:00 AM**	
Dil. Factor:	**4.50**	**Date of Analysis: 6/24/17 07:49 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	22	Not Detected	110	Not Detected
Freon 114	22	Not Detected	160	Not Detected
Chloromethane	90	Not Detected	180	Not Detected
Vinyl Chloride	22	Not Detected	58	Not Detected
1,3-Butadiene	22	Not Detected	50	Not Detected
Bromomethane	90	Not Detected	350	Not Detected
Chloroethane	90	Not Detected	240	Not Detected
Freon 11	22	Not Detected	130	Not Detected
Ethanol	90	Not Detected	170	Not Detected
Freon 113	22	Not Detected	170	Not Detected
1,1-Dichloroethene	22	50	89	200
Acetone	90	Not Detected	210	Not Detected
2-Propanol	90	Not Detected	220	Not Detected
Carbon Disulfide	90	Not Detected	280	Not Detected
3-Chloropropene	90	Not Detected	280	Not Detected
Methylene Chloride	90	Not Detected	310	Not Detected
Methyl tert-butyl ether	22	Not Detected	81	Not Detected
trans-1,2-Dichloroethene	22	620	89	2500
Hexane	22	Not Detected	79	Not Detected
1,1-Dichloroethane	22	Not Detected	91	Not Detected
2-Butanone (Methyl Ethyl Ketone)	90	Not Detected	260	Not Detected
cis-1,2-Dichloroethene	22	1100	89	4500
Tetrahydrofuran	22	Not Detected	66	Not Detected
Chloroform	22	42	110	200
1,1,1-Trichloroethane	22	Not Detected	120	Not Detected
Cyclohexane	22	Not Detected	77	Not Detected
Carbon Tetrachloride	22	Not Detected	140	Not Detected
2,2,4-Trimethylpentane	22	Not Detected	100	Not Detected
Benzene	22	Not Detected	72	Not Detected
1,2-Dichloroethane	22	Not Detected	91	Not Detected
Heptane	22	Not Detected	92	Not Detected
Trichloroethene	22	3000	120	16000
1,2-Dichloropropane	22	Not Detected	100	Not Detected
1,4-Dioxane	90	Not Detected	320	Not Detected
Bromodichloromethane	22	Not Detected	150	Not Detected
cis-1,3-Dichloropropene	22	Not Detected	100	Not Detected
4-Methyl-2-pentanone	22	Not Detected	92	Not Detected
Toluene	22	48	85	180
trans-1,3-Dichloropropene	22	Not Detected	100	Not Detected
1,1,2-Trichloroethane	22	Not Detected	120	Not Detected
Tetrachloroethene	22	20000	150	130000
2-Hexanone	90	Not Detected	370	Not Detected

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Client Sample ID: B11193-060917-SVP-1-5

Lab ID#: 1706400A-09A

EPA METHOD TO-15 GC/MS

File Name:	**14062420**	**Date of Collection:**	**6/9/17 11:19:00 AM**
Dil. Factor:	**4.50**	**Date of Analysis:**	**6/24/17 07:49 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	22	Not Detected	190	Not Detected
1,2-Dibromoethane (EDB)	22	Not Detected	170	Not Detected
Chlorobenzene	22	Not Detected	100	Not Detected
Ethyl Benzene	22	Not Detected	98	Not Detected
m,p-Xylene	22	Not Detected	98	Not Detected
o-Xylene	22	Not Detected	98	Not Detected
Styrene	22	Not Detected	96	Not Detected
Bromoform	22	Not Detected	230	Not Detected
Cumene	22	Not Detected	110	Not Detected
1,1,2,2-Tetrachloroethane	22	Not Detected	150	Not Detected
Propylbenzene	22	Not Detected	110	Not Detected
4-Ethyltoluene	22	Not Detected	110	Not Detected
1,3,5-Trimethylbenzene	22	Not Detected	110	Not Detected
1,2,4-Trimethylbenzene	22	Not Detected	110	Not Detected
1,3-Dichlorobenzene	22	Not Detected	140	Not Detected
1,4-Dichlorobenzene	22	Not Detected	140	Not Detected
alpha-Chlorotoluene	22	Not Detected	120	Not Detected
1,2-Dichlorobenzene	22	Not Detected	140	Not Detected
1,2,4-Trichlorobenzene	90	Not Detected	670	Not Detected
Hexachlorobutadiene	90	Not Detected	960	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: B11193-060917-SVP-1-10

Lab ID#: 1706400A-10A

EPA METHOD TO-15 GC/MS

File Name:	**14062421**	**Date of Collection:**	**6/9/17 10:55:00 AM**
Dil. Factor:	**4.30**	**Date of Analysis:**	**6/24/17 08:14 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	22	Not Detected	110	Not Detected
Freon 114	22	Not Detected	150	Not Detected
Chloromethane	86	Not Detected	180	Not Detected
Vinyl Chloride	22	Not Detected	55	Not Detected
1,3-Butadiene	22	Not Detected	48	Not Detected
Bromomethane	86	Not Detected	330	Not Detected
Chloroethane	86	Not Detected	230	Not Detected
Freon 11	22	Not Detected	120	Not Detected
Ethanol	86	Not Detected	160	Not Detected
Freon 113	22	Not Detected	160	Not Detected
1,1-Dichloroethene	22	48	85	190
Acetone	86	Not Detected	200	Not Detected
2-Propanol	86	Not Detected	210	Not Detected
Carbon Disulfide	86	Not Detected	270	Not Detected
3-Chloropropene	86	Not Detected	270	Not Detected
Methylene Chloride	86	Not Detected	300	Not Detected
Methyl tert-butyl ether	22	Not Detected	78	Not Detected
trans-1,2-Dichloroethene	22	640	85	2600
Hexane	22	Not Detected	76	Not Detected
1,1-Dichloroethane	22	Not Detected	87	Not Detected
2-Butanone (Methyl Ethyl Ketone)	86	Not Detected	250	Not Detected
cis-1,2-Dichloroethene	22	1600	85	6100
Tetrahydrofuran	22	Not Detected	63	Not Detected
Chloroform	22	36	100	180
1,1,1-Trichloroethane	22	Not Detected	120	Not Detected
Cyclohexane	22	Not Detected	74	Not Detected
Carbon Tetrachloride	22	Not Detected	140	Not Detected
2,2,4-Trimethylpentane	22	Not Detected	100	Not Detected
Benzene	22	Not Detected	69	Not Detected
1,2-Dichloroethane	22	Not Detected	87	Not Detected
Heptane	22	Not Detected	88	Not Detected
Trichloroethene	22	3300	120	18000
1,2-Dichloropropane	22	Not Detected	99	Not Detected
1,4-Dioxane	86	Not Detected	310	Not Detected
Bromodichloromethane	22	Not Detected	140	Not Detected
cis-1,3-Dichloropropene	22	Not Detected	98	Not Detected
4-Methyl-2-pentanone	22	Not Detected	88	Not Detected
Toluene	22	Not Detected	81	Not Detected
trans-1,3-Dichloropropene	22	Not Detected	98	Not Detected
1,1,2-Trichloroethane	22	Not Detected	120	Not Detected
Tetrachloroethene	22	20000	140	140000
2-Hexanone	86	Not Detected	350	Not Detected

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Client Sample ID: B11193-060917-SVP-1-10

Lab ID#: 1706400A-10A

EPA METHOD TO-15 GC/MS

File Name:	**14062421**	**Date of Collection: 6/9/17 10:55:00 AM**	
Dil. Factor:	**4.30**	**Date of Analysis: 6/24/17 08:14 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	22	Not Detected	180	Not Detected
1,2-Dibromoethane (EDB)	22	Not Detected	160	Not Detected
Chlorobenzene	22	Not Detected	99	Not Detected
Ethyl Benzene	22	Not Detected	93	Not Detected
m,p-Xylene	22	Not Detected	93	Not Detected
o-Xylene	22	Not Detected	93	Not Detected
Styrene	22	Not Detected	92	Not Detected
Bromoform	22	Not Detected	220	Not Detected
Cumene	22	Not Detected	100	Not Detected
1,1,2,2-Tetrachloroethane	22	Not Detected	150	Not Detected
Propylbenzene	22	Not Detected	100	Not Detected
4-Ethyltoluene	22	Not Detected	100	Not Detected
1,3,5-Trimethylbenzene	22	Not Detected	100	Not Detected
1,2,4-Trimethylbenzene	22	Not Detected	100	Not Detected
1,3-Dichlorobenzene	22	Not Detected	130	Not Detected
1,4-Dichlorobenzene	22	Not Detected	130	Not Detected
alpha-Chlorotoluene	22	Not Detected	110	Not Detected
1,2-Dichlorobenzene	22	Not Detected	130	Not Detected
1,2,4-Trichlorobenzene	86	Not Detected	640	Not Detected
Hexachlorobutadiene	86	Not Detected	920	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: B11193-060917-SVP-2-SS

Lab ID#: 1706400A-11A

EPA METHOD TO-15 GC/MS

File Name:	**14062324**	**Date of Collection:**	**6/9/17 12:27:00 PM**
Dil. Factor:	**2.13**	**Date of Analysis:**	**6/23/17 07:50 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	53	Not Detected
Freon 114	11	Not Detected	74	Not Detected
Chloromethane	43	Not Detected	88	Not Detected
Vinyl Chloride	11	Not Detected	27	Not Detected
1,3-Butadiene	11	Not Detected	24	Not Detected
Bromomethane	43	Not Detected	160	Not Detected
Chloroethane	43	Not Detected	110	Not Detected
Freon 11	11	Not Detected	60	Not Detected
Ethanol	43	Not Detected	80	Not Detected
Freon 113	11	Not Detected	82	Not Detected
1,1-Dichloroethene	11	Not Detected	42	Not Detected
Acetone	43	Not Detected	100	Not Detected
2-Propanol	43	Not Detected	100	Not Detected
Carbon Disulfide	43	Not Detected	130	Not Detected
3-Chloropropene	43	Not Detected	130	Not Detected
Methylene Chloride	43	Not Detected	150	Not Detected
Methyl tert-butyl ether	11	Not Detected	38	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	42	Not Detected
Hexane	11	Not Detected	38	Not Detected
1,1-Dichloroethane	11	Not Detected	43	Not Detected
2-Butanone (Methyl Ethyl Ketone)	43	Not Detected	120	Not Detected
cis-1,2-Dichloroethene	11	Not Detected	42	Not Detected
Tetrahydrofuran	11	Not Detected	31	Not Detected
Chloroform	11	Not Detected	52	Not Detected
1,1,1-Trichloroethane	11	Not Detected	58	Not Detected
Cyclohexane	11	Not Detected	37	Not Detected
Carbon Tetrachloride	11	Not Detected	67	Not Detected
2,2,4-Trimethylpentane	11	Not Detected	50	Not Detected
Benzene	11	Not Detected	34	Not Detected
1,2-Dichloroethane	11	Not Detected	43	Not Detected
Heptane	11	Not Detected	44	Not Detected
Trichloroethene	11	24	57	130
1,2-Dichloropropane	11	Not Detected	49	Not Detected
1,4-Dioxane	43	Not Detected	150	Not Detected
Bromodichloromethane	11	Not Detected	71	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	48	Not Detected
4-Methyl-2-pentanone	11	Not Detected	44	Not Detected
Toluene	11	Not Detected	40	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	48	Not Detected
1,1,2-Trichloroethane	11	Not Detected	58	Not Detected
Tetrachloroethene	11	7600	72	51000
2-Hexanone	43	Not Detected	170	Not Detected

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Client Sample ID: B11193-060917-SVP-2-SS

Lab ID#: 1706400A-11A

EPA METHOD TO-15 GC/MS

File Name:	**14062324**	**Date of Collection:**	**6/9/17 12:27:00 PM**
Dil. Factor:	**2.13**	**Date of Analysis:**	**6/23/17 07:50 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	11	Not Detected	91	Not Detected
1,2-Dibromoethane (EDB)	11	Not Detected	82	Not Detected
Chlorobenzene	11	Not Detected	49	Not Detected
Ethyl Benzene	11	Not Detected	46	Not Detected
m,p-Xylene	11	Not Detected	46	Not Detected
o-Xylene	11	Not Detected	46	Not Detected
Styrene	11	Not Detected	45	Not Detected
Bromoform	11	Not Detected	110	Not Detected
Cumene	11	Not Detected	52	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	73	Not Detected
Propylbenzene	11	Not Detected	52	Not Detected
4-Ethyltoluene	11	Not Detected	52	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	52	Not Detected
1,2,4-Trimethylbenzene	11	Not Detected	52	Not Detected
1,3-Dichlorobenzene	11	Not Detected	64	Not Detected
1,4-Dichlorobenzene	11	Not Detected	64	Not Detected
alpha-Chlorotoluene	11	Not Detected	55	Not Detected
1,2-Dichlorobenzene	11	Not Detected	64	Not Detected
1,2,4-Trichlorobenzene	43	Not Detected	320	Not Detected
Hexachlorobutadiene	43	Not Detected	450	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-060917-SVP-2-5

Lab ID#: 1706400A-12A

EPA METHOD TO-15 GC/MS

File Name:	**14062326**	**Date of Collection: 6/9/17 12:43:00 PM**	
Dil. Factor:	**4.54**	**Date of Analysis: 6/23/17 09:00 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	23	Not Detected	110	Not Detected
Freon 114	23	Not Detected	160	Not Detected
Chloromethane	91	Not Detected	190	Not Detected
Vinyl Chloride	23	Not Detected	58	Not Detected
1,3-Butadiene	23	Not Detected	50	Not Detected
Bromomethane	91	Not Detected	350	Not Detected
Chloroethane	91	Not Detected	240	Not Detected
Freon 11	23	Not Detected	130	Not Detected
Ethanol	91	Not Detected	170	Not Detected
Freon 113	23	Not Detected	170	Not Detected
1,1-Dichloroethene	23	Not Detected	90	Not Detected
Acetone	91	Not Detected	220	Not Detected
2-Propanol	91	Not Detected	220	Not Detected
Carbon Disulfide	91	Not Detected	280	Not Detected
3-Chloropropene	91	Not Detected	280	Not Detected
Methylene Chloride	91	Not Detected	320	Not Detected
Methyl tert-butyl ether	23	Not Detected	82	Not Detected
trans-1,2-Dichloroethene	23	36	90	140
Hexane	23	Not Detected	80	Not Detected
1,1-Dichloroethane	23	Not Detected	92	Not Detected
2-Butanone (Methyl Ethyl Ketone)	91	Not Detected	270	Not Detected
cis-1,2-Dichloroethene	23	Not Detected	90	Not Detected
Tetrahydrofuran	23	Not Detected	67	Not Detected
Chloroform	23	Not Detected	110	Not Detected
1,1,1-Trichloroethane	23	Not Detected	120	Not Detected
Cyclohexane	23	Not Detected	78	Not Detected
Carbon Tetrachloride	23	Not Detected	140	Not Detected
2,2,4-Trimethylpentane	23	Not Detected	110	Not Detected
Benzene	23	Not Detected	72	Not Detected
1,2-Dichloroethane	23	Not Detected	92	Not Detected
Heptane	23	Not Detected	93	Not Detected
Trichloroethene	23	310	120	1700
1,2-Dichloropropane	23	Not Detected	100	Not Detected
1,4-Dioxane	91	Not Detected	330	Not Detected
Bromodichloromethane	23	Not Detected	150	Not Detected
cis-1,3-Dichloropropene	23	Not Detected	100	Not Detected
4-Methyl-2-pentanone	23	Not Detected	93	Not Detected
Toluene	23	Not Detected	86	Not Detected
trans-1,3-Dichloropropene	23	Not Detected	100	Not Detected
1,1,2-Trichloroethane	23	Not Detected	120	Not Detected
Tetrachloroethene	23	16000	150	110000
2-Hexanone	91	Not Detected	370	Not Detected

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Client Sample ID: B11193-060917-SVP-2-5

Lab ID#: 1706400A-12A

EPA METHOD TO-15 GC/MS

File Name:	**14062326**	**Date of Collection: 6/9/17 12:43:00 PM**	
Dil. Factor:	**4.54**	**Date of Analysis: 6/23/17 09:00 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	23	Not Detected	190	Not Detected
1,2-Dibromoethane (EDB)	23	Not Detected	170	Not Detected
Chlorobenzene	23	Not Detected	100	Not Detected
Ethyl Benzene	23	Not Detected	98	Not Detected
m,p-Xylene	23	Not Detected	98	Not Detected
o-Xylene	23	Not Detected	98	Not Detected
Styrene	23	Not Detected	97	Not Detected
Bromoform	23	Not Detected	230	Not Detected
Cumene	23	Not Detected	110	Not Detected
1,1,2,2-Tetrachloroethane	23	Not Detected	160	Not Detected
Propylbenzene	23	Not Detected	110	Not Detected
4-Ethyltoluene	23	Not Detected	110	Not Detected
1,3,5-Trimethylbenzene	23	Not Detected	110	Not Detected
1,2,4-Trimethylbenzene	23	Not Detected	110	Not Detected
1,3-Dichlorobenzene	23	Not Detected	140	Not Detected
1,4-Dichlorobenzene	23	Not Detected	140	Not Detected
alpha-Chlorotoluene	23	Not Detected	120	Not Detected
1,2-Dichlorobenzene	23	Not Detected	140	Not Detected
1,2,4-Trichlorobenzene	91	Not Detected	670	Not Detected
Hexachlorobutadiene	91	Not Detected	970	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-060917-SVP-2-10

Lab ID#: 1706400A-13A

EPA METHOD TO-15 GC/MS

File Name:	**14062327**	**Date of Collection: 6/9/17 12:58:00 PM**	
Dil. Factor:	**4.50**	**Date of Analysis: 6/23/17 09:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	22	Not Detected	110	Not Detected
Freon 114	22	Not Detected	160	Not Detected
Chloromethane	90	Not Detected	180	Not Detected
Vinyl Chloride	22	Not Detected	58	Not Detected
1,3-Butadiene	22	Not Detected	50	Not Detected
Bromomethane	90	Not Detected	350	Not Detected
Chloroethane	90	Not Detected	240	Not Detected
Freon 11	22	Not Detected	130	Not Detected
Ethanol	90	Not Detected	170	Not Detected
Freon 113	22	Not Detected	170	Not Detected
1,1-Dichloroethene	22	Not Detected	89	Not Detected
Acetone	90	Not Detected	210	Not Detected
2-Propanol	90	Not Detected	220	Not Detected
Carbon Disulfide	90	Not Detected	280	Not Detected
3-Chloropropene	90	Not Detected	280	Not Detected
Methylene Chloride	90	Not Detected	310	Not Detected
Methyl tert-butyl ether	22	Not Detected	81	Not Detected
trans-1,2-Dichloroethene	22	30	89	120
Hexane	22	Not Detected	79	Not Detected
1,1-Dichloroethane	22	Not Detected	91	Not Detected
2-Butanone (Methyl Ethyl Ketone)	90	Not Detected	260	Not Detected
cis-1,2-Dichloroethene	22	Not Detected	89	Not Detected
Tetrahydrofuran	22	Not Detected	66	Not Detected
Chloroform	22	Not Detected	110	Not Detected
1,1,1-Trichloroethane	22	Not Detected	120	Not Detected
Cyclohexane	22	Not Detected	77	Not Detected
Carbon Tetrachloride	22	Not Detected	140	Not Detected
2,2,4-Trimethylpentane	22	Not Detected	100	Not Detected
Benzene	22	Not Detected	72	Not Detected
1,2-Dichloroethane	22	Not Detected	91	Not Detected
Heptane	22	Not Detected	92	Not Detected
Trichloroethene	22	300	120	1600
1,2-Dichloropropane	22	Not Detected	100	Not Detected
1,4-Dioxane	90	Not Detected	320	Not Detected
Bromodichloromethane	22	Not Detected	150	Not Detected
cis-1,3-Dichloropropene	22	Not Detected	100	Not Detected
4-Methyl-2-pentanone	22	Not Detected	92	Not Detected
Toluene	22	Not Detected	85	Not Detected
trans-1,3-Dichloropropene	22	Not Detected	100	Not Detected
1,1,2-Trichloroethane	22	Not Detected	120	Not Detected
Tetrachloroethene	22	15000	150	100000
2-Hexanone	90	Not Detected	370	Not Detected

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Client Sample ID: B11193-060917-SVP-2-10

Lab ID#: 1706400A-13A

EPA METHOD TO-15 GC/MS

File Name:	**14062327**	**Date of Collection: 6/9/17 12:58:00 PM**	
Dil. Factor:	**4.50**	**Date of Analysis: 6/23/17 09:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	22	Not Detected	190	Not Detected
1,2-Dibromoethane (EDB)	22	Not Detected	170	Not Detected
Chlorobenzene	22	Not Detected	100	Not Detected
Ethyl Benzene	22	Not Detected	98	Not Detected
m,p-Xylene	22	Not Detected	98	Not Detected
o-Xylene	22	Not Detected	98	Not Detected
Styrene	22	Not Detected	96	Not Detected
Bromoform	22	Not Detected	230	Not Detected
Cumene	22	Not Detected	110	Not Detected
1,1,2,2-Tetrachloroethane	22	Not Detected	150	Not Detected
Propylbenzene	22	Not Detected	110	Not Detected
4-Ethyltoluene	22	Not Detected	110	Not Detected
1,3,5-Trimethylbenzene	22	Not Detected	110	Not Detected
1,2,4-Trimethylbenzene	22	Not Detected	110	Not Detected
1,3-Dichlorobenzene	22	Not Detected	140	Not Detected
1,4-Dichlorobenzene	22	Not Detected	140	Not Detected
alpha-Chlorotoluene	22	Not Detected	120	Not Detected
1,2-Dichlorobenzene	22	Not Detected	140	Not Detected
1,2,4-Trichlorobenzene	90	Not Detected	670	Not Detected
Hexachlorobutadiene	90	Not Detected	960	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-060917-SVP-3-SS

Lab ID#: 1706400A-14A

EPA METHOD TO-15 GC/MS

File Name:	**14062328**	**Date of Collection: 6/9/17 2:21:00 PM**	
Dil. Factor:	**4.70**	**Date of Analysis: 6/23/17 09:55 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	24	Not Detected	120	Not Detected
Freon 114	24	Not Detected	160	Not Detected
Chloromethane	94	Not Detected	190	Not Detected
Vinyl Chloride	24	Not Detected	60	Not Detected
1,3-Butadiene	24	Not Detected	52	Not Detected
Bromomethane	94	Not Detected	360	Not Detected
Chloroethane	94	Not Detected	250	Not Detected
Freon 11	24	Not Detected	130	Not Detected
Ethanol	94	Not Detected	180	Not Detected
Freon 113	24	Not Detected	180	Not Detected
1,1-Dichloroethene	24	Not Detected	93	Not Detected
Acetone	94	Not Detected	220	Not Detected
2-Propanol	94	Not Detected	230	Not Detected
Carbon Disulfide	94	Not Detected	290	Not Detected
3-Chloropropene	94	Not Detected	290	Not Detected
Methylene Chloride	94	Not Detected	330	Not Detected
Methyl tert-butyl ether	24	Not Detected	85	Not Detected
trans-1,2-Dichloroethene	24	33	93	130
Hexane	24	Not Detected	83	Not Detected
1,1-Dichloroethane	24	Not Detected	95	Not Detected
2-Butanone (Methyl Ethyl Ketone)	94	Not Detected	280	Not Detected
cis-1,2-Dichloroethene	24	30	93	120
Tetrahydrofuran	24	Not Detected	69	Not Detected
Chloroform	24	Not Detected	110	Not Detected
1,1,1-Trichloroethane	24	Not Detected	130	Not Detected
Cyclohexane	24	Not Detected	81	Not Detected
Carbon Tetrachloride	24	Not Detected	150	Not Detected
2,2,4-Trimethylpentane	24	Not Detected	110	Not Detected
Benzene	24	Not Detected	75	Not Detected
1,2-Dichloroethane	24	Not Detected	95	Not Detected
Heptane	24	Not Detected	96	Not Detected
Trichloroethene	24	890	130	4800
1,2-Dichloropropane	24	Not Detected	110	Not Detected
1,4-Dioxane	94	Not Detected	340	Not Detected
Bromodichloromethane	24	Not Detected	160	Not Detected
cis-1,3-Dichloropropene	24	Not Detected	110	Not Detected
4-Methyl-2-pentanone	24	Not Detected	96	Not Detected
Toluene	24	Not Detected	88	Not Detected
trans-1,3-Dichloropropene	24	Not Detected	110	Not Detected
1,1,2-Trichloroethane	24	Not Detected	130	Not Detected
Tetrachloroethene	24	18000	160	120000
2-Hexanone	94	Not Detected	380	Not Detected

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Client Sample ID: B11193-060917-SVP-3-SS

Lab ID#: 1706400A-14A

EPA METHOD TO-15 GC/MS

File Name:	**14062328**	**Date of Collection:**	**6/9/17 2:21:00 PM**
Dil. Factor:	**4.70**	**Date of Analysis:**	**6/23/17 09:55 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	24	Not Detected	200	Not Detected
1,2-Dibromoethane (EDB)	24	Not Detected	180	Not Detected
Chlorobenzene	24	Not Detected	110	Not Detected
Ethyl Benzene	24	Not Detected	100	Not Detected
m,p-Xylene	24	Not Detected	100	Not Detected
o-Xylene	24	Not Detected	100	Not Detected
Styrene	24	Not Detected	100	Not Detected
Bromoform	24	Not Detected	240	Not Detected
Cumene	24	Not Detected	120	Not Detected
1,1,2,2-Tetrachloroethane	24	Not Detected	160	Not Detected
Propylbenzene	24	Not Detected	120	Not Detected
4-Ethyltoluene	24	Not Detected	120	Not Detected
1,3,5-Trimethylbenzene	24	Not Detected	120	Not Detected
1,2,4-Trimethylbenzene	24	Not Detected	120	Not Detected
1,3-Dichlorobenzene	24	Not Detected	140	Not Detected
1,4-Dichlorobenzene	24	Not Detected	140	Not Detected
alpha-Chlorotoluene	24	Not Detected	120	Not Detected
1,2-Dichlorobenzene	24	Not Detected	140	Not Detected
1,2,4-Trichlorobenzene	94	Not Detected	700	Not Detected
Hexachlorobutadiene	94	Not Detected	1000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	115	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: B11193-060917-SVP-3-5

Lab ID#: 1706400A-15A

EPA METHOD TO-15 GC/MS

File Name:	**14062424**	**Date of Collection:**	**6/9/17 2:42:00 PM**
Dil. Factor:	**27.2**	**Date of Analysis:**	**6/25/17 07:53 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	140	Not Detected	670	Not Detected
Freon 114	140	Not Detected	950	Not Detected
Chloromethane	540	Not Detected	1100	Not Detected
Vinyl Chloride	140	Not Detected	350	Not Detected
1,3-Butadiene	140	Not Detected	300	Not Detected
Bromomethane	540	Not Detected	2100	Not Detected
Chloroethane	540	Not Detected	1400	Not Detected
Freon 11	140	Not Detected	760	Not Detected
Ethanol	540	Not Detected	1000	Not Detected
Freon 113	140	Not Detected	1000	Not Detected
1,1-Dichloroethene	140	Not Detected	540	Not Detected
Acetone	540	Not Detected	1300	Not Detected
2-Propanol	540	Not Detected	1300	Not Detected
Carbon Disulfide	540	Not Detected	1700	Not Detected
3-Chloropropene	540	Not Detected	1700	Not Detected
Methylene Chloride	540	Not Detected	1900	Not Detected
Methyl tert-butyl ether	140	Not Detected	490	Not Detected
trans-1,2-Dichloroethene	140	150	540	600
Hexane	140	Not Detected	480	Not Detected
1,1-Dichloroethane	140	Not Detected	550	Not Detected
2-Butanone (Methyl Ethyl Ketone)	540	Not Detected	1600	Not Detected
cis-1,2-Dichloroethene	140	390	540	1600
Tetrahydrofuran	140	Not Detected	400	Not Detected
Chloroform	140	Not Detected	660	Not Detected
1,1,1-Trichloroethane	140	Not Detected	740	Not Detected
Cyclohexane	140	Not Detected	470	Not Detected
Carbon Tetrachloride	140	Not Detected	860	Not Detected
2,2,4-Trimethylpentane	140	Not Detected	640	Not Detected
Benzene	140	Not Detected	430	Not Detected
1,2-Dichloroethane	140	Not Detected	550	Not Detected
Heptane	140	Not Detected	560	Not Detected
Trichloroethene	140	2800	730	15000
1,2-Dichloropropane	140	Not Detected	630	Not Detected
1,4-Dioxane	540	Not Detected	2000	Not Detected
Bromodichloromethane	140	Not Detected	910	Not Detected
cis-1,3-Dichloropropene	140	Not Detected	620	Not Detected
4-Methyl-2-pentanone	140	Not Detected	560	Not Detected
Toluene	140	Not Detected	510	Not Detected
trans-1,3-Dichloropropene	140	Not Detected	620	Not Detected
1,1,2-Trichloroethane	140	Not Detected	740	Not Detected
Tetrachloroethene	140	55000	920	370000
2-Hexanone	540	Not Detected	2200	Not Detected

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Client Sample ID: B11193-060917-SVP-3-5

Lab ID#: 1706400A-15A

EPA METHOD TO-15 GC/MS

File Name:	**14062424**	**Date of Collection: 6/9/17 2:42:00 PM**	
Dil. Factor:	**27.2**	**Date of Analysis: 6/25/17 07:53 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	140	Not Detected	1200	Not Detected
1,2-Dibromoethane (EDB)	140	Not Detected	1000	Not Detected
Chlorobenzene	140	Not Detected	630	Not Detected
Ethyl Benzene	140	Not Detected	590	Not Detected
m,p-Xylene	140	Not Detected	590	Not Detected
o-Xylene	140	Not Detected	590	Not Detected
Styrene	140	Not Detected	580	Not Detected
Bromoform	140	Not Detected	1400	Not Detected
Cumene	140	Not Detected	670	Not Detected
1,1,2,2-Tetrachloroethane	140	Not Detected	930	Not Detected
Propylbenzene	140	Not Detected	670	Not Detected
4-Ethyltoluene	140	Not Detected	670	Not Detected
1,3,5-Trimethylbenzene	140	Not Detected	670	Not Detected
1,2,4-Trimethylbenzene	140	Not Detected	670	Not Detected
1,3-Dichlorobenzene	140	Not Detected	820	Not Detected
1,4-Dichlorobenzene	140	Not Detected	820	Not Detected
alpha-Chlorotoluene	140	Not Detected	700	Not Detected
1,2-Dichlorobenzene	140	Not Detected	820	Not Detected
1,2,4-Trichlorobenzene	540	Not Detected	4000	Not Detected
Hexachlorobutadiene	540	Not Detected	5800	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: B11193-060917-SVP-3-10

Lab ID#: 1706400A-16A

EPA METHOD TO-15 GC/MS

File Name:	**14062425**	**Date of Collection:**	**6/9/17 3:35:00 PM**
Dil. Factor:	**25.4**	**Date of Analysis:**	**6/25/17 08:27 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	130	Not Detected	630	Not Detected
Freon 114	130	Not Detected	890	Not Detected
Chloromethane	510	Not Detected	1000	Not Detected
Vinyl Chloride	130	Not Detected	320	Not Detected
1,3-Butadiene	130	Not Detected	280	Not Detected
Bromomethane	510	Not Detected	2000	Not Detected
Chloroethane	510	Not Detected	1300	Not Detected
Freon 11	130	Not Detected	710	Not Detected
Ethanol	510	Not Detected	960	Not Detected
Freon 113	130	Not Detected	970	Not Detected
1,1-Dichloroethene	130	Not Detected	500	Not Detected
Acetone	510	Not Detected	1200	Not Detected
2-Propanol	510	Not Detected	1200	Not Detected
Carbon Disulfide	510	Not Detected	1600	Not Detected
3-Chloropropene	510	Not Detected	1600	Not Detected
Methylene Chloride	510	Not Detected	1800	Not Detected
Methyl tert-butyl ether	130	Not Detected	460	Not Detected
trans-1,2-Dichloroethene	130	180	500	730
Hexane	130	Not Detected	450	Not Detected
1,1-Dichloroethane	130	Not Detected	510	Not Detected
2-Butanone (Methyl Ethyl Ketone)	510	Not Detected	1500	Not Detected
cis-1,2-Dichloroethene	130	360	500	1400
Tetrahydrofuran	130	Not Detected	370	Not Detected
Chloroform	130	Not Detected	620	Not Detected
1,1,1-Trichloroethane	130	Not Detected	690	Not Detected
Cyclohexane	130	Not Detected	440	Not Detected
Carbon Tetrachloride	130	Not Detected	800	Not Detected
2,2,4-Trimethylpentane	130	Not Detected	590	Not Detected
Benzene	130	Not Detected	400	Not Detected
1,2-Dichloroethane	130	Not Detected	510	Not Detected
Heptane	130	Not Detected	520	Not Detected
Trichloroethene	130	2800	680	15000
1,2-Dichloropropane	130	Not Detected	590	Not Detected
1,4-Dioxane	510	Not Detected	1800	Not Detected
Bromodichloromethane	130	Not Detected	850	Not Detected
cis-1,3-Dichloropropene	130	Not Detected	580	Not Detected
4-Methyl-2-pentanone	130	Not Detected	520	Not Detected
Toluene	130	Not Detected	480	Not Detected
trans-1,3-Dichloropropene	130	Not Detected	580	Not Detected
1,1,2-Trichloroethane	130	Not Detected	690	Not Detected
Tetrachloroethene	130	57000	860	380000
2-Hexanone	510	Not Detected	2100	Not Detected

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Client Sample ID: B11193-060917-SVP-3-10

Lab ID#: 1706400A-16A

EPA METHOD TO-15 GC/MS

File Name:	**14062425**	**Date of Collection: 6/9/17 3:35:00 PM**	
Dil. Factor:	**25.4**	**Date of Analysis: 6/25/17 08:27 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	130	Not Detected	1100	Not Detected
1,2-Dibromoethane (EDB)	130	Not Detected	980	Not Detected
Chlorobenzene	130	Not Detected	580	Not Detected
Ethyl Benzene	130	Not Detected	550	Not Detected
m,p-Xylene	130	Not Detected	550	Not Detected
o-Xylene	130	Not Detected	550	Not Detected
Styrene	130	Not Detected	540	Not Detected
Bromoform	130	Not Detected	1300	Not Detected
Cumene	130	Not Detected	620	Not Detected
1,1,2,2-Tetrachloroethane	130	Not Detected	870	Not Detected
Propylbenzene	130	Not Detected	620	Not Detected
4-Ethyltoluene	130	Not Detected	620	Not Detected
1,3,5-Trimethylbenzene	130	Not Detected	620	Not Detected
1,2,4-Trimethylbenzene	130	Not Detected	620	Not Detected
1,3-Dichlorobenzene	130	Not Detected	760	Not Detected
1,4-Dichlorobenzene	130	Not Detected	760	Not Detected
alpha-Chlorotoluene	130	Not Detected	660	Not Detected
1,2-Dichlorobenzene	130	Not Detected	760	Not Detected
1,2,4-Trichlorobenzene	510	Not Detected	3800	Not Detected
Hexachlorobutadiene	510	Not Detected	5400	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17A

EPA METHOD TO-15 GC/MS

File Name:	**14062306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.0	Not Detected	25	Not Detected
Freon 114	5.0	Not Detected	35	Not Detected
Chloromethane	20	Not Detected	41	Not Detected
Vinyl Chloride	5.0	Not Detected	13	Not Detected
1,3-Butadiene	5.0	Not Detected	11	Not Detected
Bromomethane	20	Not Detected	78	Not Detected
Chloroethane	20	Not Detected	53	Not Detected
Freon 11	5.0	Not Detected	28	Not Detected
Ethanol	20	Not Detected	38	Not Detected
Freon 113	5.0	Not Detected	38	Not Detected
1,1-Dichloroethene	5.0	Not Detected	20	Not Detected
Acetone	20	Not Detected	48	Not Detected
2-Propanol	20	Not Detected	49	Not Detected
Carbon Disulfide	20	Not Detected	62	Not Detected
3-Chloropropene	20	Not Detected	63	Not Detected
Methylene Chloride	20	Not Detected	69	Not Detected
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
trans-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Hexane	5.0	Not Detected	18	Not Detected
1,1-Dichloroethane	5.0	Not Detected	20	Not Detected
2-Butanone (Methyl Ethyl Ketone)	20	Not Detected	59	Not Detected
cis-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Tetrahydrofuran	5.0	Not Detected	15	Not Detected
Chloroform	5.0	Not Detected	24	Not Detected
1,1,1-Trichloroethane	5.0	Not Detected	27	Not Detected
Cyclohexane	5.0	Not Detected	17	Not Detected
Carbon Tetrachloride	5.0	Not Detected	31	Not Detected
2,2,4-Trimethylpentane	5.0	Not Detected	23	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
1,2-Dichloroethane	5.0	Not Detected	20	Not Detected
Heptane	5.0	Not Detected	20	Not Detected
Trichloroethene	5.0	Not Detected	27	Not Detected
1,2-Dichloropropane	5.0	Not Detected	23	Not Detected
1,4-Dioxane	20	Not Detected	72	Not Detected
Bromodichloromethane	5.0	Not Detected	34	Not Detected
cis-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
4-Methyl-2-pentanone	5.0	Not Detected	20	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
trans-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
1,1,2-Trichloroethane	5.0	Not Detected	27	Not Detected
Tetrachloroethene	5.0	Not Detected	34	Not Detected
2-Hexanone	20	Not Detected	82	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17A

EPA METHOD TO-15 GC/MS

File Name:	**14062306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.0	Not Detected	42	Not Detected
1,2-Dibromoethane (EDB)	5.0	Not Detected	38	Not Detected
Chlorobenzene	5.0	Not Detected	23	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
Styrene	5.0	Not Detected	21	Not Detected
Bromoform	5.0	Not Detected	52	Not Detected
Cumene	5.0	Not Detected	24	Not Detected
1,1,2,2-Tetrachloroethane	5.0	Not Detected	34	Not Detected
Propylbenzene	5.0	Not Detected	24	Not Detected
4-Ethyltoluene	5.0	Not Detected	24	Not Detected
1,3,5-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,2,4-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,3-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,4-Dichlorobenzene	5.0	Not Detected	30	Not Detected
alpha-Chlorotoluene	5.0	Not Detected	26	Not Detected
1,2-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,2,4-Trichlorobenzene	20	Not Detected	150	Not Detected
Hexachlorobutadiene	20	Not Detected	210	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:05 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	5.0	Not Detected	19	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
Methyl tert-butyl ether	2.0	Not Detected	7.2	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:05 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	86	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17C

EPA METHOD TO-15 GC/MS

File Name:	**14062410**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 03:09 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.0	Not Detected	25	Not Detected
Freon 114	5.0	Not Detected	35	Not Detected
Chloromethane	20	Not Detected	41	Not Detected
Vinyl Chloride	5.0	Not Detected	13	Not Detected
1,3-Butadiene	5.0	Not Detected	11	Not Detected
Bromomethane	20	Not Detected	78	Not Detected
Chloroethane	20	Not Detected	53	Not Detected
Freon 11	5.0	Not Detected	28	Not Detected
Ethanol	20	Not Detected	38	Not Detected
Freon 113	5.0	Not Detected	38	Not Detected
1,1-Dichloroethene	5.0	Not Detected	20	Not Detected
Acetone	20	Not Detected	48	Not Detected
2-Propanol	20	Not Detected	49	Not Detected
Carbon Disulfide	20	Not Detected	62	Not Detected
3-Chloropropene	20	Not Detected	63	Not Detected
Methylene Chloride	20	Not Detected	69	Not Detected
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
trans-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Hexane	5.0	Not Detected	18	Not Detected
1,1-Dichloroethane	5.0	Not Detected	20	Not Detected
2-Butanone (Methyl Ethyl Ketone)	20	Not Detected	59	Not Detected
cis-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Tetrahydrofuran	5.0	Not Detected	15	Not Detected
Chloroform	5.0	Not Detected	24	Not Detected
1,1,1-Trichloroethane	5.0	Not Detected	27	Not Detected
Cyclohexane	5.0	Not Detected	17	Not Detected
Carbon Tetrachloride	5.0	Not Detected	31	Not Detected
2,2,4-Trimethylpentane	5.0	Not Detected	23	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
1,2-Dichloroethane	5.0	Not Detected	20	Not Detected
Heptane	5.0	Not Detected	20	Not Detected
Trichloroethene	5.0	Not Detected	27	Not Detected
1,2-Dichloropropane	5.0	Not Detected	23	Not Detected
1,4-Dioxane	20	Not Detected	72	Not Detected
Bromodichloromethane	5.0	Not Detected	34	Not Detected
cis-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
4-Methyl-2-pentanone	5.0	Not Detected	20	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
trans-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
1,1,2-Trichloroethane	5.0	Not Detected	27	Not Detected
Tetrachloroethene	5.0	Not Detected	34	Not Detected
2-Hexanone	20	Not Detected	82	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706400A-17C

EPA METHOD TO-15 GC/MS

File Name:	**14062410**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 03:09 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.0	Not Detected	42	Not Detected
1,2-Dibromoethane (EDB)	5.0	Not Detected	38	Not Detected
Chlorobenzene	5.0	Not Detected	23	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
Styrene	5.0	Not Detected	21	Not Detected
Bromoform	5.0	Not Detected	52	Not Detected
Cumene	5.0	Not Detected	24	Not Detected
1,1,2,2-Tetrachloroethane	5.0	Not Detected	34	Not Detected
Propylbenzene	5.0	Not Detected	24	Not Detected
4-Ethyltoluene	5.0	Not Detected	24	Not Detected
1,3,5-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,2,4-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,3-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,4-Dichlorobenzene	5.0	Not Detected	30	Not Detected
alpha-Chlorotoluene	5.0	Not Detected	26	Not Detected
1,2-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,2,4-Trichlorobenzene	20	Not Detected	150	Not Detected
Hexachlorobutadiene	20	Not Detected	210	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	115	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: CCV

Lab ID#: 1706400A-18A

EPA METHOD TO-15 GC/MS

File Name:	**14062302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 07:51 AM**

Compound	%Recovery
Freon 12	98
Freon 114	103
Chloromethane	91
Vinyl Chloride	101
1,3-Butadiene	93
Bromomethane	119
Chloroethane	91
Freon 11	122
Ethanol	90
Freon 113	107
1,1-Dichloroethene	104
Acetone	92
2-Propanol	97
Carbon Disulfide	92
3-Chloropropene	98
Methylene Chloride	101
Methyl tert-butyl ether	103
trans-1,2-Dichloroethene	92
Hexane	102
1,1-Dichloroethane	99
2-Butanone (Methyl Ethyl Ketone)	90
cis-1,2-Dichloroethene	100
Tetrahydrofuran	85
Chloroform	95
1,1,1-Trichloroethane	116
Cyclohexane	105
Carbon Tetrachloride	120
2,2,4-Trimethylpentane	97
Benzene	90
1,2-Dichloroethane	104
Heptane	90
Trichloroethene	91
1,2-Dichloropropane	84
1,4-Dioxane	95
Bromodichloromethane	99
cis-1,3-Dichloropropene	93
4-Methyl-2-pentanone	103
Toluene	85
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	93
Tetrachloroethene	94
2-Hexanone	99

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Client Sample ID: CCV

Lab ID#: 1706400A-18A

EPA METHOD TO-15 GC/MS

File Name:	**14062302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 07:51 AM**	

Compound	%Recovery
Dibromochloromethane	98
1,2-Dibromoethane (EDB)	95
Chlorobenzene	93
Ethyl Benzene	97
m,p-Xylene	92
o-Xylene	93
Styrene	106
Bromoform	100
Cumene	98
1,1,2,2-Tetrachloroethane	89
Propylbenzene	95
4-Ethyltoluene	100
1,3,5-Trimethylbenzene	104
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	98
1,4-Dichlorobenzene	101
alpha-Chlorotoluene	98
1,2-Dichlorobenzene	98
1,2,4-Trichlorobenzene	93
Hexachlorobutadiene	101

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	95	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: CCV

Lab ID#: 1706400A-18B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:43 AM**

Compound	%Recovery
Freon 12	90
Freon 114	96
Chloromethane	93
Vinyl Chloride	90
1,3-Butadiene	82
Bromomethane	94
Chloroethane	90
Freon 11	92
Ethanol	81
Freon 113	95
1,1-Dichloroethene	91
Acetone	83
2-Propanol	84
Carbon Disulfide	91
3-Chloropropene	89
Methylene Chloride	84
Methyl tert-butyl ether	86
trans-1,2-Dichloroethene	90
Hexane	85
1,1-Dichloroethane	85
2-Butanone (Methyl Ethyl Ketone)	86
cis-1,2-Dichloroethene	86
Tetrahydrofuran	79
Chloroform	90
1,1,1-Trichloroethane	89
Cyclohexane	83
Carbon Tetrachloride	89
2,2,4-Trimethylpentane	82
Benzene	91
1,2-Dichloroethane	86
Heptane	87
Trichloroethene	93
1,2-Dichloropropane	88
1,4-Dioxane	92
Bromodichloromethane	94
cis-1,3-Dichloropropene	92
4-Methyl-2-pentanone	82
Toluene	93
trans-1,3-Dichloropropene	89
1,1,2-Trichloroethane	94
Tetrachloroethene	100
2-Hexanone	81

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Client Sample ID: CCV

Lab ID#: 1706400A-18B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:43 AM**	

Compound	%Recovery
Dibromochloromethane	97
1,2-Dibromoethane (EDB)	95
Chlorobenzene	93
Ethyl Benzene	92
m,p-Xylene	91
o-Xylene	90
Styrene	88
Bromoform	102
Cumene	90
1,1,2,2-Tetrachloroethane	89
Propylbenzene	90
4-Ethyltoluene	92
1,3,5-Trimethylbenzene	90
1,2,4-Trimethylbenzene	92
1,3-Dichlorobenzene	96
1,4-Dichlorobenzene	96
alpha-Chlorotoluene	90
1,2-Dichlorobenzene	94
1,2,4-Trichlorobenzene	104
Hexachlorobutadiene	107

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	105	70-130

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Client Sample ID: CCV

Lab ID#: 1706400A-18C

EPA METHOD TO-15 GC/MS

File Name:	**14062407**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 12:29 PM**	

Compound	%Recovery
Freon 12	99
Freon 114	100
Chloromethane	90
Vinyl Chloride	96
1,3-Butadiene	91
Bromomethane	114
Chloroethane	85
Freon 11	119
Ethanol	92
Freon 113	106
1,1-Dichloroethene	100
Acetone	90
2-Propanol	95
Carbon Disulfide	87
3-Chloropropene	95
Methylene Chloride	101
Methyl tert-butyl ether	102
trans-1,2-Dichloroethene	88
Hexane	96
1,1-Dichloroethane	99
2-Butanone (Methyl Ethyl Ketone)	87
cis-1,2-Dichloroethene	99
Tetrahydrofuran	85
Chloroform	93
1,1,1-Trichloroethane	111
Cyclohexane	103
Carbon Tetrachloride	118
2,2,4-Trimethylpentane	97
Benzene	88
1,2-Dichloroethane	102
Heptane	86
Trichloroethene	91
1,2-Dichloropropane	84
1,4-Dioxane	95
Bromodichloromethane	100
cis-1,3-Dichloropropene	90
4-Methyl-2-pentanone	104
Toluene	87
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	92
Tetrachloroethene	95
2-Hexanone	100

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Client Sample ID: CCV

Lab ID#: 1706400A-18C

EPA METHOD TO-15 GC/MS

File Name:	**14062407**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 12:29 PM**	

Compound	%Recovery
Dibromochloromethane	96
1,2-Dibromoethane (EDB)	91
Chlorobenzene	93
Ethyl Benzene	90
m,p-Xylene	92
o-Xylene	94
Styrene	102
Bromoform	98
Cumene	99
1,1,2,2-Tetrachloroethane	87
Propylbenzene	98
4-Ethyltoluene	100
1,3,5-Trimethylbenzene	108
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	99
1,4-Dichlorobenzene	103
alpha-Chlorotoluene	104
1,2-Dichlorobenzene	102
1,2,4-Trichlorobenzene	109
Hexachlorobutadiene	110

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19A

EPA METHOD TO-15 GC/MS

File Name:	**14062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:21 AM**	

Compound	%Recovery	Method Limits
Freon 12	109	70-130
Freon 114	114	70-130
Chloromethane	101	70-130
Vinyl Chloride	108	70-130
1,3-Butadiene	97	70-130
Bromomethane	137 Q	70-130
Chloroethane	102	70-130
Freon 11	133 Q	70-130
Ethanol	104	70-130
Freon 113	118	70-130
1,1-Dichloroethene	115	70-130
Acetone	104	70-130
2-Propanol	113	70-130
Carbon Disulfide	89	70-130
3-Chloropropene	110	70-130
Methylene Chloride	111	70-130
Methyl tert-butyl ether	116	70-130
trans-1,2-Dichloroethene	92	70-130
Hexane	113	70-130
1,1-Dichloroethane	111	70-130
2-Butanone (Methyl Ethyl Ketone)	101	70-130
cis-1,2-Dichloroethene	118	70-130
Tetrahydrofuran	95	70-130
Chloroform	107	70-130
1,1,1-Trichloroethane	129	70-130
Cyclohexane	121	70-130
Carbon Tetrachloride	130	70-130
2,2,4-Trimethylpentane	110	70-130
Benzene	103	70-130
1,2-Dichloroethane	113	70-130
Heptane	104	70-130
Trichloroethene	103	70-130
1,2-Dichloropropane	96	70-130
1,4-Dioxane	108	70-130
Bromodichloromethane	118	70-130
cis-1,3-Dichloropropene	106	70-130
4-Methyl-2-pentanone	112	70-130
Toluene	100	70-130
trans-1,3-Dichloropropene	109	70-130
1,1,2-Trichloroethane	107	70-130
Tetrachloroethene	102	70-130
2-Hexanone	110	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19A

EPA METHOD TO-15 GC/MS

File Name:	**14062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:21 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	108	70-130
1,2-Dibromoethane (EDB)	103	70-130
Chlorobenzene	104	70-130
Ethyl Benzene	102	70-130
m,p-Xylene	101	70-130
o-Xylene	104	70-130
Styrene	114	70-130
Bromoform	113	70-130
Cumene	104	70-130
1,1,2,2-Tetrachloroethane	96	70-130
Propylbenzene	104	70-130
4-Ethyltoluene	109	70-130
1,3,5-Trimethylbenzene	110	70-130
1,2,4-Trimethylbenzene	104	70-130
1,3-Dichlorobenzene	99	70-130
1,4-Dichlorobenzene	104	70-130
alpha-Chlorotoluene	108	70-130
1,2-Dichlorobenzene	97	70-130
1,2,4-Trichlorobenzene	81	70-130
Hexachlorobutadiene	86	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19AA

EPA METHOD TO-15 GC/MS

File Name:	**14062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:57 AM**	

Compound	%Recovery	Method Limits
Freon 12	110	70-130
Freon 114	116	70-130
Chloromethane	101	70-130
Vinyl Chloride	112	70-130
1,3-Butadiene	100	70-130
Bromomethane	137 Q	70-130
Chloroethane	100	70-130
Freon 11	137 Q	70-130
Ethanol	100	70-130
Freon 113	120	70-130
1,1-Dichloroethene	118	70-130
Acetone	105	70-130
2-Propanol	114	70-130
Carbon Disulfide	91	70-130
3-Chloropropene	113	70-130
Methylene Chloride	113	70-130
Methyl tert-butyl ether	117	70-130
trans-1,2-Dichloroethene	91	70-130
Hexane	114	70-130
1,1-Dichloroethane	113	70-130
2-Butanone (Methyl Ethyl Ketone)	108	70-130
cis-1,2-Dichloroethene	118	70-130
Tetrahydrofuran	98	70-130
Chloroform	107	70-130
1,1,1-Trichloroethane	127	70-130
Cyclohexane	119	70-130
Carbon Tetrachloride	130	70-130
2,2,4-Trimethylpentane	112	70-130
Benzene	103	70-130
1,2-Dichloroethane	114	70-130
Heptane	102	70-130
Trichloroethene	108	70-130
1,2-Dichloropropane	96	70-130
1,4-Dioxane	107	70-130
Bromodichloromethane	113	70-130
cis-1,3-Dichloropropene	105	70-130
4-Methyl-2-pentanone	111	70-130
Toluene	101	70-130
trans-1,3-Dichloropropene	109	70-130
1,1,2-Trichloroethane	107	70-130
Tetrachloroethene	104	70-130
2-Hexanone	111	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19AA

EPA METHOD TO-15 GC/MS

File Name:	**14062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:57 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	106	70-130
1,2-Dibromoethane (EDB)	101	70-130
Chlorobenzene	101	70-130
Ethyl Benzene	103	70-130
m,p-Xylene	100	70-130
o-Xylene	101	70-130
Styrene	114	70-130
Bromoform	110	70-130
Cumene	103	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	104	70-130
4-Ethyltoluene	105	70-130
1,3,5-Trimethylbenzene	111	70-130
1,2,4-Trimethylbenzene	103	70-130
1,3-Dichlorobenzene	100	70-130
1,4-Dichlorobenzene	103	70-130
alpha-Chlorotoluene	108	70-130
1,2-Dichlorobenzene	98	70-130
1,2,4-Trichlorobenzene	80	70-130
Hexachlorobutadiene	86	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:10 AM**	

Compound	%Recovery	Method Limits
Freon 12	95	70-130
Freon 114	103	70-130
Chloromethane	98	70-130
Vinyl Chloride	98	70-130
1,3-Butadiene	86	70-130
Bromomethane	100	70-130
Chloroethane	100	70-130
Freon 11	98	70-130
Ethanol	74	70-130
Freon 113	99	70-130
1,1-Dichloroethene	94	70-130
Acetone	89	70-130
2-Propanol	87	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	98	70-130
Methylene Chloride	88	70-130
Methyl tert-butyl ether	91	70-130
trans-1,2-Dichloroethene	103	70-130
Hexane	90	70-130
1,1-Dichloroethane	89	70-130
2-Butanone (Methyl Ethyl Ketone)	91	70-130
cis-1,2-Dichloroethene	84	70-130
Tetrahydrofuran	81	70-130
Chloroform	93	70-130
1,1,1-Trichloroethane	92	70-130
Cyclohexane	86	70-130
Carbon Tetrachloride	93	70-130
2,2,4-Trimethylpentane	87	70-130
Benzene	96	70-130
1,2-Dichloroethane	90	70-130
Heptane	94	70-130
Trichloroethene	100	70-130
1,2-Dichloropropane	92	70-130
1,4-Dioxane	94	70-130
Bromodichloromethane	101	70-130
cis-1,3-Dichloropropene	103	70-130
4-Methyl-2-pentanone	85	70-130
Toluene	97	70-130
trans-1,3-Dichloropropene	92	70-130
1,1,2-Trichloroethane	98	70-130
Tetrachloroethene	102	70-130
2-Hexanone	83	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:10 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	102	70-130
1,2-Dibromoethane (EDB)	98	70-130
Chlorobenzene	97	70-130
Ethyl Benzene	95	70-130
m,p-Xylene	94	70-130
o-Xylene	93	70-130
Styrene	90	70-130
Bromoform	108	70-130
Cumene	92	70-130
1,1,2,2-Tetrachloroethane	92	70-130
Propylbenzene	93	70-130
4-Ethyltoluene	97	70-130
1,3,5-Trimethylbenzene	94	70-130
1,2,4-Trimethylbenzene	96	70-130
1,3-Dichlorobenzene	98	70-130
1,4-Dichlorobenzene	100	70-130
alpha-Chlorotoluene	94	70-130
1,2-Dichlorobenzene	98	70-130
1,2,4-Trichlorobenzene	109	70-130
Hexachlorobutadiene	114	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	88	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19BB

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:36 AM**	

Compound	%Recovery	Method Limits
Freon 12	95	70-130
Freon 114	103	70-130
Chloromethane	95	70-130
Vinyl Chloride	99	70-130
1,3-Butadiene	88	70-130
Bromomethane	101	70-130
Chloroethane	101	70-130
Freon 11	98	70-130
Ethanol	74	70-130
Freon 113	100	70-130
1,1-Dichloroethene	96	70-130
Acetone	90	70-130
2-Propanol	88	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	102	70-130
Methylene Chloride	89	70-130
Methyl tert-butyl ether	91	70-130
trans-1,2-Dichloroethene	105	70-130
Hexane	90	70-130
1,1-Dichloroethane	89	70-130
2-Butanone (Methyl Ethyl Ketone)	92	70-130
cis-1,2-Dichloroethene	87	70-130
Tetrahydrofuran	83	70-130
Chloroform	93	70-130
1,1,1-Trichloroethane	93	70-130
Cyclohexane	88	70-130
Carbon Tetrachloride	94	70-130
2,2,4-Trimethylpentane	86	70-130
Benzene	96	70-130
1,2-Dichloroethane	91	70-130
Heptane	93	70-130
Trichloroethene	102	70-130
1,2-Dichloropropane	93	70-130
1,4-Dioxane	96	70-130
Bromodichloromethane	101	70-130
cis-1,3-Dichloropropene	103	70-130
4-Methyl-2-pentanone	87	70-130
Toluene	98	70-130
trans-1,3-Dichloropropene	95	70-130
1,1,2-Trichloroethane	100	70-130
Tetrachloroethene	105	70-130
2-Hexanone	84	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19BB

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:36 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	105	70-130
1,2-Dibromoethane (EDB)	100	70-130
Chlorobenzene	98	70-130
Ethyl Benzene	97	70-130
m,p-Xylene	96	70-130
o-Xylene	96	70-130
Styrene	90	70-130
Bromoform	110	70-130
Cumene	94	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	95	70-130
4-Ethyltoluene	100	70-130
1,3,5-Trimethylbenzene	96	70-130
1,2,4-Trimethylbenzene	98	70-130
1,3-Dichlorobenzene	101	70-130
1,4-Dichlorobenzene	102	70-130
alpha-Chlorotoluene	95	70-130
1,2-Dichlorobenzene	100	70-130
1,2,4-Trichlorobenzene	112	70-130
Hexachlorobutadiene	118	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	87	70-130
4-Bromofluorobenzene	109	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19C

EPA METHOD TO-15 GC/MS

File Name:	**14062408**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 12:58 PM**	

Compound	%Recovery	Method Limits
Freon 12	111	70-130
Freon 114	110	70-130
Chloromethane	104	70-130
Vinyl Chloride	111	70-130
1,3-Butadiene	100	70-130
Bromomethane	142 Q	70-130
Chloroethane	96	70-130
Freon 11	129	70-130
Ethanol	94	70-130
Freon 113	118	70-130
1,1-Dichloroethene	115	70-130
Acetone	102	70-130
2-Propanol	111	70-130
Carbon Disulfide	101	70-130
3-Chloropropene	110	70-130
Methylene Chloride	108	70-130
Methyl tert-butyl ether	119	70-130
trans-1,2-Dichloroethene	111	70-130
Hexane	111	70-130
1,1-Dichloroethane	111	70-130
2-Butanone (Methyl Ethyl Ketone)	106	70-130
cis-1,2-Dichloroethene	102	70-130
Tetrahydrofuran	97	70-130
Chloroform	106	70-130
1,1,1-Trichloroethane	126	70-130
Cyclohexane	117	70-130
Carbon Tetrachloride	134 Q	70-130
2,2,4-Trimethylpentane	109	70-130
Benzene	96	70-130
1,2-Dichloroethane	106	70-130
Heptane	96	70-130
Trichloroethene	99	70-130
1,2-Dichloropropane	92	70-130
1,4-Dioxane	100	70-130
Bromodichloromethane	106	70-130
cis-1,3-Dichloropropene	106	70-130
4-Methyl-2-pentanone	108	70-130
Toluene	94	70-130
trans-1,3-Dichloropropene	104	70-130
1,1,2-Trichloroethane	97	70-130
Tetrachloroethene	100	70-130
2-Hexanone	100	70-130

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Client Sample ID: LCS

Lab ID#: 1706400A-19C

EPA METHOD TO-15 GC/MS

File Name:	**14062408**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 12:58 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	105	70-130
1,2-Dibromoethane (EDB)	98	70-130
Chlorobenzene	100	70-130
Ethyl Benzene	98	70-130
m,p-Xylene	98	70-130
o-Xylene	102	70-130
Styrene	112	70-130
Bromoform	109	70-130
Cumene	102	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	100	70-130
4-Ethyltoluene	105	70-130
1,3,5-Trimethylbenzene	114	70-130
1,2,4-Trimethylbenzene	108	70-130
1,3-Dichlorobenzene	103	70-130
1,4-Dichlorobenzene	109	70-130
alpha-Chlorotoluene	114	70-130
1,2-Dichlorobenzene	104	70-130
1,2,4-Trichlorobenzene	91	70-130
Hexachlorobutadiene	97	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19CC

EPA METHOD TO-15 GC/MS

File Name:	**14062409**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 01:21 PM**	

Compound	%Recovery	Method Limits
Freon 12	108	70-130
Freon 114	107	70-130
Chloromethane	100	70-130
Vinyl Chloride	108	70-130
1,3-Butadiene	95	70-130
Bromomethane	136 Q	70-130
Chloroethane	95	70-130
Freon 11	128	70-130
Ethanol	85	70-130
Freon 113	115	70-130
1,1-Dichloroethene	110	70-130
Acetone	98	70-130
2-Propanol	105	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	112	70-130
Methylene Chloride	109	70-130
Methyl tert-butyl ether	112	70-130
trans-1,2-Dichloroethene	105	70-130
Hexane	106	70-130
1,1-Dichloroethane	103	70-130
2-Butanone (Methyl Ethyl Ketone)	95	70-130
cis-1,2-Dichloroethene	97	70-130
Tetrahydrofuran	93	70-130
Chloroform	102	70-130
1,1,1-Trichloroethane	122	70-130
Cyclohexane	110	70-130
Carbon Tetrachloride	130	70-130
2,2,4-Trimethylpentane	106	70-130
Benzene	94	70-130
1,2-Dichloroethane	106	70-130
Heptane	96	70-130
Trichloroethene	99	70-130
1,2-Dichloropropane	90	70-130
1,4-Dioxane	106	70-130
Bromodichloromethane	106	70-130
cis-1,3-Dichloropropene	106	70-130
4-Methyl-2-pentanone	104	70-130
Toluene	93	70-130
trans-1,3-Dichloropropene	105	70-130
1,1,2-Trichloroethane	100	70-130
Tetrachloroethene	101	70-130
2-Hexanone	106	70-130

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Client Sample ID: LCSD

Lab ID#: 1706400A-19CC

EPA METHOD TO-15 GC/MS

File Name:	**14062409**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/17 01:21 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	108	70-130
1,2-Dibromoethane (EDB)	101	70-130
Chlorobenzene	101	70-130
Ethyl Benzene	103	70-130
m,p-Xylene	99	70-130
o-Xylene	101	70-130
Styrene	114	70-130
Bromoform	114	70-130
Cumene	108	70-130
1,1,2,2-Tetrachloroethane	95	70-130
Propylbenzene	106	70-130
4-Ethyltoluene	112	70-130
1,3,5-Trimethylbenzene	117	70-130
1,2,4-Trimethylbenzene	113	70-130
1,3-Dichlorobenzene	107	70-130
1,4-Dichlorobenzene	113	70-130
alpha-Chlorotoluene	123	70-130
1,2-Dichlorobenzene	108	70-130
1,2,4-Trichlorobenzene	109	70-130
Hexachlorobutadiene	117	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	106	70-130

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6/30/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: UDB 11193
Project #: TR0626
Workorder #: 1706408B

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 6/19/2017 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1706408B

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Accounts Payable (NJ) GeoSyntec Consultants 7 Graphics Drive Suite 106 Ewing, NJ 08628
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0626 UDB 11193
DATE RECEIVED:	06/19/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	06/30/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
05A	B11193-061417-SVP-4-SS-10-2	TO-15	1 "Hg	15 psi
06A	B11193-061417-SVP-2-SS-10-2	TO-15	0.8 "Hg	14.8 psi
07A	B11193-061417-SVP-3-SS-10-2	TO-15	1.2 "Hg	15.1 psi
08A	B11193-061417-SVP-1-SS-10-2	TO-15	0.6 "Hg	14.7 psi
09A	B11193-061417-SVP-1-SS-10-2-DUP	TO-15	0 psi	14.6 psi
16A	B11193-061317-SVP-1-SS-10-1	TO-15	1 "Hg	15 psi
17A	B11193-061317-SVP-2-SS-10-1	TO-15	2.4 "Hg	15 psi
18A	B11193-061317-SVP-3-SS-10-1	TO-15	2.4 "Hg	14.7 psi
19A	B11193-061317-SVP-4-SS-10-1	TO-15	0.6 "Hg	14.8 psi
20A	Lab Blank	TO-15	NA	NA
20B	Lab Blank	TO-15	NA	NA
21A	CCV	TO-15	NA	NA
21B	CCV	TO-15	NA	NA
22A	LCS	TO-15	NA	NA
22AA	LCSD	TO-15	NA	NA
22B	LCS	TO-15	NA	NA
22BB	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 06/30/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
EPA Method TO-15
GeoSyntec Consultants
Workorder# 1706408B

Nine 1 Liter Summa Canister samples were received on June 19, 2017. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) information for sample B11193-061417-SVP-2-SS-10-2 did not match the entry on the sample tag with regard to sample identification. The information on the COC was used to process and report the sample.

Despite the use of flow controllers for sample collection, the final canister vacuum for sample B11193-061417-SVP-1-SS-10-2-DUP was measured at ambient pressure at the laboratory.

Analytical Notes

Dilution was performed on all samples due to the presence of high level target species.

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-061417-SVP-4-SS-10-2

Lab ID#: 1706408B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	260	320	1000	1300
cis-1,2-Dichloroethene	260	5600	1000	22000
Trichloroethene	260	3700	1400	20000
Tetrachloroethene	260	180000	1800	1200000

Client Sample ID: B11193-061417-SVP-2-SS-10-2

Lab ID#: 1706408B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Trichloroethene	10	23	55	120
Tetrachloroethene	10	7400	70	50000

Client Sample ID: B11193-061417-SVP-3-SS-10-2

Lab ID#: 1706408B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	21	29	84	120
cis-1,2-Dichloroethene	21	24	84	94
Trichloroethene	21	860	110	4600
Tetrachloroethene	21	18000	140	120000

Client Sample ID: B11193-061417-SVP-1-SS-10-2

Lab ID#: 1706408B-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	6.8	120	24	410
Cyclohexane	6.8	60	23	200
Trichloroethene	6.8	71	36	380
Tetrachloroethene	6.8	1700	46	12000

Client Sample ID: B11193-061417-SVP-1-SS-10-2-DUP

Lab ID#: 1706408B-09A

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: B11193-061417-SVP-1-SS-10-2-DUP

Lab ID#: 1706408B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	6.6	120	23	410
Cyclohexane	6.6	59	23	200
Trichloroethene	6.6	66	36	350
Tetrachloroethene	6.6	1600	45	11000

Client Sample ID: B11193-061317-SVP-1-SS-10-1

Lab ID#: 1706408B-16A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	5.2	270	18	940
Cyclohexane	5.2	140	18	470
Trichloroethene	5.2	66	28	360
Tetrachloroethene	5.2	1600	35	11000

Client Sample ID: B11193-061317-SVP-2-SS-10-1

Lab ID#: 1706408B-17A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Trichloroethene	11	23	59	120
Tetrachloroethene	11	7300	75	49000

Client Sample ID: B11193-061317-SVP-3-SS-10-1

Lab ID#: 1706408B-18A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	22	25	86	99
Hexane	22	26	77	93
cis-1,2-Dichloroethene	22	25	86	100
Trichloroethene	22	760	120	4100
Tetrachloroethene	22	15000	150	100000

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-061317-SVP-4-SS-10-1

Lab ID#: 1706408B-19A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	260	5000	1000	20000
Trichloroethene	260	3600	1400	19000
Tetrachloroethene	260	170000	1700	1200000

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Client Sample ID: B11193-061417-SVP-4-SS-10-2

Lab ID#: 1706408B-05A

EPA METHOD TO-15 GC/MS

File Name:	**14062309**	**Date of Collection:**	**6/14/17 5:49:00 PM**
Dil. Factor:	**52.2**	**Date of Analysis:**	**6/23/17 12:16 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	260	Not Detected	1300	Not Detected
Freon 114	260	Not Detected	1800	Not Detected
Chloromethane	1000	Not Detected	2200	Not Detected
Vinyl Chloride	260	Not Detected	670	Not Detected
1,3-Butadiene	260	Not Detected	580	Not Detected
Bromomethane	1000	Not Detected	4000	Not Detected
Chloroethane	1000	Not Detected	2800	Not Detected
Freon 11	260	Not Detected	1500	Not Detected
Ethanol	1000	Not Detected	2000	Not Detected
Freon 113	260	Not Detected	2000	Not Detected
1,1-Dichloroethene	260	Not Detected	1000	Not Detected
Acetone	1000	Not Detected	2500	Not Detected
2-Propanol	1000	Not Detected	2600	Not Detected
Carbon Disulfide	1000	Not Detected	3200	Not Detected
3-Chloropropene	1000	Not Detected	3300	Not Detected
Methylene Chloride	1000	Not Detected	3600	Not Detected
Methyl tert-butyl ether	260	Not Detected	940	Not Detected
trans-1,2-Dichloroethene	260	320	1000	1300
Hexane	260	Not Detected	920	Not Detected
1,1-Dichloroethane	260	Not Detected	1000	Not Detected
2-Butanone (Methyl Ethyl Ketone)	1000	Not Detected	3100	Not Detected
cis-1,2-Dichloroethene	260	5600	1000	22000
Tetrahydrofuran	260	Not Detected	770	Not Detected
Chloroform	260	Not Detected	1300	Not Detected
1,1,1-Trichloroethane	260	Not Detected	1400	Not Detected
Cyclohexane	260	Not Detected	900	Not Detected
Carbon Tetrachloride	260	Not Detected	1600	Not Detected
2,2,4-Trimethylpentane	260	Not Detected	1200	Not Detected
Benzene	260	Not Detected	830	Not Detected
1,2-Dichloroethane	260	Not Detected	1000	Not Detected
Heptane	260	Not Detected	1100	Not Detected
Trichloroethene	260	3700	1400	20000
1,2-Dichloropropane	260	Not Detected	1200	Not Detected
1,4-Dioxane	1000	Not Detected	3800	Not Detected
Bromodichloromethane	260	Not Detected	1700	Not Detected
cis-1,3-Dichloropropene	260	Not Detected	1200	Not Detected
4-Methyl-2-pentanone	260	Not Detected	1100	Not Detected
Toluene	260	Not Detected	980	Not Detected
trans-1,3-Dichloropropene	260	Not Detected	1200	Not Detected
1,1,2-Trichloroethane	260	Not Detected	1400	Not Detected
Tetrachloroethene	260	180000	1800	1200000
2-Hexanone	1000	Not Detected	4300	Not Detected

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Client Sample ID: B11193-061417-SVP-4-SS-10-2

Lab ID#: 1706408B-05A

EPA METHOD TO-15 GC/MS

File Name:	**14062309**	**Date of Collection: 6/14/17 5:49:00 PM**	
Dil. Factor:	**52.2**	**Date of Analysis: 6/23/17 12:16 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	260	Not Detected	2200	Not Detected
1,2-Dibromoethane (EDB)	260	Not Detected	2000	Not Detected
Chlorobenzene	260	Not Detected	1200	Not Detected
Ethyl Benzene	260	Not Detected	1100	Not Detected
m,p-Xylene	260	Not Detected	1100	Not Detected
o-Xylene	260	Not Detected	1100	Not Detected
Styrene	260	Not Detected	1100	Not Detected
Bromoform	260	Not Detected	2700	Not Detected
Cumene	260	Not Detected	1300	Not Detected
1,1,2,2-Tetrachloroethane	260	Not Detected	1800	Not Detected
Propylbenzene	260	Not Detected	1300	Not Detected
4-Ethyltoluene	260	Not Detected	1300	Not Detected
1,3,5-Trimethylbenzene	260	Not Detected	1300	Not Detected
1,2,4-Trimethylbenzene	260	Not Detected	1300	Not Detected
1,3-Dichlorobenzene	260	Not Detected	1600	Not Detected
1,4-Dichlorobenzene	260	Not Detected	1600	Not Detected
alpha-Chlorotoluene	260	Not Detected	1400	Not Detected
1,2-Dichlorobenzene	260	Not Detected	1600	Not Detected
1,2,4-Trichlorobenzene	1000	Not Detected	7700	Not Detected
Hexachlorobutadiene	1000	Not Detected	11000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-061417-SVP-2-SS-10-2

Lab ID#: 1706408B-06A

EPA METHOD TO-15 GC/MS

File Name:	**14062311**	**Date of Collection:**	**6/14/17 5:50:00 PM**
Dil. Factor:	**2.06**	**Date of Analysis:**	**6/23/17 01:56 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	10	Not Detected	51	Not Detected
Freon 114	10	Not Detected	72	Not Detected
Chloromethane	41	Not Detected	85	Not Detected
Vinyl Chloride	10	Not Detected	26	Not Detected
1,3-Butadiene	10	Not Detected	23	Not Detected
Bromomethane	41	Not Detected	160	Not Detected
Chloroethane	41	Not Detected	110	Not Detected
Freon 11	10	Not Detected	58	Not Detected
Ethanol	41	Not Detected	78	Not Detected
Freon 113	10	Not Detected	79	Not Detected
1,1-Dichloroethene	10	Not Detected	41	Not Detected
Acetone	41	Not Detected	98	Not Detected
2-Propanol	41	Not Detected	100	Not Detected
Carbon Disulfide	41	Not Detected	130	Not Detected
3-Chloropropene	41	Not Detected	130	Not Detected
Methylene Chloride	41	Not Detected	140	Not Detected
Methyl tert-butyl ether	10	Not Detected	37	Not Detected
trans-1,2-Dichloroethene	10	Not Detected	41	Not Detected
Hexane	10	Not Detected	36	Not Detected
1,1-Dichloroethane	10	Not Detected	42	Not Detected
2-Butanone (Methyl Ethyl Ketone)	41	Not Detected	120	Not Detected
cis-1,2-Dichloroethene	10	Not Detected	41	Not Detected
Tetrahydrofuran	10	Not Detected	30	Not Detected
Chloroform	10	Not Detected	50	Not Detected
1,1,1-Trichloroethane	10	Not Detected	56	Not Detected
Cyclohexane	10	Not Detected	35	Not Detected
Carbon Tetrachloride	10	Not Detected	65	Not Detected
2,2,4-Trimethylpentane	10	Not Detected	48	Not Detected
Benzene	10	Not Detected	33	Not Detected
1,2-Dichloroethane	10	Not Detected	42	Not Detected
Heptane	10	Not Detected	42	Not Detected
Trichloroethene	10	23	55	120
1,2-Dichloropropane	10	Not Detected	48	Not Detected
1,4-Dioxane	41	Not Detected	150	Not Detected
Bromodichloromethane	10	Not Detected	69	Not Detected
cis-1,3-Dichloropropene	10	Not Detected	47	Not Detected
4-Methyl-2-pentanone	10	Not Detected	42	Not Detected
Toluene	10	Not Detected	39	Not Detected
trans-1,3-Dichloropropene	10	Not Detected	47	Not Detected
1,1,2-Trichloroethane	10	Not Detected	56	Not Detected
Tetrachloroethene	10	7400	70	50000
2-Hexanone	41	Not Detected	170	Not Detected

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Client Sample ID: B11193-061417-SVP-2-SS-10-2

Lab ID#: 1706408B-06A

EPA METHOD TO-15 GC/MS

File Name:	**14062311**	**Date of Collection: 6/14/17 5:50:00 PM**	
Dil. Factor:	**2.06**	**Date of Analysis: 6/23/17 01:56 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	10	Not Detected	88	Not Detected
1,2-Dibromoethane (EDB)	10	Not Detected	79	Not Detected
Chlorobenzene	10	Not Detected	47	Not Detected
Ethyl Benzene	10	Not Detected	45	Not Detected
m,p-Xylene	10	Not Detected	45	Not Detected
o-Xylene	10	Not Detected	45	Not Detected
Styrene	10	Not Detected	44	Not Detected
Bromoform	10	Not Detected	110	Not Detected
Cumene	10	Not Detected	51	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected	71	Not Detected
Propylbenzene	10	Not Detected	51	Not Detected
4-Ethyltoluene	10	Not Detected	51	Not Detected
1,3,5-Trimethylbenzene	10	Not Detected	51	Not Detected
1,2,4-Trimethylbenzene	10	Not Detected	51	Not Detected
1,3-Dichlorobenzene	10	Not Detected	62	Not Detected
1,4-Dichlorobenzene	10	Not Detected	62	Not Detected
alpha-Chlorotoluene	10	Not Detected	53	Not Detected
1,2-Dichlorobenzene	10	Not Detected	62	Not Detected
1,2,4-Trichlorobenzene	41	Not Detected	300	Not Detected
Hexachlorobutadiene	41	Not Detected	440	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-061417-SVP-3-SS-10-2

Lab ID#: 1706408B-07A

EPA METHOD TO-15 GC/MS

File Name:	**14062317**	**Date of Collection:**	**6/14/17 5:51:00 PM**
Dil. Factor:	**4.22**	**Date of Analysis:**	**6/23/17 04:14 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	21	Not Detected	100	Not Detected
Freon 114	21	Not Detected	150	Not Detected
Chloromethane	84	Not Detected	170	Not Detected
Vinyl Chloride	21	Not Detected	54	Not Detected
1,3-Butadiene	21	Not Detected	47	Not Detected
Bromomethane	84	Not Detected	330	Not Detected
Chloroethane	84	Not Detected	220	Not Detected
Freon 11	21	Not Detected	120	Not Detected
Ethanol	84	Not Detected	160	Not Detected
Freon 113	21	Not Detected	160	Not Detected
1,1-Dichloroethene	21	Not Detected	84	Not Detected
Acetone	84	Not Detected	200	Not Detected
2-Propanol	84	Not Detected	210	Not Detected
Carbon Disulfide	84	Not Detected	260	Not Detected
3-Chloropropene	84	Not Detected	260	Not Detected
Methylene Chloride	84	Not Detected	290	Not Detected
Methyl tert-butyl ether	21	Not Detected	76	Not Detected
trans-1,2-Dichloroethene	21	29	84	120
Hexane	21	Not Detected	74	Not Detected
1,1-Dichloroethane	21	Not Detected	85	Not Detected
2-Butanone (Methyl Ethyl Ketone)	84	Not Detected	250	Not Detected
cis-1,2-Dichloroethene	21	24	84	94
Tetrahydrofuran	21	Not Detected	62	Not Detected
Chloroform	21	Not Detected	100	Not Detected
1,1,1-Trichloroethane	21	Not Detected	120	Not Detected
Cyclohexane	21	Not Detected	73	Not Detected
Carbon Tetrachloride	21	Not Detected	130	Not Detected
2,2,4-Trimethylpentane	21	Not Detected	98	Not Detected
Benzene	21	Not Detected	67	Not Detected
1,2-Dichloroethane	21	Not Detected	85	Not Detected
Heptane	21	Not Detected	86	Not Detected
Trichloroethene	21	860	110	4600
1,2-Dichloropropane	21	Not Detected	98	Not Detected
1,4-Dioxane	84	Not Detected	300	Not Detected
Bromodichloromethane	21	Not Detected	140	Not Detected
cis-1,3-Dichloropropene	21	Not Detected	96	Not Detected
4-Methyl-2-pentanone	21	Not Detected	86	Not Detected
Toluene	21	Not Detected	80	Not Detected
trans-1,3-Dichloropropene	21	Not Detected	96	Not Detected
1,1,2-Trichloroethane	21	Not Detected	120	Not Detected
Tetrachloroethene	21	18000	140	120000
2-Hexanone	84	Not Detected	340	Not Detected

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Client Sample ID: B11193-061417-SVP-3-SS-10-2

Lab ID#: 1706408B-07A

EPA METHOD TO-15 GC/MS

File Name:	**14062317**	**Date of Collection: 6/14/17 5:51:00 PM**	
Dil. Factor:	**4.22**	**Date of Analysis: 6/23/17 04:14 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	21	Not Detected	180	Not Detected
1,2-Dibromoethane (EDB)	21	Not Detected	160	Not Detected
Chlorobenzene	21	Not Detected	97	Not Detected
Ethyl Benzene	21	Not Detected	92	Not Detected
m,p-Xylene	21	Not Detected	92	Not Detected
o-Xylene	21	Not Detected	92	Not Detected
Styrene	21	Not Detected	90	Not Detected
Bromoform	21	Not Detected	220	Not Detected
Cumene	21	Not Detected	100	Not Detected
1,1,2,2-Tetrachloroethane	21	Not Detected	140	Not Detected
Propylbenzene	21	Not Detected	100	Not Detected
4-Ethyltoluene	21	Not Detected	100	Not Detected
1,3,5-Trimethylbenzene	21	Not Detected	100	Not Detected
1,2,4-Trimethylbenzene	21	Not Detected	100	Not Detected
1,3-Dichlorobenzene	21	Not Detected	130	Not Detected
1,4-Dichlorobenzene	21	Not Detected	130	Not Detected
alpha-Chlorotoluene	21	Not Detected	110	Not Detected
1,2-Dichlorobenzene	21	Not Detected	130	Not Detected
1,2,4-Trichlorobenzene	84	Not Detected	630	Not Detected
Hexachlorobutadiene	84	Not Detected	900	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: B11193-061417-SVP-1-SS-10-2

Lab ID#: 1706408B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062314**	**Date of Collection:**	**6/14/17 6:10:00 PM**
Dil. Factor:	**13.6**	**Date of Analysis:**	**6/23/17 10:38 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	6.8	Not Detected	34	Not Detected
Freon 114	6.8	Not Detected	48	Not Detected
Chloromethane	68	Not Detected	140	Not Detected
Vinyl Chloride	6.8	Not Detected	17	Not Detected
1,3-Butadiene	6.8	Not Detected	15	Not Detected
Bromomethane	68	Not Detected	260	Not Detected
Chloroethane	27	Not Detected	72	Not Detected
Freon 11	6.8	Not Detected	38	Not Detected
Ethanol	27	Not Detected	51	Not Detected
Freon 113	6.8	Not Detected	52	Not Detected
1,1-Dichloroethene	6.8	Not Detected	27	Not Detected
Acetone	68	Not Detected	160	Not Detected
2-Propanol	27	Not Detected	67	Not Detected
Carbon Disulfide	27	Not Detected	85	Not Detected
3-Chloropropene	27	Not Detected	85	Not Detected
Methylene Chloride	68	Not Detected	240	Not Detected
Methyl tert-butyl ether	27	Not Detected	98	Not Detected
trans-1,2-Dichloroethene	6.8	Not Detected	27	Not Detected
Hexane	6.8	120	24	410
1,1-Dichloroethane	6.8	Not Detected	28	Not Detected
2-Butanone (Methyl Ethyl Ketone)	27	Not Detected	80	Not Detected
cis-1,2-Dichloroethene	6.8	Not Detected	27	Not Detected
Tetrahydrofuran	6.8	Not Detected	20	Not Detected
Chloroform	6.8	Not Detected	33	Not Detected
1,1,1-Trichloroethane	6.8	Not Detected	37	Not Detected
Cyclohexane	6.8	60	23	200
Carbon Tetrachloride	6.8	Not Detected	43	Not Detected
2,2,4-Trimethylpentane	6.8	Not Detected	32	Not Detected
Benzene	6.8	Not Detected	22	Not Detected
1,2-Dichloroethane	6.8	Not Detected	28	Not Detected
Heptane	6.8	Not Detected	28	Not Detected
Trichloroethene	6.8	71	36	380
1,2-Dichloropropane	6.8	Not Detected	31	Not Detected
1,4-Dioxane	27	Not Detected	98	Not Detected
Bromodichloromethane	6.8	Not Detected	46	Not Detected
cis-1,3-Dichloropropene	6.8	Not Detected	31	Not Detected
4-Methyl-2-pentanone	6.8	Not Detected	28	Not Detected
Toluene	6.8	Not Detected	26	Not Detected
trans-1,3-Dichloropropene	6.8	Not Detected	31	Not Detected
1,1,2-Trichloroethane	6.8	Not Detected	37	Not Detected
Tetrachloroethene	6.8	1700	46	12000
2-Hexanone	27	Not Detected	110	Not Detected

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Client Sample ID: B11193-061417-SVP-1-SS-10-2

Lab ID#: 1706408B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062314**	**Date of Collection: 6/14/17 6:10:00 PM**	
Dil. Factor:	**13.6**	**Date of Analysis: 6/23/17 10:38 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	6.8	Not Detected	58	Not Detected
1,2-Dibromoethane (EDB)	6.8	Not Detected	52	Not Detected
Chlorobenzene	6.8	Not Detected	31	Not Detected
Ethyl Benzene	6.8	Not Detected	30	Not Detected
m,p-Xylene	6.8	Not Detected	30	Not Detected
o-Xylene	6.8	Not Detected	30	Not Detected
Styrene	6.8	Not Detected	29	Not Detected
Bromoform	6.8	Not Detected	70	Not Detected
Cumene	6.8	Not Detected	33	Not Detected
1,1,2,2-Tetrachloroethane	6.8	Not Detected	47	Not Detected
Propylbenzene	6.8	Not Detected	33	Not Detected
4-Ethyltoluene	6.8	Not Detected	33	Not Detected
1,3,5-Trimethylbenzene	6.8	Not Detected	33	Not Detected
1,2,4-Trimethylbenzene	6.8	Not Detected	33	Not Detected
1,3-Dichlorobenzene	6.8	Not Detected	41	Not Detected
1,4-Dichlorobenzene	6.8	Not Detected	41	Not Detected
alpha-Chlorotoluene	6.8	Not Detected	35	Not Detected
1,2-Dichlorobenzene	6.8	Not Detected	41	Not Detected
1,2,4-Trichlorobenzene	27	Not Detected	200	Not Detected
Hexachlorobutadiene	27	Not Detected	290	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	84	70-130
4-Bromofluorobenzene	105	70-130

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Client Sample ID: B11193-061417-SVP-1-SS-10-2-DUP

Lab ID#: 1706408B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062315**	**Date of Collection:**	**6/14/17 6:11:00 PM**
Dil. Factor:	**13.3**	**Date of Analysis:**	**6/23/17 11:03 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	6.6	Not Detected	33	Not Detected
Freon 114	6.6	Not Detected	46	Not Detected
Chloromethane	66	Not Detected	140	Not Detected
Vinyl Chloride	6.6	Not Detected	17	Not Detected
1,3-Butadiene	6.6	Not Detected	15	Not Detected
Bromomethane	66	Not Detected	260	Not Detected
Chloroethane	27	Not Detected	70	Not Detected
Freon 11	6.6	Not Detected	37	Not Detected
Ethanol	27	Not Detected	50	Not Detected
Freon 113	6.6	Not Detected	51	Not Detected
1,1-Dichloroethene	6.6	Not Detected	26	Not Detected
Acetone	66	Not Detected	160	Not Detected
2-Propanol	27	Not Detected	65	Not Detected
Carbon Disulfide	27	Not Detected	83	Not Detected
3-Chloropropene	27	Not Detected	83	Not Detected
Methylene Chloride	66	Not Detected	230	Not Detected
Methyl tert-butyl ether	27	Not Detected	96	Not Detected
trans-1,2-Dichloroethene	6.6	Not Detected	26	Not Detected
Hexane	6.6	120	23	410
1,1-Dichloroethane	6.6	Not Detected	27	Not Detected
2-Butanone (Methyl Ethyl Ketone)	27	Not Detected	78	Not Detected
cis-1,2-Dichloroethene	6.6	Not Detected	26	Not Detected
Tetrahydrofuran	6.6	Not Detected	20	Not Detected
Chloroform	6.6	Not Detected	32	Not Detected
1,1,1-Trichloroethane	6.6	Not Detected	36	Not Detected
Cyclohexane	6.6	59	23	200
Carbon Tetrachloride	6.6	Not Detected	42	Not Detected
2,2,4-Trimethylpentane	6.6	Not Detected	31	Not Detected
Benzene	6.6	Not Detected	21	Not Detected
1,2-Dichloroethane	6.6	Not Detected	27	Not Detected
Heptane	6.6	Not Detected	27	Not Detected
Trichloroethene	6.6	66	36	350
1,2-Dichloropropane	6.6	Not Detected	31	Not Detected
1,4-Dioxane	27	Not Detected	96	Not Detected
Bromodichloromethane	6.6	Not Detected	44	Not Detected
cis-1,3-Dichloropropene	6.6	Not Detected	30	Not Detected
4-Methyl-2-pentanone	6.6	Not Detected	27	Not Detected
Toluene	6.6	Not Detected	25	Not Detected
trans-1,3-Dichloropropene	6.6	Not Detected	30	Not Detected
1,1,2-Trichloroethane	6.6	Not Detected	36	Not Detected
Tetrachloroethene	6.6	1600	45	11000
2-Hexanone	27	Not Detected	110	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-061417-SVP-1-SS-10-2-DUP

Lab ID#: 1706408B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062315**	**Date of Collection:**	**6/14/17 6:11:00 PM**
Dil. Factor:	**13.3**	**Date of Analysis:**	**6/23/17 11:03 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	6.6	Not Detected	57	Not Detected
1,2-Dibromoethane (EDB)	6.6	Not Detected	51	Not Detected
Chlorobenzene	6.6	Not Detected	31	Not Detected
Ethyl Benzene	6.6	Not Detected	29	Not Detected
m,p-Xylene	6.6	Not Detected	29	Not Detected
o-Xylene	6.6	Not Detected	29	Not Detected
Styrene	6.6	Not Detected	28	Not Detected
Bromoform	6.6	Not Detected	69	Not Detected
Cumene	6.6	Not Detected	33	Not Detected
1,1,2,2-Tetrachloroethane	6.6	Not Detected	46	Not Detected
Propylbenzene	6.6	Not Detected	33	Not Detected
4-Ethyltoluene	6.6	Not Detected	33	Not Detected
1,3,5-Trimethylbenzene	6.6	Not Detected	33	Not Detected
1,2,4-Trimethylbenzene	6.6	Not Detected	33	Not Detected
1,3-Dichlorobenzene	6.6	Not Detected	40	Not Detected
1,4-Dichlorobenzene	6.6	Not Detected	40	Not Detected
alpha-Chlorotoluene	6.6	Not Detected	34	Not Detected
1,2-Dichlorobenzene	6.6	Not Detected	40	Not Detected
1,2,4-Trichlorobenzene	27	Not Detected	200	Not Detected
Hexachlorobutadiene	27	Not Detected	280	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	82	70-130
4-Bromofluorobenzene	105	70-130

eurofins | Air Toxics

Client Sample ID: B11193-061317-SVP-1-SS-10-1

Lab ID#: 1706408B-16A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062316**	**Date of Collection:**	**6/13/17 12:21:00 PM**
Dil. Factor:	**10.4**	**Date of Analysis:**	**6/23/17 11:29 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.2	Not Detected	26	Not Detected
Freon 114	5.2	Not Detected	36	Not Detected
Chloromethane	52	Not Detected	110	Not Detected
Vinyl Chloride	5.2	Not Detected	13	Not Detected
1,3-Butadiene	5.2	Not Detected	12	Not Detected
Bromomethane	52	Not Detected	200	Not Detected
Chloroethane	21	Not Detected	55	Not Detected
Freon 11	5.2	Not Detected	29	Not Detected
Ethanol	21	Not Detected	39	Not Detected
Freon 113	5.2	Not Detected	40	Not Detected
1,1-Dichloroethene	5.2	Not Detected	21	Not Detected
Acetone	52	Not Detected	120	Not Detected
2-Propanol	21	Not Detected	51	Not Detected
Carbon Disulfide	21	Not Detected	65	Not Detected
3-Chloropropene	21	Not Detected	65	Not Detected
Methylene Chloride	52	Not Detected	180	Not Detected
Methyl tert-butyl ether	21	Not Detected	75	Not Detected
trans-1,2-Dichloroethene	5.2	Not Detected	21	Not Detected
Hexane	5.2	270	18	940
1,1-Dichloroethane	5.2	Not Detected	21	Not Detected
2-Butanone (Methyl Ethyl Ketone)	21	Not Detected	61	Not Detected
cis-1,2-Dichloroethene	5.2	Not Detected	21	Not Detected
Tetrahydrofuran	5.2	Not Detected	15	Not Detected
Chloroform	5.2	Not Detected	25	Not Detected
1,1,1-Trichloroethane	5.2	Not Detected	28	Not Detected
Cyclohexane	5.2	140	18	470
Carbon Tetrachloride	5.2	Not Detected	33	Not Detected
2,2,4-Trimethylpentane	5.2	Not Detected	24	Not Detected
Benzene	5.2	Not Detected	17	Not Detected
1,2-Dichloroethane	5.2	Not Detected	21	Not Detected
Heptane	5.2	Not Detected	21	Not Detected
Trichloroethene	5.2	66	28	360
1,2-Dichloropropane	5.2	Not Detected	24	Not Detected
1,4-Dioxane	21	Not Detected	75	Not Detected
Bromodichloromethane	5.2	Not Detected	35	Not Detected
cis-1,3-Dichloropropene	5.2	Not Detected	24	Not Detected
4-Methyl-2-pentanone	5.2	Not Detected	21	Not Detected
Toluene	5.2	Not Detected	20	Not Detected
trans-1,3-Dichloropropene	5.2	Not Detected	24	Not Detected
1,1,2-Trichloroethane	5.2	Not Detected	28	Not Detected
Tetrachloroethene	5.2	1600	35	11000
2-Hexanone	21	Not Detected	85	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-061317-SVP-1-SS-10-1

Lab ID#: 1706408B-16A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062316**	**Date of Collection:**	**6/13/17 12:21:00 PM**
Dil. Factor:	**10.4**	**Date of Analysis:**	**6/23/17 11:29 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.2	Not Detected	44	Not Detected
1,2-Dibromoethane (EDB)	5.2	Not Detected	40	Not Detected
Chlorobenzene	5.2	Not Detected	24	Not Detected
Ethyl Benzene	5.2	Not Detected	22	Not Detected
m,p-Xylene	5.2	Not Detected	22	Not Detected
o-Xylene	5.2	Not Detected	22	Not Detected
Styrene	5.2	Not Detected	22	Not Detected
Bromoform	5.2	Not Detected	54	Not Detected
Cumene	5.2	Not Detected	26	Not Detected
1,1,2,2-Tetrachloroethane	5.2	Not Detected	36	Not Detected
Propylbenzene	5.2	Not Detected	26	Not Detected
4-Ethyltoluene	5.2	Not Detected	26	Not Detected
1,3,5-Trimethylbenzene	5.2	Not Detected	26	Not Detected
1,2,4-Trimethylbenzene	5.2	Not Detected	26	Not Detected
1,3-Dichlorobenzene	5.2	Not Detected	31	Not Detected
1,4-Dichlorobenzene	5.2	Not Detected	31	Not Detected
alpha-Chlorotoluene	5.2	Not Detected	27	Not Detected
1,2-Dichlorobenzene	5.2	Not Detected	31	Not Detected
1,2,4-Trichlorobenzene	21	Not Detected	150	Not Detected
Hexachlorobutadiene	21	Not Detected	220	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	83	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: B11193-061317-SVP-2-SS-10-1

Lab ID#: 1706408B-17A

EPA METHOD TO-15 GC/MS

File Name:	**14062322**	**Date of Collection: 6/13/17 12:16:00 PM**	
Dil. Factor:	**2.20**	**Date of Analysis: 6/23/17 06:44 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	54	Not Detected
Freon 114	11	Not Detected	77	Not Detected
Chloromethane	44	Not Detected	91	Not Detected
Vinyl Chloride	11	Not Detected	28	Not Detected
1,3-Butadiene	11	Not Detected	24	Not Detected
Bromomethane	44	Not Detected	170	Not Detected
Chloroethane	44	Not Detected	120	Not Detected
Freon 11	11	Not Detected	62	Not Detected
Ethanol	44	Not Detected	83	Not Detected
Freon 113	11	Not Detected	84	Not Detected
1,1-Dichloroethene	11	Not Detected	44	Not Detected
Acetone	44	Not Detected	100	Not Detected
2-Propanol	44	Not Detected	110	Not Detected
Carbon Disulfide	44	Not Detected	140	Not Detected
3-Chloropropene	44	Not Detected	140	Not Detected
Methylene Chloride	44	Not Detected	150	Not Detected
Methyl tert-butyl ether	11	Not Detected	40	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	44	Not Detected
Hexane	11	Not Detected	39	Not Detected
1,1-Dichloroethane	11	Not Detected	44	Not Detected
2-Butanone (Methyl Ethyl Ketone)	44	Not Detected	130	Not Detected
cis-1,2-Dichloroethene	11	Not Detected	44	Not Detected
Tetrahydrofuran	11	Not Detected	32	Not Detected
Chloroform	11	Not Detected	54	Not Detected
1,1,1-Trichloroethane	11	Not Detected	60	Not Detected
Cyclohexane	11	Not Detected	38	Not Detected
Carbon Tetrachloride	11	Not Detected	69	Not Detected
2,2,4-Trimethylpentane	11	Not Detected	51	Not Detected
Benzene	11	Not Detected	35	Not Detected
1,2-Dichloroethane	11	Not Detected	44	Not Detected
Heptane	11	Not Detected	45	Not Detected
Trichloroethene	11	23	59	120
1,2-Dichloropropane	11	Not Detected	51	Not Detected
1,4-Dioxane	44	Not Detected	160	Not Detected
Bromodichloromethane	11	Not Detected	74	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	50	Not Detected
4-Methyl-2-pentanone	11	Not Detected	45	Not Detected
Toluene	11	Not Detected	41	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	50	Not Detected
1,1,2-Trichloroethane	11	Not Detected	60	Not Detected
Tetrachloroethene	11	7300	75	49000
2-Hexanone	44	Not Detected	180	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-061317-SVP-2-SS-10-1

Lab ID#: 1706408B-17A

EPA METHOD TO-15 GC/MS

File Name:	**14062322**	**Date of Collection: 6/13/17 12:16:00 PM**	
Dil. Factor:	**2.20**	**Date of Analysis: 6/23/17 06:44 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	11	Not Detected	94	Not Detected
1,2-Dibromoethane (EDB)	11	Not Detected	84	Not Detected
Chlorobenzene	11	Not Detected	51	Not Detected
Ethyl Benzene	11	Not Detected	48	Not Detected
m,p-Xylene	11	Not Detected	48	Not Detected
o-Xylene	11	Not Detected	48	Not Detected
Styrene	11	Not Detected	47	Not Detected
Bromoform	11	Not Detected	110	Not Detected
Cumene	11	Not Detected	54	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	76	Not Detected
Propylbenzene	11	Not Detected	54	Not Detected
4-Ethyltoluene	11	Not Detected	54	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	54	Not Detected
1,2,4-Trimethylbenzene	11	Not Detected	54	Not Detected
1,3-Dichlorobenzene	11	Not Detected	66	Not Detected
1,4-Dichlorobenzene	11	Not Detected	66	Not Detected
alpha-Chlorotoluene	11	Not Detected	57	Not Detected
1,2-Dichlorobenzene	11	Not Detected	66	Not Detected
1,2,4-Trichlorobenzene	44	Not Detected	330	Not Detected
Hexachlorobutadiene	44	Not Detected	470	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: B11193-061317-SVP-3-SS-10-1

Lab ID#: 1706408B-18A

EPA METHOD TO-15 GC/MS

File Name:	**14062321**	**Date of Collection: 6/13/17 12:13:00 PM**	
Dil. Factor:	**4.36**	**Date of Analysis: 6/23/17 06:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	22	Not Detected	110	Not Detected
Freon 114	22	Not Detected	150	Not Detected
Chloromethane	87	Not Detected	180	Not Detected
Vinyl Chloride	22	Not Detected	56	Not Detected
1,3-Butadiene	22	Not Detected	48	Not Detected
Bromomethane	87	Not Detected	340	Not Detected
Chloroethane	87	Not Detected	230	Not Detected
Freon 11	22	Not Detected	120	Not Detected
Ethanol	87	Not Detected	160	Not Detected
Freon 113	22	Not Detected	170	Not Detected
1,1-Dichloroethene	22	Not Detected	86	Not Detected
Acetone	87	Not Detected	210	Not Detected
2-Propanol	87	Not Detected	210	Not Detected
Carbon Disulfide	87	Not Detected	270	Not Detected
3-Chloropropene	87	Not Detected	270	Not Detected
Methylene Chloride	87	Not Detected	300	Not Detected
Methyl tert-butyl ether	22	Not Detected	78	Not Detected
trans-1,2-Dichloroethene	22	25	86	99
Hexane	22	26	77	93
1,1-Dichloroethane	22	Not Detected	88	Not Detected
2-Butanone (Methyl Ethyl Ketone)	87	Not Detected	260	Not Detected
cis-1,2-Dichloroethene	22	25	86	100
Tetrahydrofuran	22	Not Detected	64	Not Detected
Chloroform	22	Not Detected	110	Not Detected
1,1,1-Trichloroethane	22	Not Detected	120	Not Detected
Cyclohexane	22	Not Detected	75	Not Detected
Carbon Tetrachloride	22	Not Detected	140	Not Detected
2,2,4-Trimethylpentane	22	Not Detected	100	Not Detected
Benzene	22	Not Detected	70	Not Detected
1,2-Dichloroethane	22	Not Detected	88	Not Detected
Heptane	22	Not Detected	89	Not Detected
Trichloroethene	22	760	120	4100
1,2-Dichloropropane	22	Not Detected	100	Not Detected
1,4-Dioxane	87	Not Detected	310	Not Detected
Bromodichloromethane	22	Not Detected	150	Not Detected
cis-1,3-Dichloropropene	22	Not Detected	99	Not Detected
4-Methyl-2-pentanone	22	Not Detected	89	Not Detected
Toluene	22	Not Detected	82	Not Detected
trans-1,3-Dichloropropene	22	Not Detected	99	Not Detected
1,1,2-Trichloroethane	22	Not Detected	120	Not Detected
Tetrachloroethene	22	15000	150	100000
2-Hexanone	87	Not Detected	360	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-061317-SVP-3-SS-10-1

Lab ID#: 1706408B-18A

EPA METHOD TO-15 GC/MS

File Name:	**14062321**	**Date of Collection: 6/13/17 12:13:00 PM**	
Dil. Factor:	**4.36**	**Date of Analysis: 6/23/17 06:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	22	Not Detected	180	Not Detected
1,2-Dibromoethane (EDB)	22	Not Detected	170	Not Detected
Chlorobenzene	22	Not Detected	100	Not Detected
Ethyl Benzene	22	Not Detected	95	Not Detected
m,p-Xylene	22	Not Detected	95	Not Detected
o-Xylene	22	Not Detected	95	Not Detected
Styrene	22	Not Detected	93	Not Detected
Bromoform	22	Not Detected	220	Not Detected
Cumene	22	Not Detected	110	Not Detected
1,1,2,2-Tetrachloroethane	22	Not Detected	150	Not Detected
Propylbenzene	22	Not Detected	110	Not Detected
4-Ethyltoluene	22	Not Detected	110	Not Detected
1,3,5-Trimethylbenzene	22	Not Detected	110	Not Detected
1,2,4-Trimethylbenzene	22	Not Detected	110	Not Detected
1,3-Dichlorobenzene	22	Not Detected	130	Not Detected
1,4-Dichlorobenzene	22	Not Detected	130	Not Detected
alpha-Chlorotoluene	22	Not Detected	110	Not Detected
1,2-Dichlorobenzene	22	Not Detected	130	Not Detected
1,2,4-Trichlorobenzene	87	Not Detected	650	Not Detected
Hexachlorobutadiene	87	Not Detected	930	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

eurofins | Air Toxics

Client Sample ID: B11193-061317-SVP-4-SS-10-1

Lab ID#: 1706408B-19A

EPA METHOD TO-15 GC/MS

File Name:	**14062323**	**Date of Collection:**	**6/13/17 12:24:00 PM**
Dil. Factor:	**51.2**	**Date of Analysis:**	**6/23/17 07:18 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	260	Not Detected	1300	Not Detected
Freon 114	260	Not Detected	1800	Not Detected
Chloromethane	1000	Not Detected	2100	Not Detected
Vinyl Chloride	260	Not Detected	650	Not Detected
1,3-Butadiene	260	Not Detected	570	Not Detected
Bromomethane	1000	Not Detected	4000	Not Detected
Chloroethane	1000	Not Detected	2700	Not Detected
Freon 11	260	Not Detected	1400	Not Detected
Ethanol	1000	Not Detected	1900	Not Detected
Freon 113	260	Not Detected	2000	Not Detected
1,1-Dichloroethene	260	Not Detected	1000	Not Detected
Acetone	1000	Not Detected	2400	Not Detected
2-Propanol	1000	Not Detected	2500	Not Detected
Carbon Disulfide	1000	Not Detected	3200	Not Detected
3-Chloropropene	1000	Not Detected	3200	Not Detected
Methylene Chloride	1000	Not Detected	3600	Not Detected
Methyl tert-butyl ether	260	Not Detected	920	Not Detected
trans-1,2-Dichloroethene	260	Not Detected	1000	Not Detected
Hexane	260	Not Detected	900	Not Detected
1,1-Dichloroethane	260	Not Detected	1000	Not Detected
2-Butanone (Methyl Ethyl Ketone)	1000	Not Detected	3000	Not Detected
cis-1,2-Dichloroethene	260	5000	1000	20000
Tetrahydrofuran	260	Not Detected	750	Not Detected
Chloroform	260	Not Detected	1200	Not Detected
1,1,1-Trichloroethane	260	Not Detected	1400	Not Detected
Cyclohexane	260	Not Detected	880	Not Detected
Carbon Tetrachloride	260	Not Detected	1600	Not Detected
2,2,4-Trimethylpentane	260	Not Detected	1200	Not Detected
Benzene	260	Not Detected	820	Not Detected
1,2-Dichloroethane	260	Not Detected	1000	Not Detected
Heptane	260	Not Detected	1000	Not Detected
Trichloroethene	260	3600	1400	19000
1,2-Dichloropropane	260	Not Detected	1200	Not Detected
1,4-Dioxane	1000	Not Detected	3700	Not Detected
Bromodichloromethane	260	Not Detected	1700	Not Detected
cis-1,3-Dichloropropene	260	Not Detected	1200	Not Detected
4-Methyl-2-pentanone	260	Not Detected	1000	Not Detected
Toluene	260	Not Detected	960	Not Detected
trans-1,3-Dichloropropene	260	Not Detected	1200	Not Detected
1,1,2-Trichloroethane	260	Not Detected	1400	Not Detected
Tetrachloroethene	260	170000	1700	1200000
2-Hexanone	1000	Not Detected	4200	Not Detected

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Client Sample ID: B11193-061317-SVP-4-SS-10-1

Lab ID#: 1706408B-19A

EPA METHOD TO-15 GC/MS

File Name:	**14062323**	**Date of Collection: 6/13/17 12:24:00 PM**	
Dil. Factor:	**51.2**	**Date of Analysis: 6/23/17 07:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	260	Not Detected	2200	Not Detected
1,2-Dibromoethane (EDB)	260	Not Detected	2000	Not Detected
Chlorobenzene	260	Not Detected	1200	Not Detected
Ethyl Benzene	260	Not Detected	1100	Not Detected
m,p-Xylene	260	Not Detected	1100	Not Detected
o-Xylene	260	Not Detected	1100	Not Detected
Styrene	260	Not Detected	1100	Not Detected
Bromoform	260	Not Detected	2600	Not Detected
Cumene	260	Not Detected	1200	Not Detected
1,1,2,2-Tetrachloroethane	260	Not Detected	1800	Not Detected
Propylbenzene	260	Not Detected	1200	Not Detected
4-Ethyltoluene	260	Not Detected	1200	Not Detected
1,3,5-Trimethylbenzene	260	Not Detected	1200	Not Detected
1,2,4-Trimethylbenzene	260	Not Detected	1200	Not Detected
1,3-Dichlorobenzene	260	Not Detected	1500	Not Detected
1,4-Dichlorobenzene	260	Not Detected	1500	Not Detected
alpha-Chlorotoluene	260	Not Detected	1300	Not Detected
1,2-Dichlorobenzene	260	Not Detected	1500	Not Detected
1,2,4-Trichlorobenzene	1000	Not Detected	7600	Not Detected
Hexachlorobutadiene	1000	Not Detected	11000	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706408B-20A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:05 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	5.0	Not Detected	19	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
Methyl tert-butyl ether	2.0	Not Detected	7.2	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706408B-20A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:05 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	86	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706408B-20B

EPA METHOD TO-15 GC/MS

File Name:	**14062306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.0	Not Detected	25	Not Detected
Freon 114	5.0	Not Detected	35	Not Detected
Chloromethane	20	Not Detected	41	Not Detected
Vinyl Chloride	5.0	Not Detected	13	Not Detected
1,3-Butadiene	5.0	Not Detected	11	Not Detected
Bromomethane	20	Not Detected	78	Not Detected
Chloroethane	20	Not Detected	53	Not Detected
Freon 11	5.0	Not Detected	28	Not Detected
Ethanol	20	Not Detected	38	Not Detected
Freon 113	5.0	Not Detected	38	Not Detected
1,1-Dichloroethene	5.0	Not Detected	20	Not Detected
Acetone	20	Not Detected	48	Not Detected
2-Propanol	20	Not Detected	49	Not Detected
Carbon Disulfide	20	Not Detected	62	Not Detected
3-Chloropropene	20	Not Detected	63	Not Detected
Methylene Chloride	20	Not Detected	69	Not Detected
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
trans-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Hexane	5.0	Not Detected	18	Not Detected
1,1-Dichloroethane	5.0	Not Detected	20	Not Detected
2-Butanone (Methyl Ethyl Ketone)	20	Not Detected	59	Not Detected
cis-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Tetrahydrofuran	5.0	Not Detected	15	Not Detected
Chloroform	5.0	Not Detected	24	Not Detected
1,1,1-Trichloroethane	5.0	Not Detected	27	Not Detected
Cyclohexane	5.0	Not Detected	17	Not Detected
Carbon Tetrachloride	5.0	Not Detected	31	Not Detected
2,2,4-Trimethylpentane	5.0	Not Detected	23	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
1,2-Dichloroethane	5.0	Not Detected	20	Not Detected
Heptane	5.0	Not Detected	20	Not Detected
Trichloroethene	5.0	Not Detected	27	Not Detected
1,2-Dichloropropane	5.0	Not Detected	23	Not Detected
1,4-Dioxane	20	Not Detected	72	Not Detected
Bromodichloromethane	5.0	Not Detected	34	Not Detected
cis-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
4-Methyl-2-pentanone	5.0	Not Detected	20	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
trans-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
1,1,2-Trichloroethane	5.0	Not Detected	27	Not Detected
Tetrachloroethene	5.0	Not Detected	34	Not Detected
2-Hexanone	20	Not Detected	82	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706408B-20B

EPA METHOD TO-15 GC/MS

File Name:	**14062306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.0	Not Detected	42	Not Detected
1,2-Dibromoethane (EDB)	5.0	Not Detected	38	Not Detected
Chlorobenzene	5.0	Not Detected	23	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
Styrene	5.0	Not Detected	21	Not Detected
Bromoform	5.0	Not Detected	52	Not Detected
Cumene	5.0	Not Detected	24	Not Detected
1,1,2,2-Tetrachloroethane	5.0	Not Detected	34	Not Detected
Propylbenzene	5.0	Not Detected	24	Not Detected
4-Ethyltoluene	5.0	Not Detected	24	Not Detected
1,3,5-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,2,4-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,3-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,4-Dichlorobenzene	5.0	Not Detected	30	Not Detected
alpha-Chlorotoluene	5.0	Not Detected	26	Not Detected
1,2-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,2,4-Trichlorobenzene	20	Not Detected	150	Not Detected
Hexachlorobutadiene	20	Not Detected	210	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	102	70-130

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Client Sample ID: CCV

Lab ID#: 1706408B-21A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:43 AM**

Compound	%Recovery
Freon 12	90
Freon 114	96
Chloromethane	93
Vinyl Chloride	90
1,3-Butadiene	82
Bromomethane	94
Chloroethane	90
Freon 11	92
Ethanol	81
Freon 113	95
1,1-Dichloroethene	91
Acetone	83
2-Propanol	84
Carbon Disulfide	91
3-Chloropropene	89
Methylene Chloride	84
Methyl tert-butyl ether	86
trans-1,2-Dichloroethene	90
Hexane	85
1,1-Dichloroethane	85
2-Butanone (Methyl Ethyl Ketone)	86
cis-1,2-Dichloroethene	86
Tetrahydrofuran	79
Chloroform	90
1,1,1-Trichloroethane	89
Cyclohexane	83
Carbon Tetrachloride	89
2,2,4-Trimethylpentane	82
Benzene	91
1,2-Dichloroethane	86
Heptane	87
Trichloroethene	93
1,2-Dichloropropane	88
1,4-Dioxane	92
Bromodichloromethane	94
cis-1,3-Dichloropropene	92
4-Methyl-2-pentanone	82
Toluene	93
trans-1,3-Dichloropropene	89
1,1,2-Trichloroethane	94
Tetrachloroethene	100
2-Hexanone	81

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Client Sample ID: CCV

Lab ID#: 1706408B-21A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:43 AM**	

Compound	%Recovery
Dibromochloromethane	97
1,2-Dibromoethane (EDB)	95
Chlorobenzene	93
Ethyl Benzene	92
m,p-Xylene	91
o-Xylene	90
Styrene	88
Bromoform	102
Cumene	90
1,1,2,2-Tetrachloroethane	89
Propylbenzene	90
4-Ethyltoluene	92
1,3,5-Trimethylbenzene	90
1,2,4-Trimethylbenzene	92
1,3-Dichlorobenzene	96
1,4-Dichlorobenzene	96
alpha-Chlorotoluene	90
1,2-Dichlorobenzene	94
1,2,4-Trichlorobenzene	104
Hexachlorobutadiene	107

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	105	70-130

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Client Sample ID: CCV

Lab ID#: 1706408B-21B

EPA METHOD TO-15 GC/MS

File Name:	**14062302**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 07:51 AM**

Compound	%Recovery
Freon 12	98
Freon 114	103
Chloromethane	91
Vinyl Chloride	101
1,3-Butadiene	93
Bromomethane	119
Chloroethane	91
Freon 11	122
Ethanol	90
Freon 113	107
1,1-Dichloroethene	104
Acetone	92
2-Propanol	97
Carbon Disulfide	92
3-Chloropropene	98
Methylene Chloride	101
Methyl tert-butyl ether	103
trans-1,2-Dichloroethene	92
Hexane	102
1,1-Dichloroethane	99
2-Butanone (Methyl Ethyl Ketone)	90
cis-1,2-Dichloroethene	100
Tetrahydrofuran	85
Chloroform	95
1,1,1-Trichloroethane	116
Cyclohexane	105
Carbon Tetrachloride	120
2,2,4-Trimethylpentane	97
Benzene	90
1,2-Dichloroethane	104
Heptane	90
Trichloroethene	91
1,2-Dichloropropane	84
1,4-Dioxane	95
Bromodichloromethane	99
cis-1,3-Dichloropropene	93
4-Methyl-2-pentanone	103
Toluene	85
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	93
Tetrachloroethene	94
2-Hexanone	99

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Client Sample ID: CCV

Lab ID#: 1706408B-21B

EPA METHOD TO-15 GC/MS

File Name:	**14062302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 07:51 AM**	

Compound	%Recovery
Dibromochloromethane	98
1,2-Dibromoethane (EDB)	95
Chlorobenzene	93
Ethyl Benzene	97
m,p-Xylene	92
o-Xylene	93
Styrene	106
Bromoform	100
Cumene	98
1,1,2,2-Tetrachloroethane	89
Propylbenzene	95
4-Ethyltoluene	100
1,3,5-Trimethylbenzene	104
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	98
1,4-Dichlorobenzene	101
alpha-Chlorotoluene	98
1,2-Dichlorobenzene	98
1,2,4-Trichlorobenzene	93
Hexachlorobutadiene	101

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	95	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: LCS

Lab ID#: 1706408B-22A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:10 AM**	

Compound	%Recovery	Method Limits
Freon 12	95	70-130
Freon 114	103	70-130
Chloromethane	98	70-130
Vinyl Chloride	98	70-130
1,3-Butadiene	86	70-130
Bromomethane	100	70-130
Chloroethane	100	70-130
Freon 11	98	70-130
Ethanol	74	70-130
Freon 113	99	70-130
1,1-Dichloroethene	94	70-130
Acetone	89	70-130
2-Propanol	87	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	98	70-130
Methylene Chloride	88	70-130
Methyl tert-butyl ether	91	70-130
trans-1,2-Dichloroethene	103	70-130
Hexane	90	70-130
1,1-Dichloroethane	89	70-130
2-Butanone (Methyl Ethyl Ketone)	91	70-130
cis-1,2-Dichloroethene	84	70-130
Tetrahydrofuran	81	70-130
Chloroform	93	70-130
1,1,1-Trichloroethane	92	70-130
Cyclohexane	86	70-130
Carbon Tetrachloride	93	70-130
2,2,4-Trimethylpentane	87	70-130
Benzene	96	70-130
1,2-Dichloroethane	90	70-130
Heptane	94	70-130
Trichloroethene	100	70-130
1,2-Dichloropropane	92	70-130
1,4-Dioxane	94	70-130
Bromodichloromethane	101	70-130
cis-1,3-Dichloropropene	103	70-130
4-Methyl-2-pentanone	85	70-130
Toluene	97	70-130
trans-1,3-Dichloropropene	92	70-130
1,1,2-Trichloroethane	98	70-130
Tetrachloroethene	102	70-130
2-Hexanone	83	70-130

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Client Sample ID: LCS

Lab ID#: 1706408B-22A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:10 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	102	70-130
1,2-Dibromoethane (EDB)	98	70-130
Chlorobenzene	97	70-130
Ethyl Benzene	95	70-130
m,p-Xylene	94	70-130
o-Xylene	93	70-130
Styrene	90	70-130
Bromoform	108	70-130
Cumene	92	70-130
1,1,2,2-Tetrachloroethane	92	70-130
Propylbenzene	93	70-130
4-Ethyltoluene	97	70-130
1,3,5-Trimethylbenzene	94	70-130
1,2,4-Trimethylbenzene	96	70-130
1,3-Dichlorobenzene	98	70-130
1,4-Dichlorobenzene	100	70-130
alpha-Chlorotoluene	94	70-130
1,2-Dichlorobenzene	98	70-130
1,2,4-Trichlorobenzene	109	70-130
Hexachlorobutadiene	114	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	88	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: LCSD

Lab ID#: 1706408B-22AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:36 AM**	

Compound	%Recovery	Method Limits
Freon 12	95	70-130
Freon 114	103	70-130
Chloromethane	95	70-130
Vinyl Chloride	99	70-130
1,3-Butadiene	88	70-130
Bromomethane	101	70-130
Chloroethane	101	70-130
Freon 11	98	70-130
Ethanol	74	70-130
Freon 113	100	70-130
1,1-Dichloroethene	96	70-130
Acetone	90	70-130
2-Propanol	88	70-130
Carbon Disulfide	98	70-130
3-Chloropropene	102	70-130
Methylene Chloride	89	70-130
Methyl tert-butyl ether	91	70-130
trans-1,2-Dichloroethene	105	70-130
Hexane	90	70-130
1,1-Dichloroethane	89	70-130
2-Butanone (Methyl Ethyl Ketone)	92	70-130
cis-1,2-Dichloroethene	87	70-130
Tetrahydrofuran	83	70-130
Chloroform	93	70-130
1,1,1-Trichloroethane	93	70-130
Cyclohexane	88	70-130
Carbon Tetrachloride	94	70-130
2,2,4-Trimethylpentane	86	70-130
Benzene	96	70-130
1,2-Dichloroethane	91	70-130
Heptane	93	70-130
Trichloroethene	102	70-130
1,2-Dichloropropane	93	70-130
1,4-Dioxane	96	70-130
Bromodichloromethane	101	70-130
cis-1,3-Dichloropropene	103	70-130
4-Methyl-2-pentanone	87	70-130
Toluene	98	70-130
trans-1,3-Dichloropropene	95	70-130
1,1,2-Trichloroethane	100	70-130
Tetrachloroethene	105	70-130
2-Hexanone	84	70-130

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Client Sample ID: LCSD

Lab ID#: 1706408B-22AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**17062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 09:36 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	105	70-130
1,2-Dibromoethane (EDB)	100	70-130
Chlorobenzene	98	70-130
Ethyl Benzene	97	70-130
m,p-Xylene	96	70-130
o-Xylene	96	70-130
Styrene	90	70-130
Bromoform	110	70-130
Cumene	94	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	95	70-130
4-Ethyltoluene	100	70-130
1,3,5-Trimethylbenzene	96	70-130
1,2,4-Trimethylbenzene	98	70-130
1,3-Dichlorobenzene	101	70-130
1,4-Dichlorobenzene	102	70-130
alpha-Chlorotoluene	95	70-130
1,2-Dichlorobenzene	100	70-130
1,2,4-Trichlorobenzene	112	70-130
Hexachlorobutadiene	118	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	87	70-130
4-Bromofluorobenzene	109	70-130

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Client Sample ID: LCS

Lab ID#: 1706408B-22B

EPA METHOD TO-15 GC/MS

File Name:	**14062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:21 AM**	

Compound	%Recovery	Method Limits
Freon 12	109	70-130
Freon 114	114	70-130
Chloromethane	101	70-130
Vinyl Chloride	108	70-130
1,3-Butadiene	97	70-130
Bromomethane	137 Q	70-130
Chloroethane	102	70-130
Freon 11	133 Q	70-130
Ethanol	104	70-130
Freon 113	118	70-130
1,1-Dichloroethene	115	70-130
Acetone	104	70-130
2-Propanol	113	70-130
Carbon Disulfide	89	70-130
3-Chloropropene	110	70-130
Methylene Chloride	111	70-130
Methyl tert-butyl ether	116	70-130
trans-1,2-Dichloroethene	92	70-130
Hexane	113	70-130
1,1-Dichloroethane	111	70-130
2-Butanone (Methyl Ethyl Ketone)	101	70-130
cis-1,2-Dichloroethene	118	70-130
Tetrahydrofuran	95	70-130
Chloroform	107	70-130
1,1,1-Trichloroethane	129	70-130
Cyclohexane	121	70-130
Carbon Tetrachloride	130	70-130
2,2,4-Trimethylpentane	110	70-130
Benzene	103	70-130
1,2-Dichloroethane	113	70-130
Heptane	104	70-130
Trichloroethene	103	70-130
1,2-Dichloropropane	96	70-130
1,4-Dioxane	108	70-130
Bromodichloromethane	118	70-130
cis-1,3-Dichloropropene	106	70-130
4-Methyl-2-pentanone	112	70-130
Toluene	100	70-130
trans-1,3-Dichloropropene	109	70-130
1,1,2-Trichloroethane	107	70-130
Tetrachloroethene	102	70-130
2-Hexanone	110	70-130

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Client Sample ID: LCS

Lab ID#: 1706408B-22B

EPA METHOD TO-15 GC/MS

File Name:	**14062303**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:21 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	108	70-130
1,2-Dibromoethane (EDB)	103	70-130
Chlorobenzene	104	70-130
Ethyl Benzene	102	70-130
m,p-Xylene	101	70-130
o-Xylene	104	70-130
Styrene	114	70-130
Bromoform	113	70-130
Cumene	104	70-130
1,1,2,2-Tetrachloroethane	96	70-130
Propylbenzene	104	70-130
4-Ethyltoluene	109	70-130
1,3,5-Trimethylbenzene	110	70-130
1,2,4-Trimethylbenzene	104	70-130
1,3-Dichlorobenzene	99	70-130
1,4-Dichlorobenzene	104	70-130
alpha-Chlorotoluene	108	70-130
1,2-Dichlorobenzene	97	70-130
1,2,4-Trichlorobenzene	81	70-130
Hexachlorobutadiene	86	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCSD

Lab ID#: 1706408B-22BB

EPA METHOD TO-15 GC/MS

File Name:	**14062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:57 AM**	

Compound	%Recovery	Method Limits
Freon 12	110	70-130
Freon 114	116	70-130
Chloromethane	101	70-130
Vinyl Chloride	112	70-130
1,3-Butadiene	100	70-130
Bromomethane	137 Q	70-130
Chloroethane	100	70-130
Freon 11	137 Q	70-130
Ethanol	100	70-130
Freon 113	120	70-130
1,1-Dichloroethene	118	70-130
Acetone	105	70-130
2-Propanol	114	70-130
Carbon Disulfide	91	70-130
3-Chloropropene	113	70-130
Methylene Chloride	113	70-130
Methyl tert-butyl ether	117	70-130
trans-1,2-Dichloroethene	91	70-130
Hexane	114	70-130
1,1-Dichloroethane	113	70-130
2-Butanone (Methyl Ethyl Ketone)	108	70-130
cis-1,2-Dichloroethene	118	70-130
Tetrahydrofuran	98	70-130
Chloroform	107	70-130
1,1,1-Trichloroethane	127	70-130
Cyclohexane	119	70-130
Carbon Tetrachloride	130	70-130
2,2,4-Trimethylpentane	112	70-130
Benzene	103	70-130
1,2-Dichloroethane	114	70-130
Heptane	102	70-130
Trichloroethene	108	70-130
1,2-Dichloropropane	96	70-130
1,4-Dioxane	107	70-130
Bromodichloromethane	113	70-130
cis-1,3-Dichloropropene	105	70-130
4-Methyl-2-pentanone	111	70-130
Toluene	101	70-130
trans-1,3-Dichloropropene	109	70-130
1,1,2-Trichloroethane	107	70-130
Tetrachloroethene	104	70-130
2-Hexanone	111	70-130

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Client Sample ID: LCSD

Lab ID#: 1706408B-22BB

EPA METHOD TO-15 GC/MS

File Name:	**14062304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/23/17 08:57 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	106	70-130
1,2-Dibromoethane (EDB)	101	70-130
Chlorobenzene	101	70-130
Ethyl Benzene	103	70-130
m,p-Xylene	100	70-130
o-Xylene	101	70-130
Styrene	114	70-130
Bromoform	110	70-130
Cumene	103	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	104	70-130
4-Ethyltoluene	105	70-130
1,3,5-Trimethylbenzene	111	70-130
1,2,4-Trimethylbenzene	103	70-130
1,3-Dichlorobenzene	100	70-130
1,4-Dichlorobenzene	103	70-130
alpha-Chlorotoluene	108	70-130
1,2-Dichlorobenzene	98	70-130
1,2,4-Trichlorobenzene	80	70-130
Hexachlorobutadiene	86	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	104	70-130

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7/10/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: VDB 11193
Project #: TR0479
Workorder #: 1706492A

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 6/26/2017 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 SIM are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1706492A

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0479 VDB 11193
DATE RECEIVED:	06/26/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	07/10/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	B11193-061917-SSV-OA-A	Modified TO-15 SIM	5.0 "Hg	5 psi
02A	B11193-061917-SSV-OA-B	Modified TO-15 SIM	5.5 "Hg	5 psi
03A	B11193-062017-SSV-OA-A	Modified TO-15 SIM	5.0 "Hg	5 psi
04A	B11193-062017-SSV-OA-B	Modified TO-15 SIM	5.5 "Hg	5 psi
20A	B11193-062117-ST-5-IA-A-5	Modified TO-15 SIM	4.5 "Hg	5 psi
21A	B11193-062117-SSV-OA-B	Modified TO-15 SIM	6.5 "Hg	5 psi
22A	B11193-062117-SSV-OA-A	Modified TO-15 SIM	6.0 "Hg	5 psi
24A	B11193-062117-ST-6-IA-A-5	Modified TO-15 SIM	3.3 "Hg	5 psi
25A	Lab Blank	Modified TO-15 SIM	NA	NA
26A	CCV	Modified TO-15 SIM	NA	NA
27A	LCS	Modified TO-15 SIM	NA	NA
27AA	LCSD	Modified TO-15 SIM	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 07/10/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Eurofins Air Toxics, Inc.

LABORATORY NARRATIVE
Modified TO-15 SIM
GeoSyntec Consultants
Workorder# 1706492A

Seven 6 Liter Summa Canister (SIM Certified) samples were received on June 26, 2017. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the SIM acquisition mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-15***	***ATL Modifications***
ICAL %RSD acceptance criteria	</=30% RSD with 2 compounds allowed out to < 40% RSD	Project specific; default criteria is </=30% RSD with 10% of compounds allowed out to < 40% RSD
Daily Calibration	+- 30% Difference	Project specific; default criteria is </= 30% Difference with 10% of compounds allowed out up to </=40%.; flag and narrate outliers
Blank and standards	Zero air	Nitrogen
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A signature, date, and time were not provided by the field sampler.

The number of samples received did not match the information on the Chain of Custody (COC). Sample B11193-062117-ST-6-IA-A-5 was added to the analytical request.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM

Client Sample ID: B11193-061917-SSV-OA-A

Lab ID#: 1706492A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.48	0.16	2.4
Carbon Tetrachloride	0.032	0.054	0.20	0.34
Toluene	0.032	0.12	0.12	0.44

Client Sample ID: B11193-061917-SSV-OA-B

Lab ID#: 1706492A-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.033	0.46	0.16	2.2
Carbon Tetrachloride	0.033	0.057	0.21	0.36
Tetrachloroethene	0.033	0.039	0.22	0.26

Client Sample ID: B11193-062017-SSV-OA-A

Lab ID#: 1706492A-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.44	0.16	2.2
Carbon Tetrachloride	0.032	0.067	0.20	0.42
Toluene	0.032	0.036	0.12	0.13

Client Sample ID: B11193-062017-SSV-OA-B

Lab ID#: 1706492A-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.033	0.45	0.16	2.2
Carbon Tetrachloride	0.033	0.059	0.21	0.37

Client Sample ID: B11193-062117-ST-5-IA-A-5

Lab ID#: 1706492A-20A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.46	0.16	2.3

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM

Client Sample ID: B11193-062117-ST-5-IA-A-5

Lab ID#: 1706492A-20A

cis-1,2-Dichloroethene	0.032	0.32	0.12	1.2
Carbon Tetrachloride	0.032	0.056	0.20	0.36
Trichloroethene	0.032	0.15	0.17	0.82
Toluene	0.032	0.047	0.12	0.18
Tetrachloroethene	0.032	5.5	0.21	37

Client Sample ID: B11193-062117-SSV-OA-B

Lab ID#: 1706492A-21A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.034	0.46	0.17	2.3
Carbon Tetrachloride	0.034	0.051	0.22	0.32
Tetrachloroethene	0.034	0.067	0.23	0.46

Client Sample ID: B11193-062117-SSV-OA-A

Lab ID#: 1706492A-22A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.034	0.45	0.17	2.2
Carbon Tetrachloride	0.034	0.063	0.21	0.40

Client Sample ID: B11193-062117-ST-6-IA-A-5

Lab ID#: 1706492A-24A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.030	0.43	0.15	2.1
cis-1,2-Dichloroethene	0.030	0.19	0.12	0.76
Carbon Tetrachloride	0.030	0.064	0.19	0.40
Benzene	0.075	0.24	0.24	0.76
Trichloroethene	0.030	0.10	0.16	0.55
Toluene	0.030	0.45	0.11	1.7
Tetrachloroethene	0.030	3.4	0.20	23
Ethyl Benzene	0.030	0.033	0.13	0.14
m,p-Xylene	0.060	0.068	0.26	0.29

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM

Client Sample ID: B11193-062117-ST-6-IA-A-5

Lab ID#: 1706492A-24A

o-Xylene	0.030	0.036	0.13	0.16

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Client Sample ID: B11193-061917-SSV-OA-A

Lab ID#: 1706492A-01A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062914sim**	**Date of Collection: 6/19/17 6:28:00 PM**	
Dil. Factor:	**1.61**	**Date of Analysis: 6/29/17 07:35 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.48	0.16	2.4
Freon 114	0.032	Not Detected	0.22	Not Detected
Chloromethane	0.80	Not Detected	1.7	Not Detected
Vinyl Chloride	0.016	Not Detected	0.041	Not Detected
Chloroethane	0.080	Not Detected	0.21	Not Detected
1,1-Dichloroethene	0.016	Not Detected	0.064	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.64	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.58	Not Detected
1,1-Dichloroethane	0.032	Not Detected	0.13	Not Detected
cis-1,2-Dichloroethene	0.032	Not Detected	0.13	Not Detected
Chloroform	0.032	Not Detected	0.16	Not Detected
1,1,1-Trichloroethane	0.032	Not Detected	0.18	Not Detected
Carbon Tetrachloride	0.032	0.054	0.20	0.34
Benzene	0.080	Not Detected	0.26	Not Detected
1,2-Dichloroethane	0.032	Not Detected	0.13	Not Detected
Trichloroethene	0.032	Not Detected	0.17	Not Detected
Toluene	0.032	0.12	0.12	0.44
1,1,2-Trichloroethane	0.032	Not Detected	0.18	Not Detected
Tetrachloroethene	0.032	Not Detected	0.22	Not Detected
1,2-Dibromoethane (EDB)	0.032	Not Detected	0.25	Not Detected
Ethyl Benzene	0.032	Not Detected	0.14	Not Detected
m,p-Xylene	0.064	Not Detected	0.28	Not Detected
o-Xylene	0.032	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.032	Not Detected	0.22	Not Detected
1,4-Dichlorobenzene	0.032	Not Detected	0.19	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	117	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	92	70-130

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Client Sample ID: B11193-061917-SSV-OA-B

Lab ID#: 1706492A-02A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062915sim**	**Date of Collection: 6/19/17 6:38:00 PM**	
Dil. Factor:	**1.64**	**Date of Analysis: 6/29/17 08:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.033	0.46	0.16	2.2
Freon 114	0.033	Not Detected	0.23	Not Detected
Chloromethane	0.82	Not Detected	1.7	Not Detected
Vinyl Chloride	0.016	Not Detected	0.042	Not Detected
Chloroethane	0.082	Not Detected	0.22	Not Detected
1,1-Dichloroethene	0.016	Not Detected	0.065	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.65	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.59	Not Detected
1,1-Dichloroethane	0.033	Not Detected	0.13	Not Detected
cis-1,2-Dichloroethene	0.033	Not Detected	0.13	Not Detected
Chloroform	0.033	Not Detected	0.16	Not Detected
1,1,1-Trichloroethane	0.033	Not Detected	0.18	Not Detected
Carbon Tetrachloride	0.033	0.057	0.21	0.36
Benzene	0.082	Not Detected	0.26	Not Detected
1,2-Dichloroethane	0.033	Not Detected	0.13	Not Detected
Trichloroethene	0.033	Not Detected	0.18	Not Detected
Toluene	0.033	Not Detected	0.12	Not Detected
1,1,2-Trichloroethane	0.033	Not Detected	0.18	Not Detected
Tetrachloroethene	0.033	0.039	0.22	0.26
1,2-Dibromoethane (EDB)	0.033	Not Detected	0.25	Not Detected
Ethyl Benzene	0.033	Not Detected	0.14	Not Detected
m,p-Xylene	0.066	Not Detected	0.28	Not Detected
o-Xylene	0.033	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.033	Not Detected	0.22	Not Detected
1,4-Dichlorobenzene	0.033	Not Detected	0.20	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	89	70-130

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Client Sample ID: B11193-062017-SSV-OA-A

Lab ID#: 1706492A-03A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062916sim**	**Date of Collection: 6/20/17 4:04:00 PM**	
Dil. Factor:	**1.61**	**Date of Analysis: 6/29/17 08:50 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.44	0.16	2.2
Freon 114	0.032	Not Detected	0.22	Not Detected
Chloromethane	0.80	Not Detected	1.7	Not Detected
Vinyl Chloride	0.016	Not Detected	0.041	Not Detected
Chloroethane	0.080	Not Detected	0.21	Not Detected
1,1-Dichloroethene	0.016	Not Detected	0.064	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.64	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.58	Not Detected
1,1-Dichloroethane	0.032	Not Detected	0.13	Not Detected
cis-1,2-Dichloroethene	0.032	Not Detected	0.13	Not Detected
Chloroform	0.032	Not Detected	0.16	Not Detected
1,1,1-Trichloroethane	0.032	Not Detected	0.18	Not Detected
Carbon Tetrachloride	0.032	0.067	0.20	0.42
Benzene	0.080	Not Detected	0.26	Not Detected
1,2-Dichloroethane	0.032	Not Detected	0.13	Not Detected
Trichloroethene	0.032	Not Detected	0.17	Not Detected
Toluene	0.032	0.036	0.12	0.13
1,1,2-Trichloroethane	0.032	Not Detected	0.18	Not Detected
Tetrachloroethene	0.032	Not Detected	0.22	Not Detected
1,2-Dibromoethane (EDB)	0.032	Not Detected	0.25	Not Detected
Ethyl Benzene	0.032	Not Detected	0.14	Not Detected
m,p-Xylene	0.064	Not Detected	0.28	Not Detected
o-Xylene	0.032	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.032	Not Detected	0.22	Not Detected
1,4-Dichlorobenzene	0.032	Not Detected	0.19	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	94	70-130

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Client Sample ID: B11193-062017-SSV-OA-B

Lab ID#: 1706492A-04A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062917sim**	**Date of Collection: 6/20/17 4:05:00 PM**	
Dil. Factor:	**1.64**	**Date of Analysis: 6/29/17 09:22 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.033	0.45	0.16	2.2
Freon 114	0.033	Not Detected	0.23	Not Detected
Chloromethane	0.82	Not Detected	1.7	Not Detected
Vinyl Chloride	0.016	Not Detected	0.042	Not Detected
Chloroethane	0.082	Not Detected	0.22	Not Detected
1,1-Dichloroethene	0.016	Not Detected	0.065	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.65	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.59	Not Detected
1,1-Dichloroethane	0.033	Not Detected	0.13	Not Detected
cis-1,2-Dichloroethene	0.033	Not Detected	0.13	Not Detected
Chloroform	0.033	Not Detected	0.16	Not Detected
1,1,1-Trichloroethane	0.033	Not Detected	0.18	Not Detected
Carbon Tetrachloride	0.033	0.059	0.21	0.37
Benzene	0.082	Not Detected	0.26	Not Detected
1,2-Dichloroethane	0.033	Not Detected	0.13	Not Detected
Trichloroethene	0.033	Not Detected	0.18	Not Detected
Toluene	0.033	Not Detected	0.12	Not Detected
1,1,2-Trichloroethane	0.033	Not Detected	0.18	Not Detected
Tetrachloroethene	0.033	Not Detected	0.22	Not Detected
1,2-Dibromoethane (EDB)	0.033	Not Detected	0.25	Not Detected
Ethyl Benzene	0.033	Not Detected	0.14	Not Detected
m,p-Xylene	0.066	Not Detected	0.28	Not Detected
o-Xylene	0.033	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.033	Not Detected	0.22	Not Detected
1,4-Dichlorobenzene	0.033	Not Detected	0.20	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	93	70-130

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Client Sample ID: B11193-062117-ST-5-IA-A-5

Lab ID#: 1706492A-20A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062918sim**	**Date of Collection: 6/21/17 1:35:00 PM**	
Dil. Factor:	**1.58**	**Date of Analysis: 6/29/17 09:54 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.032	0.46	0.16	2.3
Freon 114	0.032	Not Detected	0.22	Not Detected
Chloromethane	0.79	Not Detected	1.6	Not Detected
Vinyl Chloride	0.016	Not Detected	0.040	Not Detected
Chloroethane	0.079	Not Detected	0.21	Not Detected
1,1-Dichloroethene	0.016	Not Detected	0.063	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.63	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.57	Not Detected
1,1-Dichloroethane	0.032	Not Detected	0.13	Not Detected
cis-1,2-Dichloroethene	0.032	0.32	0.12	1.2
Chloroform	0.032	Not Detected	0.15	Not Detected
1,1,1-Trichloroethane	0.032	Not Detected	0.17	Not Detected
Carbon Tetrachloride	0.032	0.056	0.20	0.36
Benzene	0.079	Not Detected	0.25	Not Detected
1,2-Dichloroethane	0.032	Not Detected	0.13	Not Detected
Trichloroethene	0.032	0.15	0.17	0.82
Toluene	0.032	0.047	0.12	0.18
1,1,2-Trichloroethane	0.032	Not Detected	0.17	Not Detected
Tetrachloroethene	0.032	5.5	0.21	37
1,2-Dibromoethane (EDB)	0.032	Not Detected	0.24	Not Detected
Ethyl Benzene	0.032	Not Detected	0.14	Not Detected
m,p-Xylene	0.063	Not Detected	0.27	Not Detected
o-Xylene	0.032	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.032	Not Detected	0.22	Not Detected
1,4-Dichlorobenzene	0.032	Not Detected	0.19	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	88	70-130

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Client Sample ID: B11193-062117-SSV-OA-B

Lab ID#: 1706492A-21A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062919sim**	**Date of Collection: 6/21/17 3:35:00 PM**	
Dil. Factor:	**1.71**	**Date of Analysis: 6/29/17 10:25 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.034	0.46	0.17	2.3
Freon 114	0.034	Not Detected	0.24	Not Detected
Chloromethane	0.86	Not Detected	1.8	Not Detected
Vinyl Chloride	0.017	Not Detected	0.044	Not Detected
Chloroethane	0.086	Not Detected	0.22	Not Detected
1,1-Dichloroethene	0.017	Not Detected	0.068	Not Detected
trans-1,2-Dichloroethene	0.17	Not Detected	0.68	Not Detected
Methyl tert-butyl ether	0.17	Not Detected	0.62	Not Detected
1,1-Dichloroethane	0.034	Not Detected	0.14	Not Detected
cis-1,2-Dichloroethene	0.034	Not Detected	0.14	Not Detected
Chloroform	0.034	Not Detected	0.17	Not Detected
1,1,1-Trichloroethane	0.034	Not Detected	0.19	Not Detected
Carbon Tetrachloride	0.034	0.051	0.22	0.32
Benzene	0.086	Not Detected	0.27	Not Detected
1,2-Dichloroethane	0.034	Not Detected	0.14	Not Detected
Trichloroethene	0.034	Not Detected	0.18	Not Detected
Toluene	0.034	Not Detected	0.13	Not Detected
1,1,2-Trichloroethane	0.034	Not Detected	0.19	Not Detected
Tetrachloroethene	0.034	0.067	0.23	0.46
1,2-Dibromoethane (EDB)	0.034	Not Detected	0.26	Not Detected
Ethyl Benzene	0.034	Not Detected	0.15	Not Detected
m,p-Xylene	0.068	Not Detected	0.30	Not Detected
o-Xylene	0.034	Not Detected	0.15	Not Detected
1,1,2,2-Tetrachloroethane	0.034	Not Detected	0.23	Not Detected
1,4-Dichlorobenzene	0.034	Not Detected	0.20	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	91	70-130

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Client Sample ID: B11193-062117-SSV-OA-A

Lab ID#: 1706492A-22A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062920sim**	**Date of Collection: 6/21/17 3:35:00 PM**	
Dil. Factor:	**1.68**	**Date of Analysis: 6/29/17 10:57 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.034	0.45	0.17	2.2
Freon 114	0.034	Not Detected	0.23	Not Detected
Chloromethane	0.84	Not Detected	1.7	Not Detected
Vinyl Chloride	0.017	Not Detected	0.043	Not Detected
Chloroethane	0.084	Not Detected	0.22	Not Detected
1,1-Dichloroethene	0.017	Not Detected	0.067	Not Detected
trans-1,2-Dichloroethene	0.17	Not Detected	0.67	Not Detected
Methyl tert-butyl ether	0.17	Not Detected	0.60	Not Detected
1,1-Dichloroethane	0.034	Not Detected	0.14	Not Detected
cis-1,2-Dichloroethene	0.034	Not Detected	0.13	Not Detected
Chloroform	0.034	Not Detected	0.16	Not Detected
1,1,1-Trichloroethane	0.034	Not Detected	0.18	Not Detected
Carbon Tetrachloride	0.034	0.063	0.21	0.40
Benzene	0.084	Not Detected	0.27	Not Detected
1,2-Dichloroethane	0.034	Not Detected	0.14	Not Detected
Trichloroethene	0.034	Not Detected	0.18	Not Detected
Toluene	0.034	Not Detected	0.13	Not Detected
1,1,2-Trichloroethane	0.034	Not Detected	0.18	Not Detected
Tetrachloroethene	0.034	Not Detected	0.23	Not Detected
1,2-Dibromoethane (EDB)	0.034	Not Detected	0.26	Not Detected
Ethyl Benzene	0.034	Not Detected	0.14	Not Detected
m,p-Xylene	0.067	Not Detected	0.29	Not Detected
o-Xylene	0.034	Not Detected	0.14	Not Detected
1,1,2,2-Tetrachloroethane	0.034	Not Detected	0.23	Not Detected
1,4-Dichlorobenzene	0.034	Not Detected	0.20	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	88	70-130

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Client Sample ID: B11193-062117-ST-6-IA-A-5

Lab ID#: 1706492A-24A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062921sim**	**Date of Collection: 6/21/17 6:05:00 PM**	
Dil. Factor:	**1.50**	**Date of Analysis: 6/30/17 07:51 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.030	0.43	0.15	2.1
Freon 114	0.030	Not Detected	0.21	Not Detected
Chloromethane	0.75	Not Detected	1.5	Not Detected
Vinyl Chloride	0.015	Not Detected	0.038	Not Detected
Chloroethane	0.075	Not Detected	0.20	Not Detected
1,1-Dichloroethene	0.015	Not Detected	0.059	Not Detected
trans-1,2-Dichloroethene	0.15	Not Detected	0.59	Not Detected
Methyl tert-butyl ether	0.15	Not Detected	0.54	Not Detected
1,1-Dichloroethane	0.030	Not Detected	0.12	Not Detected
cis-1,2-Dichloroethene	0.030	0.19	0.12	0.76
Chloroform	0.030	Not Detected	0.15	Not Detected
1,1,1-Trichloroethane	0.030	Not Detected	0.16	Not Detected
Carbon Tetrachloride	0.030	0.064	0.19	0.40
Benzene	0.075	0.24	0.24	0.76
1,2-Dichloroethane	0.030	Not Detected	0.12	Not Detected
Trichloroethene	0.030	0.10	0.16	0.55
Toluene	0.030	0.45	0.11	1.7
1,1,2-Trichloroethane	0.030	Not Detected	0.16	Not Detected
Tetrachloroethene	0.030	3.4	0.20	23
1,2-Dibromoethane (EDB)	0.030	Not Detected	0.23	Not Detected
Ethyl Benzene	0.030	0.033	0.13	0.14
m,p-Xylene	0.060	0.068	0.26	0.29
o-Xylene	0.030	0.036	0.13	0.16
1,1,2,2-Tetrachloroethane	0.030	Not Detected	0.20	Not Detected
1,4-Dichlorobenzene	0.030	Not Detected	0.18	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706492A-25A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062906sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 01:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.020	Not Detected	0.099	Not Detected
Freon 114	0.020	Not Detected	0.14	Not Detected
Chloromethane	0.50	Not Detected	1.0	Not Detected
Vinyl Chloride	0.010	Not Detected	0.026	Not Detected
Chloroethane	0.050	Not Detected	0.13	Not Detected
1,1-Dichloroethene	0.010	Not Detected	0.040	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
1,1-Dichloroethane	0.020	Not Detected	0.081	Not Detected
cis-1,2-Dichloroethene	0.020	Not Detected	0.079	Not Detected
Chloroform	0.020	Not Detected	0.098	Not Detected
1,1,1-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Carbon Tetrachloride	0.020	Not Detected	0.12	Not Detected
Benzene	0.050	Not Detected	0.16	Not Detected
1,2-Dichloroethane	0.020	Not Detected	0.081	Not Detected
Trichloroethene	0.020	Not Detected	0.11	Not Detected
Toluene	0.020	Not Detected	0.075	Not Detected
1,1,2-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Tetrachloroethene	0.020	Not Detected	0.14	Not Detected
1,2-Dibromoethane (EDB)	0.020	Not Detected	0.15	Not Detected
Ethyl Benzene	0.020	Not Detected	0.087	Not Detected
m,p-Xylene	0.040	Not Detected	0.17	Not Detected
o-Xylene	0.020	Not Detected	0.087	Not Detected
1,1,2,2-Tetrachloroethane	0.020	Not Detected	0.14	Not Detected
1,4-Dichlorobenzene	0.020	Not Detected	0.12	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	84	70-130

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Client Sample ID: CCV

Lab ID#: 1706492A-26A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062902sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 11:01 AM**	

Compound	%Recovery
Freon 12	95
Freon 114	87
Chloromethane	78
Vinyl Chloride	90
Chloroethane	95
1,1-Dichloroethene	94
trans-1,2-Dichloroethene	91
Methyl tert-butyl ether	108
1,1-Dichloroethane	92
cis-1,2-Dichloroethene	94
Chloroform	81
1,1,1-Trichloroethane	90
Carbon Tetrachloride	107
Benzene	79
1,2-Dichloroethane	80
Trichloroethene	86
Toluene	86
1,1,2-Trichloroethane	99
Tetrachloroethene	87
1,2-Dibromoethane (EDB)	103
Ethyl Benzene	100
m,p-Xylene	102
o-Xylene	106
1,1,2,2-Tetrachloroethane	101
1,4-Dichlorobenzene	80

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	93	70-130

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Client Sample ID: LCS

Lab ID#: 1706492A-27A

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062903sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 11:39 AM**	

Compound	%Recovery	Method Limits
Freon 12	107	70-130
Freon 114	104	70-130
Chloromethane	94	70-130
Vinyl Chloride	105	70-130
Chloroethane	110	70-130
1,1-Dichloroethene	105	70-130
trans-1,2-Dichloroethene	88	70-130
Methyl tert-butyl ether	119	70-130
1,1-Dichloroethane	105	70-130
cis-1,2-Dichloroethene	116	70-130
Chloroform	91	70-130
1,1,1-Trichloroethane	100	70-130
Carbon Tetrachloride	128	60-140
Benzene	88	70-130
1,2-Dichloroethane	91	70-130
Trichloroethene	95	70-130
Toluene	94	70-130
1,1,2-Trichloroethane	108	70-130
Tetrachloroethene	96	70-130
1,2-Dibromoethane (EDB)	113	70-130
Ethyl Benzene	110	70-130
m,p-Xylene	115	70-130
o-Xylene	122	70-130
1,1,2,2-Tetrachloroethane	110	70-130
1,4-Dichlorobenzene	92	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: LCSD

Lab ID#: 1706492A-27AA

MODIFIED EPA METHOD TO-15 GC/MS SIM

File Name:	**21062904sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 12:09 PM**	

Compound	%Recovery	Method Limits
Freon 12	104	70-130
Freon 114	102	70-130
Chloromethane	88	70-130
Vinyl Chloride	104	70-130
Chloroethane	110	70-130
1,1-Dichloroethene	104	70-130
trans-1,2-Dichloroethene	87	70-130
Methyl tert-butyl ether	118	70-130
1,1-Dichloroethane	104	70-130
cis-1,2-Dichloroethene	114	70-130
Chloroform	90	70-130
1,1,1-Trichloroethane	100	70-130
Carbon Tetrachloride	127	60-140
Benzene	87	70-130
1,2-Dichloroethane	90	70-130
Trichloroethene	94	70-130
Toluene	94	70-130
1,1,2-Trichloroethane	108	70-130
Tetrachloroethene	99	70-130
1,2-Dibromoethane (EDB)	113	70-130
Ethyl Benzene	112	70-130
m,p-Xylene	117	70-130
o-Xylene	126	70-130
1,1,2,2-Tetrachloroethane	117	70-130
1,4-Dichlorobenzene	92	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	101	70-130

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7/10/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: VDB 11193
Project #: TR0479
Workorder #: 1706492B

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 6/26/2017 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1706492B

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0479 VDB 11193
DATE RECEIVED:	06/26/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	07/10/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
05A	B11193-061917-SSV-2-22	TO-15	0.6 "Hg	15.1 psi
06A	B11193-062017-SSV-3-22	TO-15	0.4 "Hg	15.2 psi
07A	B11193-062017-SSV-4-22	TO-15	1 "Hg	14.9 psi
08A	B11193-062017-SSV-4-22-DUP	TO-15	1 "Hg	14.8 psi
09A	B11193-062017-SSV-5-59	TO-15	0.2 "Hg	15.1 psi
10A	B11193-062017-SSV-1-44	TO-15	2.4 "Hg	14.9 psi
11A	B11193-062117-SSV-6-59	TO-15	1.6 "Hg	14.9 psi
12A	B11193-062117-SSV-7-65	TO-15	2.6 "Hg	15 psi
13A	B11193-062117-SSV-8-65	TO-15	2.8 "Hg	15 psi
14A	B11193-062217-SVP1SS	TO-15	2.8 "Hg	14.6 psi
15A	B11193-062217-SVP3SS	TO-15	3.7 "Hg	15 psi
16A	B11193-062217-SSPE3	TO-15	0.4 "Hg	14.9 psi
17A	B11193-062217-SVP4SS	TO-15	6.5 "Hg	14.9 psi
18A	B11193-062217-SSPN2	TO-15	9.0 "Hg	15 psi
19A	B11193-062217-SVP2SS	TO-15	3.0 "Hg	15 psi
23A	B11193-062117-SSV-9-58	TO-15	3.0 "Hg	15 psi
24A	Lab Blank	TO-15	NA	NA
24B	Lab Blank	TO-15	NA	NA
25A	CCV	TO-15	NA	NA
25B	CCV	TO-15	NA	NA
26A	LCS	TO-15	NA	NA
26AA	LCSD	TO-15	NA	NA
26B	LCS	TO-15	NA	NA

Continued on next page

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WORK ORDER #: 1706492B

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	TR0479 VDB 11193
DATE RECEIVED:	06/26/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	07/10/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
26BB	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 07/10/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
EPA Method TO-15
GeoSyntec Consultants
Workorder# 1706492B

Sixteen 1 Liter Summa Canister samples were received on June 26, 2017. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A signature, date, and time were not provided by the field sampler.

The Chain of Custody (COC) information for sample B11193-062017-SSV-4-22-DUP did not match the entry on the sample tag with regard to sample identification. The information on the sample tag was used to process and report the sample.

Sample B11193-062117-SSV-8-65 was included twice on the Chain of Custody (COC). The sample information listed on the second page of the COC only was used to process and report the sample. The sample listing on the third page was not included in the workorder.

Analytical Notes

Dilution was performed on samples B11193-061917-SSV-2-22, B11193-062017-SSV-3-22, B11193-062017-SSV-4-22, B11193-062017-SSV-4-22-DUP, B11193-062017-SSV-5-59, B11193-062017-SSV-1-44, B11193-062117-SSV-6-59, B11193-062117-SSV-7-65, B11193-062117-SSV-8-65, B11193-062217-SVP1SS, B11193-062217-SVP3SS, B11193-062217-SSPE3, B11193-062217-SVP4SS, B11193-062217-SVP2SS and B11193-062117-SSV-9-58 due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates

as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: B11193-061917-SSV-2-22

Lab ID#: 1706492B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	14	75	55	300
Trichloroethene	14	73	74	390
Tetrachloroethene	14	3600	94	25000

Client Sample ID: B11193-062017-SSV-3-22

Lab ID#: 1706492B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	14	61	54	240
Trichloroethene	14	56	74	300
Tetrachloroethene	14	3300	93	22000

Client Sample ID: B11193-062017-SSV-4-22

Lab ID#: 1706492B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	21	60	83	240
Trichloroethene	21	58	110	310
Tetrachloroethene	21	4000	140	27000

Client Sample ID: B11193-062017-SSV-4-22-DUP

Lab ID#: 1706492B-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	21	56	82	220
Trichloroethene	21	58	110	310
Tetrachloroethene	21	3900	140	27000

Client Sample ID: B11193-062017-SSV-5-59

Lab ID#: 1706492B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: B11193-062017-SSV-5-59

Lab ID#: 1706492B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	14	67	54	270
Trichloroethene	14	58	73	310
Tetrachloroethene	14	4100	92	28000

Client Sample ID: B11193-062017-SSV-1-44

Lab ID#: 1706492B-10A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	15	74	58	290
Trichloroethene	15	76	78	410
Tetrachloroethene	15	3900	99	26000

Client Sample ID: B11193-062117-SSV-6-59

Lab ID#: 1706492B-11A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	14	44	56	170
Trichloroethene	14	41	76	220
Tetrachloroethene	14	3200	96	21000

Client Sample ID: B11193-062117-SSV-7-65

Lab ID#: 1706492B-12A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	15	47	58	180
Trichloroethene	15	39	79	210
Tetrachloroethene	15	3100	100	21000

Client Sample ID: B11193-062117-SSV-8-65

Lab ID#: 1706492B-13A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: B11193-062117-SSV-8-65

Lab ID#: 1706492B-13A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	11	44	44	170
Trichloroethene	11	39	60	210
Tetrachloroethene	11	2900	76	20000

Client Sample ID: B11193-062217-SVP1SS

Lab ID#: 1706492B-14A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	2.2	3.0	8.7	12
Trichloroethene	2.2	15	12	82
Tetrachloroethene	2.2	620	15	4200

Client Sample ID: B11193-062217-SVP3SS

Lab ID#: 1706492B-15A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	29	290	110	1200
cis-1,2-Dichloroethene	29	4700	110	19000
Trichloroethene	29	660	150	3600
Tetrachloroethene	29	29000	200	190000

Client Sample ID: B11193-062217-SSPE3

Lab ID#: 1706492B-16A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
trans-1,2-Dichloroethene	13	59	50	240
cis-1,2-Dichloroethene	13	850	50	3400
Trichloroethene	13	420	68	2200
Tetrachloroethene	13	15000	86	100000

Client Sample ID: B11193-062217-SVP4SS

Lab ID#: 1706492B-17A

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: B11193-062217-SVP4SS

Lab ID#: 1706492B-17A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	64	650	250	2600
Trichloroethene	64	410	340	2200
1,1,2-Trichloroethane	64	390	350	2100
Tetrachloroethene	64	50000	430	340000

Client Sample ID: B11193-062217-SSPN2

Lab ID#: 1706492B-18A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	1.4	6.6	5.7	26
Trichloroethene	1.4	5.0	7.8	27
Tetrachloroethene	1.4	87	9.8	590

Client Sample ID: B11193-062217-SVP2SS

Lab ID#: 1706492B-19A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrachloroethene	9.0	1800	61	12000

Client Sample ID: B11193-062117-SSV-9-58

Lab ID#: 1706492B-23A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	11	40	44	160
Trichloroethene	11	33	60	180
Tetrachloroethene	11	2400	76	16000

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Client Sample ID: B11193-061917-SSV-2-22

Lab ID#: 1706492B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062810**	**Date of Collection:**	**6/19/17 5:48:00 PM**
Dil. Factor:	**27.6**	**Date of Analysis:**	**6/28/17 04:42 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	14	Not Detected	68	Not Detected
Freon 114	14	Not Detected	96	Not Detected
Chloromethane	140	Not Detected	280	Not Detected
Vinyl Chloride	14	Not Detected	35	Not Detected
1,3-Butadiene	14	Not Detected	30	Not Detected
Bromomethane	140	Not Detected	540	Not Detected
Chloroethane	55	Not Detected	140	Not Detected
Freon 11	14	Not Detected	78	Not Detected
Ethanol	55	Not Detected	100	Not Detected
Freon 113	14	Not Detected	100	Not Detected
1,1-Dichloroethene	14	Not Detected	55	Not Detected
Acetone	140	Not Detected	330	Not Detected
2-Propanol	55	Not Detected	140	Not Detected
Carbon Disulfide	55	Not Detected	170	Not Detected
3-Chloropropene	55	Not Detected	170	Not Detected
Methylene Chloride	140	Not Detected	480	Not Detected
Methyl tert-butyl ether	55	Not Detected	200	Not Detected
trans-1,2-Dichloroethene	14	Not Detected	55	Not Detected
Hexane	14	Not Detected	49	Not Detected
1,1-Dichloroethane	14	Not Detected	56	Not Detected
2-Butanone (Methyl Ethyl Ketone)	55	Not Detected	160	Not Detected
cis-1,2-Dichloroethene	14	75	55	300
Tetrahydrofuran	14	Not Detected	41	Not Detected
Chloroform	14	Not Detected	67	Not Detected
1,1,1-Trichloroethane	14	Not Detected	75	Not Detected
Cyclohexane	14	Not Detected	48	Not Detected
Carbon Tetrachloride	14	Not Detected	87	Not Detected
2,2,4-Trimethylpentane	14	Not Detected	64	Not Detected
Benzene	14	Not Detected	44	Not Detected
1,2-Dichloroethane	14	Not Detected	56	Not Detected
Heptane	14	Not Detected	56	Not Detected
Trichloroethene	14	73	74	390
1,2-Dichloropropane	14	Not Detected	64	Not Detected
1,4-Dioxane	55	Not Detected	200	Not Detected
Bromodichloromethane	14	Not Detected	92	Not Detected
cis-1,3-Dichloropropene	14	Not Detected	63	Not Detected
4-Methyl-2-pentanone	14	Not Detected	56	Not Detected
Toluene	14	Not Detected	52	Not Detected
trans-1,3-Dichloropropene	14	Not Detected	63	Not Detected
1,1,2-Trichloroethane	14	Not Detected	75	Not Detected
Tetrachloroethene	14	3600	94	25000
2-Hexanone	55	Not Detected	230	Not Detected

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Client Sample ID: B11193-061917-SSV-2-22

Lab ID#: 1706492B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062810**	**Date of Collection: 6/19/17 5:48:00 PM**	
Dil. Factor:	**27.6**	**Date of Analysis: 6/28/17 04:42 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	14	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	14	Not Detected	110	Not Detected
Chlorobenzene	14	Not Detected	64	Not Detected
Ethyl Benzene	14	Not Detected	60	Not Detected
m,p-Xylene	14	Not Detected	60	Not Detected
o-Xylene	14	Not Detected	60	Not Detected
Styrene	14	Not Detected	59	Not Detected
Bromoform	14	Not Detected	140	Not Detected
Cumene	14	Not Detected	68	Not Detected
1,1,2,2-Tetrachloroethane	14	Not Detected	95	Not Detected
Propylbenzene	14	Not Detected	68	Not Detected
4-Ethyltoluene	14	Not Detected	68	Not Detected
1,3,5-Trimethylbenzene	14	Not Detected	68	Not Detected
1,2,4-Trimethylbenzene	14	Not Detected	68	Not Detected
1,3-Dichlorobenzene	14	Not Detected	83	Not Detected
1,4-Dichlorobenzene	14	Not Detected	83	Not Detected
alpha-Chlorotoluene	14	Not Detected	71	Not Detected
1,2-Dichlorobenzene	14	Not Detected	83	Not Detected
1,2,4-Trichlorobenzene	55	Not Detected	410	Not Detected
Hexachlorobutadiene	55	Not Detected	590	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	97	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: B11193-062017-SSV-3-22

Lab ID#: 1706492B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062811**	**Date of Collection:**	**6/20/17 8:52:00 AM**
Dil. Factor:	**27.5**	**Date of Analysis:**	**6/28/17 05:06 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	14	Not Detected	68	Not Detected
Freon 114	14	Not Detected	96	Not Detected
Chloromethane	140	Not Detected	280	Not Detected
Vinyl Chloride	14	Not Detected	35	Not Detected
1,3-Butadiene	14	Not Detected	30	Not Detected
Bromomethane	140	Not Detected	530	Not Detected
Chloroethane	55	Not Detected	140	Not Detected
Freon 11	14	Not Detected	77	Not Detected
Ethanol	55	Not Detected	100	Not Detected
Freon 113	14	Not Detected	100	Not Detected
1,1-Dichloroethene	14	Not Detected	54	Not Detected
Acetone	140	Not Detected	330	Not Detected
2-Propanol	55	Not Detected	140	Not Detected
Carbon Disulfide	55	Not Detected	170	Not Detected
3-Chloropropene	55	Not Detected	170	Not Detected
Methylene Chloride	140	Not Detected	480	Not Detected
Methyl tert-butyl ether	55	Not Detected	200	Not Detected
trans-1,2-Dichloroethene	14	Not Detected	54	Not Detected
Hexane	14	Not Detected	48	Not Detected
1,1-Dichloroethane	14	Not Detected	56	Not Detected
2-Butanone (Methyl Ethyl Ketone)	55	Not Detected	160	Not Detected
cis-1,2-Dichloroethene	14	61	54	240
Tetrahydrofuran	14	Not Detected	40	Not Detected
Chloroform	14	Not Detected	67	Not Detected
1,1,1-Trichloroethane	14	Not Detected	75	Not Detected
Cyclohexane	14	Not Detected	47	Not Detected
Carbon Tetrachloride	14	Not Detected	86	Not Detected
2,2,4-Trimethylpentane	14	Not Detected	64	Not Detected
Benzene	14	Not Detected	44	Not Detected
1,2-Dichloroethane	14	Not Detected	56	Not Detected
Heptane	14	Not Detected	56	Not Detected
Trichloroethene	14	56	74	300
1,2-Dichloropropane	14	Not Detected	64	Not Detected
1,4-Dioxane	55	Not Detected	200	Not Detected
Bromodichloromethane	14	Not Detected	92	Not Detected
cis-1,3-Dichloropropene	14	Not Detected	62	Not Detected
4-Methyl-2-pentanone	14	Not Detected	56	Not Detected
Toluene	14	Not Detected	52	Not Detected
trans-1,3-Dichloropropene	14	Not Detected	62	Not Detected
1,1,2-Trichloroethane	14	Not Detected	75	Not Detected
Tetrachloroethene	14	3300	93	22000
2-Hexanone	55	Not Detected	220	Not Detected

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Client Sample ID: B11193-062017-SSV-3-22

Lab ID#: 1706492B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062811**	**Date of Collection:**	**6/20/17 8:52:00 AM**
Dil. Factor:	**27.5**	**Date of Analysis:**	**6/28/17 05:06 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	14	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	14	Not Detected	100	Not Detected
Chlorobenzene	14	Not Detected	63	Not Detected
Ethyl Benzene	14	Not Detected	60	Not Detected
m,p-Xylene	14	Not Detected	60	Not Detected
o-Xylene	14	Not Detected	60	Not Detected
Styrene	14	Not Detected	58	Not Detected
Bromoform	14	Not Detected	140	Not Detected
Cumene	14	Not Detected	68	Not Detected
1,1,2,2-Tetrachloroethane	14	Not Detected	94	Not Detected
Propylbenzene	14	Not Detected	68	Not Detected
4-Ethyltoluene	14	Not Detected	68	Not Detected
1,3,5-Trimethylbenzene	14	Not Detected	68	Not Detected
1,2,4-Trimethylbenzene	14	Not Detected	68	Not Detected
1,3-Dichlorobenzene	14	Not Detected	83	Not Detected
1,4-Dichlorobenzene	14	Not Detected	83	Not Detected
alpha-Chlorotoluene	14	Not Detected	71	Not Detected
1,2-Dichlorobenzene	14	Not Detected	83	Not Detected
1,2,4-Trichlorobenzene	55	Not Detected	410	Not Detected
Hexachlorobutadiene	55	Not Detected	590	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062017-SSV-4-22

Lab ID#: 1706492B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062814**	**Date of Collection:**	**6/20/17 2:48:00 PM**
Dil. Factor:	**41.7**	**Date of Analysis:**	**6/28/17 06:17 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	21	Not Detected	100	Not Detected
Freon 114	21	Not Detected	140	Not Detected
Chloromethane	210	Not Detected	430	Not Detected
Vinyl Chloride	21	Not Detected	53	Not Detected
1,3-Butadiene	21	Not Detected	46	Not Detected
Bromomethane	210	Not Detected	810	Not Detected
Chloroethane	83	Not Detected	220	Not Detected
Freon 11	21	Not Detected	120	Not Detected
Ethanol	83	Not Detected	160	Not Detected
Freon 113	21	Not Detected	160	Not Detected
1,1-Dichloroethene	21	Not Detected	83	Not Detected
Acetone	210	Not Detected	500	Not Detected
2-Propanol	83	Not Detected	200	Not Detected
Carbon Disulfide	83	Not Detected	260	Not Detected
3-Chloropropene	83	Not Detected	260	Not Detected
Methylene Chloride	210	Not Detected	720	Not Detected
Methyl tert-butyl ether	83	Not Detected	300	Not Detected
trans-1,2-Dichloroethene	21	Not Detected	83	Not Detected
Hexane	21	Not Detected	73	Not Detected
1,1-Dichloroethane	21	Not Detected	84	Not Detected
2-Butanone (Methyl Ethyl Ketone)	83	Not Detected	240	Not Detected
cis-1,2-Dichloroethene	21	60	83	240
Tetrahydrofuran	21	Not Detected	61	Not Detected
Chloroform	21	Not Detected	100	Not Detected
1,1,1-Trichloroethane	21	Not Detected	110	Not Detected
Cyclohexane	21	Not Detected	72	Not Detected
Carbon Tetrachloride	21	Not Detected	130	Not Detected
2,2,4-Trimethylpentane	21	Not Detected	97	Not Detected
Benzene	21	Not Detected	67	Not Detected
1,2-Dichloroethane	21	Not Detected	84	Not Detected
Heptane	21	Not Detected	85	Not Detected
Trichloroethene	21	58	110	310
1,2-Dichloropropane	21	Not Detected	96	Not Detected
1,4-Dioxane	83	Not Detected	300	Not Detected
Bromodichloromethane	21	Not Detected	140	Not Detected
cis-1,3-Dichloropropene	21	Not Detected	95	Not Detected
4-Methyl-2-pentanone	21	Not Detected	85	Not Detected
Toluene	21	Not Detected	78	Not Detected
trans-1,3-Dichloropropene	21	Not Detected	95	Not Detected
1,1,2-Trichloroethane	21	Not Detected	110	Not Detected
Tetrachloroethene	21	4000	140	27000
2-Hexanone	83	Not Detected	340	Not Detected

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Client Sample ID: B11193-062017-SSV-4-22

Lab ID#: 1706492B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062814**	**Date of Collection:**	**6/20/17 2:48:00 PM**
Dil. Factor:	**41.7**	**Date of Analysis:**	**6/28/17 06:17 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	21	Not Detected	180	Not Detected
1,2-Dibromoethane (EDB)	21	Not Detected	160	Not Detected
Chlorobenzene	21	Not Detected	96	Not Detected
Ethyl Benzene	21	Not Detected	90	Not Detected
m,p-Xylene	21	Not Detected	90	Not Detected
o-Xylene	21	Not Detected	90	Not Detected
Styrene	21	Not Detected	89	Not Detected
Bromoform	21	Not Detected	220	Not Detected
Cumene	21	Not Detected	100	Not Detected
1,1,2,2-Tetrachloroethane	21	Not Detected	140	Not Detected
Propylbenzene	21	Not Detected	100	Not Detected
4-Ethyltoluene	21	Not Detected	100	Not Detected
1,3,5-Trimethylbenzene	21	Not Detected	100	Not Detected
1,2,4-Trimethylbenzene	21	Not Detected	100	Not Detected
1,3-Dichlorobenzene	21	Not Detected	120	Not Detected
1,4-Dichlorobenzene	21	Not Detected	120	Not Detected
alpha-Chlorotoluene	21	Not Detected	110	Not Detected
1,2-Dichlorobenzene	21	Not Detected	120	Not Detected
1,2,4-Trichlorobenzene	83	Not Detected	620	Not Detected
Hexachlorobutadiene	83	Not Detected	890	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: B11193-062017-SSV-4-22-DUP

Lab ID#: 1706492B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062815**	**Date of Collection:**	**6/20/17 2:48:00 PM**
Dil. Factor:	**41.5**	**Date of Analysis:**	**6/28/17 06:40 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	21	Not Detected	100	Not Detected
Freon 114	21	Not Detected	140	Not Detected
Chloromethane	210	Not Detected	430	Not Detected
Vinyl Chloride	21	Not Detected	53	Not Detected
1,3-Butadiene	21	Not Detected	46	Not Detected
Bromomethane	210	Not Detected	800	Not Detected
Chloroethane	83	Not Detected	220	Not Detected
Freon 11	21	Not Detected	120	Not Detected
Ethanol	83	Not Detected	160	Not Detected
Freon 113	21	Not Detected	160	Not Detected
1,1-Dichloroethene	21	Not Detected	82	Not Detected
Acetone	210	Not Detected	490	Not Detected
2-Propanol	83	Not Detected	200	Not Detected
Carbon Disulfide	83	Not Detected	260	Not Detected
3-Chloropropene	83	Not Detected	260	Not Detected
Methylene Chloride	210	Not Detected	720	Not Detected
Methyl tert-butyl ether	83	Not Detected	300	Not Detected
trans-1,2-Dichloroethene	21	Not Detected	82	Not Detected
Hexane	21	Not Detected	73	Not Detected
1,1-Dichloroethane	21	Not Detected	84	Not Detected
2-Butanone (Methyl Ethyl Ketone)	83	Not Detected	240	Not Detected
cis-1,2-Dichloroethene	21	56	82	220
Tetrahydrofuran	21	Not Detected	61	Not Detected
Chloroform	21	Not Detected	100	Not Detected
1,1,1-Trichloroethane	21	Not Detected	110	Not Detected
Cyclohexane	21	Not Detected	71	Not Detected
Carbon Tetrachloride	21	Not Detected	130	Not Detected
2,2,4-Trimethylpentane	21	Not Detected	97	Not Detected
Benzene	21	Not Detected	66	Not Detected
1,2-Dichloroethane	21	Not Detected	84	Not Detected
Heptane	21	Not Detected	85	Not Detected
Trichloroethene	21	58	110	310
1,2-Dichloropropane	21	Not Detected	96	Not Detected
1,4-Dioxane	83	Not Detected	300	Not Detected
Bromodichloromethane	21	Not Detected	140	Not Detected
cis-1,3-Dichloropropene	21	Not Detected	94	Not Detected
4-Methyl-2-pentanone	21	Not Detected	85	Not Detected
Toluene	21	Not Detected	78	Not Detected
trans-1,3-Dichloropropene	21	Not Detected	94	Not Detected
1,1,2-Trichloroethane	21	Not Detected	110	Not Detected
Tetrachloroethene	21	3900	140	27000
2-Hexanone	83	Not Detected	340	Not Detected

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Client Sample ID: B11193-062017-SSV-4-22-DUP

Lab ID#: 1706492B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062815**	**Date of Collection: 6/20/17 2:48:00 PM**	
Dil. Factor:	**41.5**	**Date of Analysis: 6/28/17 06:40 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	21	Not Detected	180	Not Detected
1,2-Dibromoethane (EDB)	21	Not Detected	160	Not Detected
Chlorobenzene	21	Not Detected	96	Not Detected
Ethyl Benzene	21	Not Detected	90	Not Detected
m,p-Xylene	21	Not Detected	90	Not Detected
o-Xylene	21	Not Detected	90	Not Detected
Styrene	21	Not Detected	88	Not Detected
Bromoform	21	Not Detected	210	Not Detected
Cumene	21	Not Detected	100	Not Detected
1,1,2,2-Tetrachloroethane	21	Not Detected	140	Not Detected
Propylbenzene	21	Not Detected	100	Not Detected
4-Ethyltoluene	21	Not Detected	100	Not Detected
1,3,5-Trimethylbenzene	21	Not Detected	100	Not Detected
1,2,4-Trimethylbenzene	21	Not Detected	100	Not Detected
1,3-Dichlorobenzene	21	Not Detected	120	Not Detected
1,4-Dichlorobenzene	21	Not Detected	120	Not Detected
alpha-Chlorotoluene	21	Not Detected	110	Not Detected
1,2-Dichlorobenzene	21	Not Detected	120	Not Detected
1,2,4-Trichlorobenzene	83	Not Detected	620	Not Detected
Hexachlorobutadiene	83	Not Detected	880	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-062017-SSV-5-59

Lab ID#: 1706492B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062812**	**Date of Collection:**	**6/20/17 4:02:00 PM**
Dil. Factor:	**27.2**	**Date of Analysis:**	**6/28/17 05:30 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	14	Not Detected	67	Not Detected
Freon 114	14	Not Detected	95	Not Detected
Chloromethane	140	Not Detected	280	Not Detected
Vinyl Chloride	14	Not Detected	35	Not Detected
1,3-Butadiene	14	Not Detected	30	Not Detected
Bromomethane	140	Not Detected	530	Not Detected
Chloroethane	54	Not Detected	140	Not Detected
Freon 11	14	Not Detected	76	Not Detected
Ethanol	54	Not Detected	100	Not Detected
Freon 113	14	Not Detected	100	Not Detected
1,1-Dichloroethene	14	Not Detected	54	Not Detected
Acetone	140	Not Detected	320	Not Detected
2-Propanol	54	Not Detected	130	Not Detected
Carbon Disulfide	54	Not Detected	170	Not Detected
3-Chloropropene	54	Not Detected	170	Not Detected
Methylene Chloride	140	Not Detected	470	Not Detected
Methyl tert-butyl ether	54	Not Detected	200	Not Detected
trans-1,2-Dichloroethene	14	Not Detected	54	Not Detected
Hexane	14	Not Detected	48	Not Detected
1,1-Dichloroethane	14	Not Detected	55	Not Detected
2-Butanone (Methyl Ethyl Ketone)	54	Not Detected	160	Not Detected
cis-1,2-Dichloroethene	14	67	54	270
Tetrahydrofuran	14	Not Detected	40	Not Detected
Chloroform	14	Not Detected	66	Not Detected
1,1,1-Trichloroethane	14	Not Detected	74	Not Detected
Cyclohexane	14	Not Detected	47	Not Detected
Carbon Tetrachloride	14	Not Detected	86	Not Detected
2,2,4-Trimethylpentane	14	Not Detected	64	Not Detected
Benzene	14	Not Detected	43	Not Detected
1,2-Dichloroethane	14	Not Detected	55	Not Detected
Heptane	14	Not Detected	56	Not Detected
Trichloroethene	14	58	73	310
1,2-Dichloropropane	14	Not Detected	63	Not Detected
1,4-Dioxane	54	Not Detected	200	Not Detected
Bromodichloromethane	14	Not Detected	91	Not Detected
cis-1,3-Dichloropropene	14	Not Detected	62	Not Detected
4-Methyl-2-pentanone	14	Not Detected	56	Not Detected
Toluene	14	Not Detected	51	Not Detected
trans-1,3-Dichloropropene	14	Not Detected	62	Not Detected
1,1,2-Trichloroethane	14	Not Detected	74	Not Detected
Tetrachloroethene	14	4100	92	28000
2-Hexanone	54	Not Detected	220	Not Detected

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Client Sample ID: B11193-062017-SSV-5-59

Lab ID#: 1706492B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062812**	**Date of Collection:**	**6/20/17 4:02:00 PM**
Dil. Factor:	**27.2**	**Date of Analysis:**	**6/28/17 05:30 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	14	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	14	Not Detected	100	Not Detected
Chlorobenzene	14	Not Detected	63	Not Detected
Ethyl Benzene	14	Not Detected	59	Not Detected
m,p-Xylene	14	Not Detected	59	Not Detected
o-Xylene	14	Not Detected	59	Not Detected
Styrene	14	Not Detected	58	Not Detected
Bromoform	14	Not Detected	140	Not Detected
Cumene	14	Not Detected	67	Not Detected
1,1,2,2-Tetrachloroethane	14	Not Detected	93	Not Detected
Propylbenzene	14	Not Detected	67	Not Detected
4-Ethyltoluene	14	Not Detected	67	Not Detected
1,3,5-Trimethylbenzene	14	Not Detected	67	Not Detected
1,2,4-Trimethylbenzene	14	Not Detected	67	Not Detected
1,3-Dichlorobenzene	14	Not Detected	82	Not Detected
1,4-Dichlorobenzene	14	Not Detected	82	Not Detected
alpha-Chlorotoluene	14	Not Detected	70	Not Detected
1,2-Dichlorobenzene	14	Not Detected	82	Not Detected
1,2,4-Trichlorobenzene	54	Not Detected	400	Not Detected
Hexachlorobutadiene	54	Not Detected	580	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-062017-SSV-1-44

Lab ID#: 1706492B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062813**	**Date of Collection:**	**6/19/17 2:50:00 PM**
Dil. Factor:	**29.2**	**Date of Analysis:**	**6/28/17 05:54 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	15	Not Detected	72	Not Detected
Freon 114	15	Not Detected	100	Not Detected
Chloromethane	150	Not Detected	300	Not Detected
Vinyl Chloride	15	Not Detected	37	Not Detected
1,3-Butadiene	15	Not Detected	32	Not Detected
Bromomethane	150	Not Detected	570	Not Detected
Chloroethane	58	Not Detected	150	Not Detected
Freon 11	15	Not Detected	82	Not Detected
Ethanol	58	Not Detected	110	Not Detected
Freon 113	15	Not Detected	110	Not Detected
1,1-Dichloroethene	15	Not Detected	58	Not Detected
Acetone	150	Not Detected	350	Not Detected
2-Propanol	58	Not Detected	140	Not Detected
Carbon Disulfide	58	Not Detected	180	Not Detected
3-Chloropropene	58	Not Detected	180	Not Detected
Methylene Chloride	150	Not Detected	510	Not Detected
Methyl tert-butyl ether	58	Not Detected	210	Not Detected
trans-1,2-Dichloroethene	15	Not Detected	58	Not Detected
Hexane	15	Not Detected	51	Not Detected
1,1-Dichloroethane	15	Not Detected	59	Not Detected
2-Butanone (Methyl Ethyl Ketone)	58	Not Detected	170	Not Detected
cis-1,2-Dichloroethene	15	74	58	290
Tetrahydrofuran	15	Not Detected	43	Not Detected
Chloroform	15	Not Detected	71	Not Detected
1,1,1-Trichloroethane	15	Not Detected	80	Not Detected
Cyclohexane	15	Not Detected	50	Not Detected
Carbon Tetrachloride	15	Not Detected	92	Not Detected
2,2,4-Trimethylpentane	15	Not Detected	68	Not Detected
Benzene	15	Not Detected	47	Not Detected
1,2-Dichloroethane	15	Not Detected	59	Not Detected
Heptane	15	Not Detected	60	Not Detected
Trichloroethene	15	76	78	410
1,2-Dichloropropane	15	Not Detected	67	Not Detected
1,4-Dioxane	58	Not Detected	210	Not Detected
Bromodichloromethane	15	Not Detected	98	Not Detected
cis-1,3-Dichloropropene	15	Not Detected	66	Not Detected
4-Methyl-2-pentanone	15	Not Detected	60	Not Detected
Toluene	15	Not Detected	55	Not Detected
trans-1,3-Dichloropropene	15	Not Detected	66	Not Detected
1,1,2-Trichloroethane	15	Not Detected	80	Not Detected
Tetrachloroethene	15	3900	99	26000
2-Hexanone	58	Not Detected	240	Not Detected

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Client Sample ID: B11193-062017-SSV-1-44

Lab ID#: 1706492B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062813**	**Date of Collection:**	**6/19/17 2:50:00 PM**
Dil. Factor:	**29.2**	**Date of Analysis:**	**6/28/17 05:54 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	15	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	15	Not Detected	110	Not Detected
Chlorobenzene	15	Not Detected	67	Not Detected
Ethyl Benzene	15	Not Detected	63	Not Detected
m,p-Xylene	15	Not Detected	63	Not Detected
o-Xylene	15	Not Detected	63	Not Detected
Styrene	15	Not Detected	62	Not Detected
Bromoform	15	Not Detected	150	Not Detected
Cumene	15	Not Detected	72	Not Detected
1,1,2,2-Tetrachloroethane	15	Not Detected	100	Not Detected
Propylbenzene	15	Not Detected	72	Not Detected
4-Ethyltoluene	15	Not Detected	72	Not Detected
1,3,5-Trimethylbenzene	15	Not Detected	72	Not Detected
1,2,4-Trimethylbenzene	15	Not Detected	72	Not Detected
1,3-Dichlorobenzene	15	Not Detected	88	Not Detected
1,4-Dichlorobenzene	15	Not Detected	88	Not Detected
alpha-Chlorotoluene	15	Not Detected	76	Not Detected
1,2-Dichlorobenzene	15	Not Detected	88	Not Detected
1,2,4-Trichlorobenzene	58	Not Detected	430	Not Detected
Hexachlorobutadiene	58	Not Detected	620	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: B11193-062117-SSV-6-59

Lab ID#: 1706492B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062819**	**Date of Collection:**	**6/21/17 9:05:00 AM**
Dil. Factor:	**28.4**	**Date of Analysis:**	**6/28/17 09:55 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	14	Not Detected	70	Not Detected
Freon 114	14	Not Detected	99	Not Detected
Chloromethane	140	Not Detected	290	Not Detected
Vinyl Chloride	14	Not Detected	36	Not Detected
1,3-Butadiene	14	Not Detected	31	Not Detected
Bromomethane	140	Not Detected	550	Not Detected
Chloroethane	57	Not Detected	150	Not Detected
Freon 11	14	Not Detected	80	Not Detected
Ethanol	57	Not Detected	110	Not Detected
Freon 113	14	Not Detected	110	Not Detected
1,1-Dichloroethene	14	Not Detected	56	Not Detected
Acetone	140	Not Detected	340	Not Detected
2-Propanol	57	Not Detected	140	Not Detected
Carbon Disulfide	57	Not Detected	180	Not Detected
3-Chloropropene	57	Not Detected	180	Not Detected
Methylene Chloride	140	Not Detected	490	Not Detected
Methyl tert-butyl ether	57	Not Detected	200	Not Detected
trans-1,2-Dichloroethene	14	Not Detected	56	Not Detected
Hexane	14	Not Detected	50	Not Detected
1,1-Dichloroethane	14	Not Detected	57	Not Detected
2-Butanone (Methyl Ethyl Ketone)	57	Not Detected	170	Not Detected
cis-1,2-Dichloroethene	14	44	56	170
Tetrahydrofuran	14	Not Detected	42	Not Detected
Chloroform	14	Not Detected	69	Not Detected
1,1,1-Trichloroethane	14	Not Detected	77	Not Detected
Cyclohexane	14	Not Detected	49	Not Detected
Carbon Tetrachloride	14	Not Detected	89	Not Detected
2,2,4-Trimethylpentane	14	Not Detected	66	Not Detected
Benzene	14	Not Detected	45	Not Detected
1,2-Dichloroethane	14	Not Detected	57	Not Detected
Heptane	14	Not Detected	58	Not Detected
Trichloroethene	14	41	76	220
1,2-Dichloropropane	14	Not Detected	66	Not Detected
1,4-Dioxane	57	Not Detected	200	Not Detected
Bromodichloromethane	14	Not Detected	95	Not Detected
cis-1,3-Dichloropropene	14	Not Detected	64	Not Detected
4-Methyl-2-pentanone	14	Not Detected	58	Not Detected
Toluene	14	Not Detected	54	Not Detected
trans-1,3-Dichloropropene	14	Not Detected	64	Not Detected
1,1,2-Trichloroethane	14	Not Detected	77	Not Detected
Tetrachloroethene	14	3200	96	21000
2-Hexanone	57	Not Detected	230	Not Detected

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Client Sample ID: B11193-062117-SSV-6-59

Lab ID#: 1706492B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062819**	**Date of Collection:**	**6/21/17 9:05:00 AM**
Dil. Factor:	**28.4**	**Date of Analysis:**	**6/28/17 09:55 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	14	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	14	Not Detected	110	Not Detected
Chlorobenzene	14	Not Detected	65	Not Detected
Ethyl Benzene	14	Not Detected	62	Not Detected
m,p-Xylene	14	Not Detected	62	Not Detected
o-Xylene	14	Not Detected	62	Not Detected
Styrene	14	Not Detected	60	Not Detected
Bromoform	14	Not Detected	150	Not Detected
Cumene	14	Not Detected	70	Not Detected
1,1,2,2-Tetrachloroethane	14	Not Detected	97	Not Detected
Propylbenzene	14	Not Detected	70	Not Detected
4-Ethyltoluene	14	Not Detected	70	Not Detected
1,3,5-Trimethylbenzene	14	Not Detected	70	Not Detected
1,2,4-Trimethylbenzene	14	Not Detected	70	Not Detected
1,3-Dichlorobenzene	14	Not Detected	85	Not Detected
1,4-Dichlorobenzene	14	Not Detected	85	Not Detected
alpha-Chlorotoluene	14	Not Detected	74	Not Detected
1,2-Dichlorobenzene	14	Not Detected	85	Not Detected
1,2,4-Trichlorobenzene	57	Not Detected	420	Not Detected
Hexachlorobutadiene	57	Not Detected	600	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062117-SSV-7-65

Lab ID#: 1706492B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062820**	**Date of Collection:**	**6/21/17 12:10:00 PM**
Dil. Factor:	**29.5**	**Date of Analysis:**	**6/28/17 10:20 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	15	Not Detected	73	Not Detected
Freon 114	15	Not Detected	100	Not Detected
Chloromethane	150	Not Detected	300	Not Detected
Vinyl Chloride	15	Not Detected	38	Not Detected
1,3-Butadiene	15	Not Detected	33	Not Detected
Bromomethane	150	Not Detected	570	Not Detected
Chloroethane	59	Not Detected	160	Not Detected
Freon 11	15	Not Detected	83	Not Detected
Ethanol	59	Not Detected	110	Not Detected
Freon 113	15	Not Detected	110	Not Detected
1,1-Dichloroethene	15	Not Detected	58	Not Detected
Acetone	150	Not Detected	350	Not Detected
2-Propanol	59	Not Detected	140	Not Detected
Carbon Disulfide	59	Not Detected	180	Not Detected
3-Chloropropene	59	Not Detected	180	Not Detected
Methylene Chloride	150	Not Detected	510	Not Detected
Methyl tert-butyl ether	59	Not Detected	210	Not Detected
trans-1,2-Dichloroethene	15	Not Detected	58	Not Detected
Hexane	15	Not Detected	52	Not Detected
1,1-Dichloroethane	15	Not Detected	60	Not Detected
2-Butanone (Methyl Ethyl Ketone)	59	Not Detected	170	Not Detected
cis-1,2-Dichloroethene	15	47	58	180
Tetrahydrofuran	15	Not Detected	43	Not Detected
Chloroform	15	Not Detected	72	Not Detected
1,1,1-Trichloroethane	15	Not Detected	80	Not Detected
Cyclohexane	15	Not Detected	51	Not Detected
Carbon Tetrachloride	15	Not Detected	93	Not Detected
2,2,4-Trimethylpentane	15	Not Detected	69	Not Detected
Benzene	15	Not Detected	47	Not Detected
1,2-Dichloroethane	15	Not Detected	60	Not Detected
Heptane	15	Not Detected	60	Not Detected
Trichloroethene	15	39	79	210
1,2-Dichloropropane	15	Not Detected	68	Not Detected
1,4-Dioxane	59	Not Detected	210	Not Detected
Bromodichloromethane	15	Not Detected	99	Not Detected
cis-1,3-Dichloropropene	15	Not Detected	67	Not Detected
4-Methyl-2-pentanone	15	Not Detected	60	Not Detected
Toluene	15	Not Detected	56	Not Detected
trans-1,3-Dichloropropene	15	Not Detected	67	Not Detected
1,1,2-Trichloroethane	15	Not Detected	80	Not Detected
Tetrachloroethene	15	3100	100	21000
2-Hexanone	59	Not Detected	240	Not Detected

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Client Sample ID: B11193-062117-SSV-7-65

Lab ID#: 1706492B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062820**	**Date of Collection:**	**6/21/17 12:10:00 PM**
Dil. Factor:	**29.5**	**Date of Analysis:**	**6/28/17 10:20 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	15	Not Detected	120	Not Detected
1,2-Dibromoethane (EDB)	15	Not Detected	110	Not Detected
Chlorobenzene	15	Not Detected	68	Not Detected
Ethyl Benzene	15	Not Detected	64	Not Detected
m,p-Xylene	15	Not Detected	64	Not Detected
o-Xylene	15	Not Detected	64	Not Detected
Styrene	15	Not Detected	63	Not Detected
Bromoform	15	Not Detected	150	Not Detected
Cumene	15	Not Detected	72	Not Detected
1,1,2,2-Tetrachloroethane	15	Not Detected	100	Not Detected
Propylbenzene	15	Not Detected	72	Not Detected
4-Ethyltoluene	15	Not Detected	72	Not Detected
1,3,5-Trimethylbenzene	15	Not Detected	72	Not Detected
1,2,4-Trimethylbenzene	15	Not Detected	72	Not Detected
1,3-Dichlorobenzene	15	Not Detected	89	Not Detected
1,4-Dichlorobenzene	15	Not Detected	89	Not Detected
alpha-Chlorotoluene	15	Not Detected	76	Not Detected
1,2-Dichlorobenzene	15	Not Detected	89	Not Detected
1,2,4-Trichlorobenzene	59	Not Detected	440	Not Detected
Hexachlorobutadiene	59	Not Detected	630	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	88	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062117-SSV-8-65

Lab ID#: 1706492B-13A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062821**	**Date of Collection:**	**6/21/17 1:35:00 PM**
Dil. Factor:	**22.3**	**Date of Analysis:**	**6/28/17 10:44 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	55	Not Detected
Freon 114	11	Not Detected	78	Not Detected
Chloromethane	110	Not Detected	230	Not Detected
Vinyl Chloride	11	Not Detected	28	Not Detected
1,3-Butadiene	11	Not Detected	25	Not Detected
Bromomethane	110	Not Detected	430	Not Detected
Chloroethane	45	Not Detected	120	Not Detected
Freon 11	11	Not Detected	63	Not Detected
Ethanol	45	Not Detected	84	Not Detected
Freon 113	11	Not Detected	85	Not Detected
1,1-Dichloroethene	11	Not Detected	44	Not Detected
Acetone	110	Not Detected	260	Not Detected
2-Propanol	45	Not Detected	110	Not Detected
Carbon Disulfide	45	Not Detected	140	Not Detected
3-Chloropropene	45	Not Detected	140	Not Detected
Methylene Chloride	110	Not Detected	390	Not Detected
Methyl tert-butyl ether	45	Not Detected	160	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	44	Not Detected
Hexane	11	Not Detected	39	Not Detected
1,1-Dichloroethane	11	Not Detected	45	Not Detected
2-Butanone (Methyl Ethyl Ketone)	45	Not Detected	130	Not Detected
cis-1,2-Dichloroethene	11	44	44	170
Tetrahydrofuran	11	Not Detected	33	Not Detected
Chloroform	11	Not Detected	54	Not Detected
1,1,1-Trichloroethane	11	Not Detected	61	Not Detected
Cyclohexane	11	Not Detected	38	Not Detected
Carbon Tetrachloride	11	Not Detected	70	Not Detected
2,2,4-Trimethylpentane	11	Not Detected	52	Not Detected
Benzene	11	Not Detected	36	Not Detected
1,2-Dichloroethane	11	Not Detected	45	Not Detected
Heptane	11	Not Detected	46	Not Detected
Trichloroethene	11	39	60	210
1,2-Dichloropropane	11	Not Detected	52	Not Detected
1,4-Dioxane	45	Not Detected	160	Not Detected
Bromodichloromethane	11	Not Detected	75	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	51	Not Detected
4-Methyl-2-pentanone	11	Not Detected	46	Not Detected
Toluene	11	Not Detected	42	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	51	Not Detected
1,1,2-Trichloroethane	11	Not Detected	61	Not Detected
Tetrachloroethene	11	2900	76	20000
2-Hexanone	45	Not Detected	180	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-062117-SSV-8-65

Lab ID#: 1706492B-13A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062821**	**Date of Collection:**	**6/21/17 1:35:00 PM**
Dil. Factor:	**22.3**	**Date of Analysis:**	**6/28/17 10:44 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	11	Not Detected	95	Not Detected
1,2-Dibromoethane (EDB)	11	Not Detected	86	Not Detected
Chlorobenzene	11	Not Detected	51	Not Detected
Ethyl Benzene	11	Not Detected	48	Not Detected
m,p-Xylene	11	Not Detected	48	Not Detected
o-Xylene	11	Not Detected	48	Not Detected
Styrene	11	Not Detected	47	Not Detected
Bromoform	11	Not Detected	120	Not Detected
Cumene	11	Not Detected	55	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	76	Not Detected
Propylbenzene	11	Not Detected	55	Not Detected
4-Ethyltoluene	11	Not Detected	55	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	55	Not Detected
1,2,4-Trimethylbenzene	11	Not Detected	55	Not Detected
1,3-Dichlorobenzene	11	Not Detected	67	Not Detected
1,4-Dichlorobenzene	11	Not Detected	67	Not Detected
alpha-Chlorotoluene	11	Not Detected	58	Not Detected
1,2-Dichlorobenzene	11	Not Detected	67	Not Detected
1,2,4-Trichlorobenzene	45	Not Detected	330	Not Detected
Hexachlorobutadiene	45	Not Detected	480	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062217-SVP1SS

Lab ID#: 1706492B-14A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062822**	**Date of Collection: 6/22/17 12:04:00 PM**	
Dil. Factor:	**4.40**	**Date of Analysis: 6/28/17 11:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	2.2	Not Detected	11	Not Detected
Freon 114	2.2	Not Detected	15	Not Detected
Chloromethane	22	Not Detected	45	Not Detected
Vinyl Chloride	2.2	Not Detected	5.6	Not Detected
1,3-Butadiene	2.2	Not Detected	4.9	Not Detected
Bromomethane	22	Not Detected	85	Not Detected
Chloroethane	8.8	Not Detected	23	Not Detected
Freon 11	2.2	Not Detected	12	Not Detected
Ethanol	8.8	Not Detected	16	Not Detected
Freon 113	2.2	Not Detected	17	Not Detected
1,1-Dichloroethene	2.2	Not Detected	8.7	Not Detected
Acetone	22	Not Detected	52	Not Detected
2-Propanol	8.8	Not Detected	22	Not Detected
Carbon Disulfide	8.8	Not Detected	27	Not Detected
3-Chloropropene	8.8	Not Detected	28	Not Detected
Methylene Chloride	22	Not Detected	76	Not Detected
Methyl tert-butyl ether	8.8	Not Detected	32	Not Detected
trans-1,2-Dichloroethene	2.2	Not Detected	8.7	Not Detected
Hexane	2.2	Not Detected	7.8	Not Detected
1,1-Dichloroethane	2.2	Not Detected	8.9	Not Detected
2-Butanone (Methyl Ethyl Ketone)	8.8	Not Detected	26	Not Detected
cis-1,2-Dichloroethene	2.2	3.0	8.7	12
Tetrahydrofuran	2.2	Not Detected	6.5	Not Detected
Chloroform	2.2	Not Detected	11	Not Detected
1,1,1-Trichloroethane	2.2	Not Detected	12	Not Detected
Cyclohexane	2.2	Not Detected	7.6	Not Detected
Carbon Tetrachloride	2.2	Not Detected	14	Not Detected
2,2,4-Trimethylpentane	2.2	Not Detected	10	Not Detected
Benzene	2.2	Not Detected	7.0	Not Detected
1,2-Dichloroethane	2.2	Not Detected	8.9	Not Detected
Heptane	2.2	Not Detected	9.0	Not Detected
Trichloroethene	2.2	15	12	82
1,2-Dichloropropane	2.2	Not Detected	10	Not Detected
1,4-Dioxane	8.8	Not Detected	32	Not Detected
Bromodichloromethane	2.2	Not Detected	15	Not Detected
cis-1,3-Dichloropropene	2.2	Not Detected	10	Not Detected
4-Methyl-2-pentanone	2.2	Not Detected	9.0	Not Detected
Toluene	2.2	Not Detected	8.3	Not Detected
trans-1,3-Dichloropropene	2.2	Not Detected	10	Not Detected
1,1,2-Trichloroethane	2.2	Not Detected	12	Not Detected
Tetrachloroethene	2.2	620	15	4200
2-Hexanone	8.8	Not Detected	36	Not Detected

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Client Sample ID: B11193-062217-SVP1SS

Lab ID#: 1706492B-14A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062822**	**Date of Collection:**	**6/22/17 12:04:00 PM**
Dil. Factor:	**4.40**	**Date of Analysis:**	**6/28/17 11:07 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	2.2	Not Detected	19	Not Detected
1,2-Dibromoethane (EDB)	2.2	Not Detected	17	Not Detected
Chlorobenzene	2.2	Not Detected	10	Not Detected
Ethyl Benzene	2.2	Not Detected	9.6	Not Detected
m,p-Xylene	2.2	Not Detected	9.6	Not Detected
o-Xylene	2.2	Not Detected	9.6	Not Detected
Styrene	2.2	Not Detected	9.4	Not Detected
Bromoform	2.2	Not Detected	23	Not Detected
Cumene	2.2	Not Detected	11	Not Detected
1,1,2,2-Tetrachloroethane	2.2	Not Detected	15	Not Detected
Propylbenzene	2.2	Not Detected	11	Not Detected
4-Ethyltoluene	2.2	Not Detected	11	Not Detected
1,3,5-Trimethylbenzene	2.2	Not Detected	11	Not Detected
1,2,4-Trimethylbenzene	2.2	Not Detected	11	Not Detected
1,3-Dichlorobenzene	2.2	Not Detected	13	Not Detected
1,4-Dichlorobenzene	2.2	Not Detected	13	Not Detected
alpha-Chlorotoluene	2.2	Not Detected	11	Not Detected
1,2-Dichlorobenzene	2.2	Not Detected	13	Not Detected
1,2,4-Trichlorobenzene	8.8	Not Detected	65	Not Detected
Hexachlorobutadiene	8.8	Not Detected	94	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062217-SVP3SS

Lab ID#: 1706492B-15A

EPA METHOD TO-15 GC/MS

File Name:	**j062911**	**Date of Collection:**	**6/22/17 11:38:00 AM**
Dil. Factor:	**5.76**	**Date of Analysis:**	**6/29/17 03:53 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	29	Not Detected	140	Not Detected
Freon 114	29	Not Detected	200	Not Detected
Chloromethane	120	Not Detected	240	Not Detected
Vinyl Chloride	29	Not Detected	74	Not Detected
1,3-Butadiene	29	Not Detected	64	Not Detected
Bromomethane	120	Not Detected	450	Not Detected
Chloroethane	120	Not Detected	300	Not Detected
Freon 11	29	Not Detected	160	Not Detected
Ethanol	120	Not Detected	220	Not Detected
Freon 113	29	Not Detected	220	Not Detected
1,1-Dichloroethene	29	Not Detected	110	Not Detected
Acetone	120	Not Detected	270	Not Detected
2-Propanol	120	Not Detected	280	Not Detected
Carbon Disulfide	120	Not Detected	360	Not Detected
3-Chloropropene	120	Not Detected	360	Not Detected
Methylene Chloride	120	Not Detected	400	Not Detected
Methyl tert-butyl ether	29	Not Detected	100	Not Detected
trans-1,2-Dichloroethene	29	290	110	1200
Hexane	29	Not Detected	100	Not Detected
1,1-Dichloroethane	29	Not Detected	120	Not Detected
2-Butanone (Methyl Ethyl Ketone)	120	Not Detected	340	Not Detected
cis-1,2-Dichloroethene	29	4700	110	19000
Tetrahydrofuran	29	Not Detected	85	Not Detected
Chloroform	29	Not Detected	140	Not Detected
1,1,1-Trichloroethane	29	Not Detected	160	Not Detected
Cyclohexane	29	Not Detected	99	Not Detected
Carbon Tetrachloride	29	Not Detected	180	Not Detected
2,2,4-Trimethylpentane	29	Not Detected	130	Not Detected
Benzene	29	Not Detected	92	Not Detected
1,2-Dichloroethane	29	Not Detected	120	Not Detected
Heptane	29	Not Detected	120	Not Detected
Trichloroethene	29	660	150	3600
1,2-Dichloropropane	29	Not Detected	130	Not Detected
1,4-Dioxane	120	Not Detected	420	Not Detected
Bromodichloromethane	29	Not Detected	190	Not Detected
cis-1,3-Dichloropropene	29	Not Detected	130	Not Detected
4-Methyl-2-pentanone	29	Not Detected	120	Not Detected
Toluene	29	Not Detected	110	Not Detected
trans-1,3-Dichloropropene	29	Not Detected	130	Not Detected
1,1,2-Trichloroethane	29	Not Detected	160	Not Detected
Tetrachloroethene	29	29000	200	190000
2-Hexanone	120	Not Detected	470	Not Detected

eurofins | Air Toxics

Client Sample ID: B11193-062217-SVP3SS

Lab ID#: 1706492B-15A

EPA METHOD TO-15 GC/MS

File Name:	**j062911**	**Date of Collection:**	**6/22/17 11:38:00 AM**
Dil. Factor:	**5.76**	**Date of Analysis:**	**6/29/17 03:53 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	29	Not Detected	240	Not Detected
1,2-Dibromoethane (EDB)	29	Not Detected	220	Not Detected
Chlorobenzene	29	Not Detected	130	Not Detected
Ethyl Benzene	29	Not Detected	120	Not Detected
m,p-Xylene	29	Not Detected	120	Not Detected
o-Xylene	29	Not Detected	120	Not Detected
Styrene	29	Not Detected	120	Not Detected
Bromoform	29	Not Detected	300	Not Detected
Cumene	29	Not Detected	140	Not Detected
1,1,2,2-Tetrachloroethane	29	Not Detected	200	Not Detected
Propylbenzene	29	Not Detected	140	Not Detected
4-Ethyltoluene	29	Not Detected	140	Not Detected
1,3,5-Trimethylbenzene	29	Not Detected	140	Not Detected
1,2,4-Trimethylbenzene	29	Not Detected	140	Not Detected
1,3-Dichlorobenzene	29	Not Detected	170	Not Detected
1,4-Dichlorobenzene	29	Not Detected	170	Not Detected
alpha-Chlorotoluene	29	Not Detected	150	Not Detected
1,2-Dichlorobenzene	29	Not Detected	170	Not Detected
1,2,4-Trichlorobenzene	120	Not Detected	850	Not Detected
Hexachlorobutadiene	120	Not Detected	1200	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	97	70-130

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Client Sample ID: B11193-062217-SSPE3

Lab ID#: 1706492B-16A

EPA METHOD TO-15 GC/MS

File Name:	**j062912**	**Date of Collection: 6/22/17 11:47:00 AM**	
Dil. Factor:	**2.55**	**Date of Analysis: 6/29/17 04:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	13	Not Detected	63	Not Detected
Freon 114	13	Not Detected	89	Not Detected
Chloromethane	51	Not Detected	100	Not Detected
Vinyl Chloride	13	Not Detected	32	Not Detected
1,3-Butadiene	13	Not Detected	28	Not Detected
Bromomethane	51	Not Detected	200	Not Detected
Chloroethane	51	Not Detected	130	Not Detected
Freon 11	13	Not Detected	72	Not Detected
Ethanol	51	Not Detected	96	Not Detected
Freon 113	13	Not Detected	98	Not Detected
1,1-Dichloroethene	13	Not Detected	50	Not Detected
Acetone	51	Not Detected	120	Not Detected
2-Propanol	51	Not Detected	120	Not Detected
Carbon Disulfide	51	Not Detected	160	Not Detected
3-Chloropropene	51	Not Detected	160	Not Detected
Methylene Chloride	51	Not Detected	180	Not Detected
Methyl tert-butyl ether	13	Not Detected	46	Not Detected
trans-1,2-Dichloroethene	13	59	50	240
Hexane	13	Not Detected	45	Not Detected
1,1-Dichloroethane	13	Not Detected	52	Not Detected
2-Butanone (Methyl Ethyl Ketone)	51	Not Detected	150	Not Detected
cis-1,2-Dichloroethene	13	850	50	3400
Tetrahydrofuran	13	Not Detected	38	Not Detected
Chloroform	13	Not Detected	62	Not Detected
1,1,1-Trichloroethane	13	Not Detected	70	Not Detected
Cyclohexane	13	Not Detected	44	Not Detected
Carbon Tetrachloride	13	Not Detected	80	Not Detected
2,2,4-Trimethylpentane	13	Not Detected	60	Not Detected
Benzene	13	Not Detected	41	Not Detected
1,2-Dichloroethane	13	Not Detected	52	Not Detected
Heptane	13	Not Detected	52	Not Detected
Trichloroethene	13	420	68	2200
1,2-Dichloropropane	13	Not Detected	59	Not Detected
1,4-Dioxane	51	Not Detected	180	Not Detected
Bromodichloromethane	13	Not Detected	85	Not Detected
cis-1,3-Dichloropropene	13	Not Detected	58	Not Detected
4-Methyl-2-pentanone	13	Not Detected	52	Not Detected
Toluene	13	Not Detected	48	Not Detected
trans-1,3-Dichloropropene	13	Not Detected	58	Not Detected
1,1,2-Trichloroethane	13	Not Detected	70	Not Detected
Tetrachloroethene	13	15000	86	100000
2-Hexanone	51	Not Detected	210	Not Detected

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Client Sample ID: B11193-062217-SSPE3

Lab ID#: 1706492B-16A

EPA METHOD TO-15 GC/MS

File Name:	**j062912**	**Date of Collection:**	**6/22/17 11:47:00 AM**
Dil. Factor:	**2.55**	**Date of Analysis:**	**6/29/17 04:21 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	13	Not Detected	110	Not Detected
1,2-Dibromoethane (EDB)	13	Not Detected	98	Not Detected
Chlorobenzene	13	Not Detected	59	Not Detected
Ethyl Benzene	13	Not Detected	55	Not Detected
m,p-Xylene	13	Not Detected	55	Not Detected
o-Xylene	13	Not Detected	55	Not Detected
Styrene	13	Not Detected	54	Not Detected
Bromoform	13	Not Detected	130	Not Detected
Cumene	13	Not Detected	63	Not Detected
1,1,2,2-Tetrachloroethane	13	Not Detected	88	Not Detected
Propylbenzene	13	Not Detected	63	Not Detected
4-Ethyltoluene	13	Not Detected	63	Not Detected
1,3,5-Trimethylbenzene	13	Not Detected	63	Not Detected
1,2,4-Trimethylbenzene	13	Not Detected	63	Not Detected
1,3-Dichlorobenzene	13	Not Detected	77	Not Detected
1,4-Dichlorobenzene	13	Not Detected	77	Not Detected
alpha-Chlorotoluene	13	Not Detected	66	Not Detected
1,2-Dichlorobenzene	13	Not Detected	77	Not Detected
1,2,4-Trichlorobenzene	51	Not Detected	380	Not Detected
Hexachlorobutadiene	51	Not Detected	540	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: B11193-062217-SVP4SS

Lab ID#: 1706492B-17A

EPA METHOD TO-15 GC/MS

File Name:	**j062913**	**Date of Collection:**	**6/22/17 10:58:00 AM**
Dil. Factor:	**12.8**	**Date of Analysis:**	**6/29/17 04:49 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	64	Not Detected	320	Not Detected
Freon 114	64	Not Detected	450	Not Detected
Chloromethane	260	Not Detected	530	Not Detected
Vinyl Chloride	64	Not Detected	160	Not Detected
1,3-Butadiene	64	Not Detected	140	Not Detected
Bromomethane	260	Not Detected	990	Not Detected
Chloroethane	260	Not Detected	680	Not Detected
Freon 11	64	Not Detected	360	Not Detected
Ethanol	260	Not Detected	480	Not Detected
Freon 113	64	Not Detected	490	Not Detected
1,1-Dichloroethene	64	Not Detected	250	Not Detected
Acetone	260	Not Detected	610	Not Detected
2-Propanol	260	Not Detected	630	Not Detected
Carbon Disulfide	260	Not Detected	800	Not Detected
3-Chloropropene	260	Not Detected	800	Not Detected
Methylene Chloride	260	Not Detected	890	Not Detected
Methyl tert-butyl ether	64	Not Detected	230	Not Detected
trans-1,2-Dichloroethene	64	Not Detected	250	Not Detected
Hexane	64	Not Detected	220	Not Detected
1,1-Dichloroethane	64	Not Detected	260	Not Detected
2-Butanone (Methyl Ethyl Ketone)	260	Not Detected	750	Not Detected
cis-1,2-Dichloroethene	64	650	250	2600
Tetrahydrofuran	64	Not Detected	190	Not Detected
Chloroform	64	Not Detected	310	Not Detected
1,1,1-Trichloroethane	64	Not Detected	350	Not Detected
Cyclohexane	64	Not Detected	220	Not Detected
Carbon Tetrachloride	64	Not Detected	400	Not Detected
2,2,4-Trimethylpentane	64	Not Detected	300	Not Detected
Benzene	64	Not Detected	200	Not Detected
1,2-Dichloroethane	64	Not Detected	260	Not Detected
Heptane	64	Not Detected	260	Not Detected
Trichloroethene	64	410	340	2200
1,2-Dichloropropane	64	Not Detected	300	Not Detected
1,4-Dioxane	260	Not Detected	920	Not Detected
Bromodichloromethane	64	Not Detected	430	Not Detected
cis-1,3-Dichloropropene	64	Not Detected	290	Not Detected
4-Methyl-2-pentanone	64	Not Detected	260	Not Detected
Toluene	64	Not Detected	240	Not Detected
trans-1,3-Dichloropropene	64	Not Detected	290	Not Detected
1,1,2-Trichloroethane	64	390	350	2100
Tetrachloroethene	64	50000	430	340000
2-Hexanone	260	Not Detected	1000	Not Detected

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Client Sample ID: B11193-062217-SVP4SS

Lab ID#: 1706492B-17A

EPA METHOD TO-15 GC/MS

File Name:	**j062913**	**Date of Collection: 6/22/17 10:58:00 AM**	
Dil. Factor:	**12.8**	**Date of Analysis: 6/29/17 04:49 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	64	Not Detected	540	Not Detected
1,2-Dibromoethane (EDB)	64	Not Detected	490	Not Detected
Chlorobenzene	64	Not Detected	290	Not Detected
Ethyl Benzene	64	Not Detected	280	Not Detected
m,p-Xylene	64	Not Detected	280	Not Detected
o-Xylene	64	Not Detected	280	Not Detected
Styrene	64	Not Detected	270	Not Detected
Bromoform	64	Not Detected	660	Not Detected
Cumene	64	Not Detected	310	Not Detected
1,1,2,2-Tetrachloroethane	64	Not Detected	440	Not Detected
Propylbenzene	64	Not Detected	310	Not Detected
4-Ethyltoluene	64	Not Detected	310	Not Detected
1,3,5-Trimethylbenzene	64	Not Detected	310	Not Detected
1,2,4-Trimethylbenzene	64	Not Detected	310	Not Detected
1,3-Dichlorobenzene	64	Not Detected	380	Not Detected
1,4-Dichlorobenzene	64	Not Detected	380	Not Detected
alpha-Chlorotoluene	64	Not Detected	330	Not Detected
1,2-Dichlorobenzene	64	Not Detected	380	Not Detected
1,2,4-Trichlorobenzene	260	Not Detected	1900	Not Detected
Hexachlorobutadiene	260	Not Detected	2700	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: B11193-062217-SSPN2

Lab ID#: 1706492B-18A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062825**	**Date of Collection:**	**6/22/17 11:14:00 AM**
Dil. Factor:	**2.89**	**Date of Analysis:**	**6/29/17 12:22 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	1.4	Not Detected	7.1	Not Detected
Freon 114	1.4	Not Detected	10	Not Detected
Chloromethane	14	Not Detected	30	Not Detected
Vinyl Chloride	1.4	Not Detected	3.7	Not Detected
1,3-Butadiene	1.4	Not Detected	3.2	Not Detected
Bromomethane	14	Not Detected	56	Not Detected
Chloroethane	5.8	Not Detected	15	Not Detected
Freon 11	1.4	Not Detected	8.1	Not Detected
Ethanol	5.8	Not Detected	11	Not Detected
Freon 113	1.4	Not Detected	11	Not Detected
1,1-Dichloroethene	1.4	Not Detected	5.7	Not Detected
Acetone	14	Not Detected	34	Not Detected
2-Propanol	5.8	Not Detected	14	Not Detected
Carbon Disulfide	5.8	Not Detected	18	Not Detected
3-Chloropropene	5.8	Not Detected	18	Not Detected
Methylene Chloride	14	Not Detected	50	Not Detected
Methyl tert-butyl ether	5.8	Not Detected	21	Not Detected
trans-1,2-Dichloroethene	1.4	Not Detected	5.7	Not Detected
Hexane	1.4	Not Detected	5.1	Not Detected
1,1-Dichloroethane	1.4	Not Detected	5.8	Not Detected
2-Butanone (Methyl Ethyl Ketone)	5.8	Not Detected	17	Not Detected
cis-1,2-Dichloroethene	1.4	6.6	5.7	26
Tetrahydrofuran	1.4	Not Detected	4.3	Not Detected
Chloroform	1.4	Not Detected	7.0	Not Detected
1,1,1-Trichloroethane	1.4	Not Detected	7.9	Not Detected
Cyclohexane	1.4	Not Detected	5.0	Not Detected
Carbon Tetrachloride	1.4	Not Detected	9.1	Not Detected
2,2,4-Trimethylpentane	1.4	Not Detected	6.8	Not Detected
Benzene	1.4	Not Detected	4.6	Not Detected
1,2-Dichloroethane	1.4	Not Detected	5.8	Not Detected
Heptane	1.4	Not Detected	5.9	Not Detected
Trichloroethene	1.4	5.0	7.8	27
1,2-Dichloropropane	1.4	Not Detected	6.7	Not Detected
1,4-Dioxane	5.8	Not Detected	21	Not Detected
Bromodichloromethane	1.4	Not Detected	9.7	Not Detected
cis-1,3-Dichloropropene	1.4	Not Detected	6.6	Not Detected
4-Methyl-2-pentanone	1.4	Not Detected	5.9	Not Detected
Toluene	1.4	Not Detected	5.4	Not Detected
trans-1,3-Dichloropropene	1.4	Not Detected	6.6	Not Detected
1,1,2-Trichloroethane	1.4	Not Detected	7.9	Not Detected
Tetrachloroethene	1.4	87	9.8	590
2-Hexanone	5.8	Not Detected	24	Not Detected

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Client Sample ID: B11193-062217-SSPN2

Lab ID#: 1706492B-18A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062825**	**Date of Collection:**	**6/22/17 11:14:00 AM**
Dil. Factor:	**2.89**	**Date of Analysis:**	**6/29/17 12:22 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	1.4	Not Detected	12	Not Detected
1,2-Dibromoethane (EDB)	1.4	Not Detected	11	Not Detected
Chlorobenzene	1.4	Not Detected	6.6	Not Detected
Ethyl Benzene	1.4	Not Detected	6.3	Not Detected
m,p-Xylene	1.4	Not Detected	6.3	Not Detected
o-Xylene	1.4	Not Detected	6.3	Not Detected
Styrene	1.4	Not Detected	6.2	Not Detected
Bromoform	1.4	Not Detected	15	Not Detected
Cumene	1.4	Not Detected	7.1	Not Detected
1,1,2,2-Tetrachloroethane	1.4	Not Detected	9.9	Not Detected
Propylbenzene	1.4	Not Detected	7.1	Not Detected
4-Ethyltoluene	1.4	Not Detected	7.1	Not Detected
1,3,5-Trimethylbenzene	1.4	Not Detected	7.1	Not Detected
1,2,4-Trimethylbenzene	1.4	Not Detected	7.1	Not Detected
1,3-Dichlorobenzene	1.4	Not Detected	8.7	Not Detected
1,4-Dichlorobenzene	1.4	Not Detected	8.7	Not Detected
alpha-Chlorotoluene	1.4	Not Detected	7.5	Not Detected
1,2-Dichlorobenzene	1.4	Not Detected	8.7	Not Detected
1,2,4-Trichlorobenzene	5.8	Not Detected	43	Not Detected
Hexachlorobutadiene	5.8	Not Detected	62	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: B11193-062217-SVP2SS

Lab ID#: 1706492B-19A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062823**	**Date of Collection: 6/22/17 12:11:00 PM**	
Dil. Factor:	**18.0**	**Date of Analysis: 6/28/17 11:32 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	9.0	Not Detected	44	Not Detected
Freon 114	9.0	Not Detected	63	Not Detected
Chloromethane	90	Not Detected	180	Not Detected
Vinyl Chloride	9.0	Not Detected	23	Not Detected
1,3-Butadiene	9.0	Not Detected	20	Not Detected
Bromomethane	90	Not Detected	350	Not Detected
Chloroethane	36	Not Detected	95	Not Detected
Freon 11	9.0	Not Detected	50	Not Detected
Ethanol	36	Not Detected	68	Not Detected
Freon 113	9.0	Not Detected	69	Not Detected
1,1-Dichloroethene	9.0	Not Detected	36	Not Detected
Acetone	90	Not Detected	210	Not Detected
2-Propanol	36	Not Detected	88	Not Detected
Carbon Disulfide	36	Not Detected	110	Not Detected
3-Chloropropene	36	Not Detected	110	Not Detected
Methylene Chloride	90	Not Detected	310	Not Detected
Methyl tert-butyl ether	36	Not Detected	130	Not Detected
trans-1,2-Dichloroethene	9.0	Not Detected	36	Not Detected
Hexane	9.0	Not Detected	32	Not Detected
1,1-Dichloroethane	9.0	Not Detected	36	Not Detected
2-Butanone (Methyl Ethyl Ketone)	36	Not Detected	110	Not Detected
cis-1,2-Dichloroethene	9.0	Not Detected	36	Not Detected
Tetrahydrofuran	9.0	Not Detected	26	Not Detected
Chloroform	9.0	Not Detected	44	Not Detected
1,1,1-Trichloroethane	9.0	Not Detected	49	Not Detected
Cyclohexane	9.0	Not Detected	31	Not Detected
Carbon Tetrachloride	9.0	Not Detected	57	Not Detected
2,2,4-Trimethylpentane	9.0	Not Detected	42	Not Detected
Benzene	9.0	Not Detected	29	Not Detected
1,2-Dichloroethane	9.0	Not Detected	36	Not Detected
Heptane	9.0	Not Detected	37	Not Detected
Trichloroethene	9.0	Not Detected	48	Not Detected
1,2-Dichloropropane	9.0	Not Detected	42	Not Detected
1,4-Dioxane	36	Not Detected	130	Not Detected
Bromodichloromethane	9.0	Not Detected	60	Not Detected
cis-1,3-Dichloropropene	9.0	Not Detected	41	Not Detected
4-Methyl-2-pentanone	9.0	Not Detected	37	Not Detected
Toluene	9.0	Not Detected	34	Not Detected
trans-1,3-Dichloropropene	9.0	Not Detected	41	Not Detected
1,1,2-Trichloroethane	9.0	Not Detected	49	Not Detected
Tetrachloroethene	9.0	1800	61	12000
2-Hexanone	36	Not Detected	150	Not Detected

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Client Sample ID: B11193-062217-SVP2SS

Lab ID#: 1706492B-19A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062823**	**Date of Collection:**	**6/22/17 12:11:00 PM**
Dil. Factor:	**18.0**	**Date of Analysis:**	**6/28/17 11:32 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	9.0	Not Detected	77	Not Detected
1,2-Dibromoethane (EDB)	9.0	Not Detected	69	Not Detected
Chlorobenzene	9.0	Not Detected	41	Not Detected
Ethyl Benzene	9.0	Not Detected	39	Not Detected
m,p-Xylene	9.0	Not Detected	39	Not Detected
o-Xylene	9.0	Not Detected	39	Not Detected
Styrene	9.0	Not Detected	38	Not Detected
Bromoform	9.0	Not Detected	93	Not Detected
Cumene	9.0	Not Detected	44	Not Detected
1,1,2,2-Tetrachloroethane	9.0	Not Detected	62	Not Detected
Propylbenzene	9.0	Not Detected	44	Not Detected
4-Ethyltoluene	9.0	Not Detected	44	Not Detected
1,3,5-Trimethylbenzene	9.0	Not Detected	44	Not Detected
1,2,4-Trimethylbenzene	9.0	Not Detected	44	Not Detected
1,3-Dichlorobenzene	9.0	Not Detected	54	Not Detected
1,4-Dichlorobenzene	9.0	Not Detected	54	Not Detected
alpha-Chlorotoluene	9.0	Not Detected	46	Not Detected
1,2-Dichlorobenzene	9.0	Not Detected	54	Not Detected
1,2,4-Trichlorobenzene	36	Not Detected	270	Not Detected
Hexachlorobutadiene	36	Not Detected	380	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: B11193-062117-SSV-9-58

Lab ID#: 1706492B-23A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062824**	**Date of Collection:**	**6/21/17 5:59:00 PM**
Dil. Factor:	**22.4**	**Date of Analysis:**	**6/28/17 11:56 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	55	Not Detected
Freon 114	11	Not Detected	78	Not Detected
Chloromethane	110	Not Detected	230	Not Detected
Vinyl Chloride	11	Not Detected	29	Not Detected
1,3-Butadiene	11	Not Detected	25	Not Detected
Bromomethane	110	Not Detected	430	Not Detected
Chloroethane	45	Not Detected	120	Not Detected
Freon 11	11	Not Detected	63	Not Detected
Ethanol	45	Not Detected	84	Not Detected
Freon 113	11	Not Detected	86	Not Detected
1,1-Dichloroethene	11	Not Detected	44	Not Detected
Acetone	110	Not Detected	270	Not Detected
2-Propanol	45	Not Detected	110	Not Detected
Carbon Disulfide	45	Not Detected	140	Not Detected
3-Chloropropene	45	Not Detected	140	Not Detected
Methylene Chloride	110	Not Detected	390	Not Detected
Methyl tert-butyl ether	45	Not Detected	160	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	44	Not Detected
Hexane	11	Not Detected	39	Not Detected
1,1-Dichloroethane	11	Not Detected	45	Not Detected
2-Butanone (Methyl Ethyl Ketone)	45	Not Detected	130	Not Detected
cis-1,2-Dichloroethene	11	40	44	160
Tetrahydrofuran	11	Not Detected	33	Not Detected
Chloroform	11	Not Detected	55	Not Detected
1,1,1-Trichloroethane	11	Not Detected	61	Not Detected
Cyclohexane	11	Not Detected	38	Not Detected
Carbon Tetrachloride	11	Not Detected	70	Not Detected
2,2,4-Trimethylpentane	11	Not Detected	52	Not Detected
Benzene	11	Not Detected	36	Not Detected
1,2-Dichloroethane	11	Not Detected	45	Not Detected
Heptane	11	Not Detected	46	Not Detected
Trichloroethene	11	33	60	180
1,2-Dichloropropane	11	Not Detected	52	Not Detected
1,4-Dioxane	45	Not Detected	160	Not Detected
Bromodichloromethane	11	Not Detected	75	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	51	Not Detected
4-Methyl-2-pentanone	11	Not Detected	46	Not Detected
Toluene	11	Not Detected	42	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	51	Not Detected
1,1,2-Trichloroethane	11	Not Detected	61	Not Detected
Tetrachloroethene	11	2400	76	16000
2-Hexanone	45	Not Detected	180	Not Detected

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Client Sample ID: B11193-062117-SSV-9-58

Lab ID#: 1706492B-23A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062824**	**Date of Collection:**	**6/21/17 5:59:00 PM**
Dil. Factor:	**22.4**	**Date of Analysis:**	**6/28/17 11:56 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	11	Not Detected	95	Not Detected
1,2-Dibromoethane (EDB)	11	Not Detected	86	Not Detected
Chlorobenzene	11	Not Detected	52	Not Detected
Ethyl Benzene	11	Not Detected	49	Not Detected
m,p-Xylene	11	Not Detected	49	Not Detected
o-Xylene	11	Not Detected	49	Not Detected
Styrene	11	Not Detected	48	Not Detected
Bromoform	11	Not Detected	120	Not Detected
Cumene	11	Not Detected	55	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	77	Not Detected
Propylbenzene	11	Not Detected	55	Not Detected
4-Ethyltoluene	11	Not Detected	55	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	55	Not Detected
1,2,4-Trimethylbenzene	11	Not Detected	55	Not Detected
1,3-Dichlorobenzene	11	Not Detected	67	Not Detected
1,4-Dichlorobenzene	11	Not Detected	67	Not Detected
alpha-Chlorotoluene	11	Not Detected	58	Not Detected
1,2-Dichlorobenzene	11	Not Detected	67	Not Detected
1,2,4-Trichlorobenzene	45	Not Detected	330	Not Detected
Hexachlorobutadiene	45	Not Detected	480	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706492B-24A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062805**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:53 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	5.0	Not Detected	19	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
Methyl tert-butyl ether	2.0	Not Detected	7.2	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706492B-24A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062805**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:53 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1706492B-24B

EPA METHOD TO-15 GC/MS

File Name:	**j062909**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 01:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.0	Not Detected	25	Not Detected
Freon 114	5.0	Not Detected	35	Not Detected
Chloromethane	20	Not Detected	41	Not Detected
Vinyl Chloride	5.0	Not Detected	13	Not Detected
1,3-Butadiene	5.0	Not Detected	11	Not Detected
Bromomethane	20	Not Detected	78	Not Detected
Chloroethane	20	Not Detected	53	Not Detected
Freon 11	5.0	Not Detected	28	Not Detected
Ethanol	20	Not Detected	38	Not Detected
Freon 113	5.0	Not Detected	38	Not Detected
1,1-Dichloroethene	5.0	Not Detected	20	Not Detected
Acetone	20	Not Detected	48	Not Detected
2-Propanol	20	Not Detected	49	Not Detected
Carbon Disulfide	20	Not Detected	62	Not Detected
3-Chloropropene	20	Not Detected	63	Not Detected
Methylene Chloride	20	Not Detected	69	Not Detected
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
trans-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Hexane	5.0	Not Detected	18	Not Detected
1,1-Dichloroethane	5.0	Not Detected	20	Not Detected
2-Butanone (Methyl Ethyl Ketone)	20	Not Detected	59	Not Detected
cis-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Tetrahydrofuran	5.0	Not Detected	15	Not Detected
Chloroform	5.0	Not Detected	24	Not Detected
1,1,1-Trichloroethane	5.0	Not Detected	27	Not Detected
Cyclohexane	5.0	Not Detected	17	Not Detected
Carbon Tetrachloride	5.0	Not Detected	31	Not Detected
2,2,4-Trimethylpentane	5.0	Not Detected	23	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
1,2-Dichloroethane	5.0	Not Detected	20	Not Detected
Heptane	5.0	Not Detected	20	Not Detected
Trichloroethene	5.0	Not Detected	27	Not Detected
1,2-Dichloropropane	5.0	Not Detected	23	Not Detected
1,4-Dioxane	20	Not Detected	72	Not Detected
Bromodichloromethane	5.0	Not Detected	34	Not Detected
cis-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
4-Methyl-2-pentanone	5.0	Not Detected	20	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
trans-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
1,1,2-Trichloroethane	5.0	Not Detected	27	Not Detected
Tetrachloroethene	5.0	Not Detected	34	Not Detected
2-Hexanone	20	Not Detected	82	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1706492B-24B

EPA METHOD TO-15 GC/MS

File Name:	**j062909**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 01:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.0	Not Detected	42	Not Detected
1,2-Dibromoethane (EDB)	5.0	Not Detected	38	Not Detected
Chlorobenzene	5.0	Not Detected	23	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
Styrene	5.0	Not Detected	21	Not Detected
Bromoform	5.0	Not Detected	52	Not Detected
Cumene	5.0	Not Detected	24	Not Detected
1,1,2,2-Tetrachloroethane	5.0	Not Detected	34	Not Detected
Propylbenzene	5.0	Not Detected	24	Not Detected
4-Ethyltoluene	5.0	Not Detected	24	Not Detected
1,3,5-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,2,4-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,3-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,4-Dichlorobenzene	5.0	Not Detected	30	Not Detected
alpha-Chlorotoluene	5.0	Not Detected	26	Not Detected
1,2-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,2,4-Trichlorobenzene	20	Not Detected	150	Not Detected
Hexachlorobutadiene	20	Not Detected	210	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: CCV

Lab ID#: 1706492B-25A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062802**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 10:27 AM**	

Compound	%Recovery
Freon 12	99
Freon 114	107
Chloromethane	100
Vinyl Chloride	101
1,3-Butadiene	94
Bromomethane	104
Chloroethane	101
Freon 11	99
Ethanol	91
Freon 113	105
1,1-Dichloroethene	98
Acetone	87
2-Propanol	88
Carbon Disulfide	92
3-Chloropropene	96
Methylene Chloride	91
Methyl tert-butyl ether	92
trans-1,2-Dichloroethene	106
Hexane	95
1,1-Dichloroethane	98
2-Butanone (Methyl Ethyl Ketone)	99
cis-1,2-Dichloroethene	98
Tetrahydrofuran	86
Chloroform	100
1,1,1-Trichloroethane	99
Cyclohexane	97
Carbon Tetrachloride	103
2,2,4-Trimethylpentane	93
Benzene	106
1,2-Dichloroethane	99
Heptane	103
Trichloroethene	105
1,2-Dichloropropane	104
1,4-Dioxane	102
Bromodichloromethane	105
cis-1,3-Dichloropropene	101
4-Methyl-2-pentanone	90
Toluene	106
trans-1,3-Dichloropropene	100
1,1,2-Trichloroethane	106
Tetrachloroethene	108
2-Hexanone	98

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Client Sample ID: CCV

Lab ID#: 1706492B-25A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062802**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 10:27 AM**	

Compound	%Recovery
Dibromochloromethane	108
1,2-Dibromoethane (EDB)	108
Chlorobenzene	106
Ethyl Benzene	104
m,p-Xylene	104
o-Xylene	103
Styrene	114
Bromoform	109
Cumene	104
1,1,2,2-Tetrachloroethane	103
Propylbenzene	102
4-Ethyltoluene	107
1,3,5-Trimethylbenzene	108
1,2,4-Trimethylbenzene	103
1,3-Dichlorobenzene	108
1,4-Dichlorobenzene	108
alpha-Chlorotoluene	102
1,2-Dichlorobenzene	109
1,2,4-Trichlorobenzene	113
Hexachlorobutadiene	113

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: CCV

Lab ID#: 1706492B-25B

EPA METHOD TO-15 GC/MS

File Name:	**j062906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 11:59 AM**	

Compound	%Recovery
Freon 12	95
Freon 114	96
Chloromethane	87
Vinyl Chloride	93
1,3-Butadiene	88
Bromomethane	93
Chloroethane	94
Freon 11	114
Ethanol	97
Freon 113	113
1,1-Dichloroethene	110
Acetone	104
2-Propanol	99
Carbon Disulfide	98
3-Chloropropene	99
Methylene Chloride	120
Methyl tert-butyl ether	96
trans-1,2-Dichloroethene	106
Hexane	106
1,1-Dichloroethane	110
2-Butanone (Methyl Ethyl Ketone)	100
cis-1,2-Dichloroethene	103
Tetrahydrofuran	94
Chloroform	106
1,1,1-Trichloroethane	106
Cyclohexane	108
Carbon Tetrachloride	110
2,2,4-Trimethylpentane	104
Benzene	103
1,2-Dichloroethane	96
Heptane	95
Trichloroethene	106
1,2-Dichloropropane	99
1,4-Dioxane	98
Bromodichloromethane	97
cis-1,3-Dichloropropene	100
4-Methyl-2-pentanone	91
Toluene	103
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	105
Tetrachloroethene	112
2-Hexanone	100

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Client Sample ID: CCV

Lab ID#: 1706492B-25B

EPA METHOD TO-15 GC/MS

File Name:	**j062906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 11:59 AM**	

Compound	%Recovery
Dibromochloromethane	103
1,2-Dibromoethane (EDB)	104
Chlorobenzene	103
Ethyl Benzene	101
m,p-Xylene	104
o-Xylene	102
Styrene	101
Bromoform	102
Cumene	100
1,1,2,2-Tetrachloroethane	102
Propylbenzene	103
4-Ethyltoluene	104
1,3,5-Trimethylbenzene	99
1,2,4-Trimethylbenzene	98
1,3-Dichlorobenzene	103
1,4-Dichlorobenzene	98
alpha-Chlorotoluene	97
1,2-Dichlorobenzene	100
1,2,4-Trichlorobenzene	92
Hexachlorobutadiene	94

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: LCS

Lab ID#: 1706492B-26A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062803**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:01 AM**	

Compound	%Recovery	Method Limits
Freon 12	103	70-130
Freon 114	110	70-130
Chloromethane	106	70-130
Vinyl Chloride	107	70-130
1,3-Butadiene	94	70-130
Bromomethane	106	70-130
Chloroethane	104	70-130
Freon 11	103	70-130
Ethanol	84	70-130
Freon 113	106	70-130
1,1-Dichloroethene	101	70-130
Acetone	90	70-130
2-Propanol	89	70-130
Carbon Disulfide	97	70-130
3-Chloropropene	103	70-130
Methylene Chloride	94	70-130
Methyl tert-butyl ether	95	70-130
trans-1,2-Dichloroethene	117	70-130
Hexane	98	70-130
1,1-Dichloroethane	100	70-130
2-Butanone (Methyl Ethyl Ketone)	103	70-130
cis-1,2-Dichloroethene	93	70-130
Tetrahydrofuran	90	70-130
Chloroform	102	70-130
1,1,1-Trichloroethane	101	70-130
Cyclohexane	100	70-130
Carbon Tetrachloride	104	70-130
2,2,4-Trimethylpentane	97	70-130
Benzene	106	70-130
1,2-Dichloroethane	99	70-130
Heptane	106	70-130
Trichloroethene	108	70-130
1,2-Dichloropropane	105	70-130
1,4-Dioxane	96	70-130
Bromodichloromethane	110	70-130
cis-1,3-Dichloropropene	108	70-130
4-Methyl-2-pentanone	91	70-130
Toluene	107	70-130
trans-1,3-Dichloropropene	101	70-130
1,1,2-Trichloroethane	108	70-130
Tetrachloroethene	109	70-130
2-Hexanone	98	70-130

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Client Sample ID: LCS

Lab ID#: 1706492B-26A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062803**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:01 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	109	70-130
1,2-Dibromoethane (EDB)	107	70-130
Chlorobenzene	106	70-130
Ethyl Benzene	106	70-130
m,p-Xylene	106	70-130
o-Xylene	104	70-130
Styrene	109	70-130
Bromoform	114	70-130
Cumene	104	70-130
1,1,2,2-Tetrachloroethane	104	70-130
Propylbenzene	103	70-130
4-Ethyltoluene	108	70-130
1,3,5-Trimethylbenzene	108	70-130
1,2,4-Trimethylbenzene	104	70-130
1,3-Dichlorobenzene	108	70-130
1,4-Dichlorobenzene	109	70-130
alpha-Chlorotoluene	103	70-130
1,2-Dichlorobenzene	108	70-130
1,2,4-Trichlorobenzene	108	70-130
Hexachlorobutadiene	108	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: LCSD

Lab ID#: 1706492B-26AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062804**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:27 AM**	

Compound	%Recovery	Method Limits
Freon 12	101	70-130
Freon 114	108	70-130
Chloromethane	104	70-130
Vinyl Chloride	105	70-130
1,3-Butadiene	94	70-130
Bromomethane	105	70-130
Chloroethane	103	70-130
Freon 11	101	70-130
Ethanol	83	70-130
Freon 113	105	70-130
1,1-Dichloroethene	101	70-130
Acetone	91	70-130
2-Propanol	89	70-130
Carbon Disulfide	96	70-130
3-Chloropropene	103	70-130
Methylene Chloride	92	70-130
Methyl tert-butyl ether	92	70-130
trans-1,2-Dichloroethene	117	70-130
Hexane	98	70-130
1,1-Dichloroethane	98	70-130
2-Butanone (Methyl Ethyl Ketone)	100	70-130
cis-1,2-Dichloroethene	92	70-130
Tetrahydrofuran	89	70-130
Chloroform	101	70-130
1,1,1-Trichloroethane	101	70-130
Cyclohexane	100	70-130
Carbon Tetrachloride	102	70-130
2,2,4-Trimethylpentane	95	70-130
Benzene	104	70-130
1,2-Dichloroethane	98	70-130
Heptane	103	70-130
Trichloroethene	105	70-130
1,2-Dichloropropane	102	70-130
1,4-Dioxane	95	70-130
Bromodichloromethane	107	70-130
cis-1,3-Dichloropropene	107	70-130
4-Methyl-2-pentanone	90	70-130
Toluene	105	70-130
trans-1,3-Dichloropropene	100	70-130
1,1,2-Trichloroethane	107	70-130
Tetrachloroethene	109	70-130
2-Hexanone	97	70-130

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Client Sample ID: LCSD

Lab ID#: 1706492B-26AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3062804**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/17 11:27 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	110	70-130
1,2-Dibromoethane (EDB)	106	70-130
Chlorobenzene	106	70-130
Ethyl Benzene	106	70-130
m,p-Xylene	106	70-130
o-Xylene	105	70-130
Styrene	108	70-130
Bromoform	114	70-130
Cumene	105	70-130
1,1,2,2-Tetrachloroethane	104	70-130
Propylbenzene	103	70-130
4-Ethyltoluene	108	70-130
1,3,5-Trimethylbenzene	108	70-130
1,2,4-Trimethylbenzene	104	70-130
1,3-Dichlorobenzene	109	70-130
1,4-Dichlorobenzene	111	70-130
alpha-Chlorotoluene	105	70-130
1,2-Dichlorobenzene	109	70-130
1,2,4-Trichlorobenzene	113	70-130
Hexachlorobutadiene	113	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: LCS

Lab ID#: 1706492B-26B

EPA METHOD TO-15 GC/MS

File Name:	**j062907**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 12:26 PM**	

Compound	%Recovery	Method Limits
Freon 12	91	70-130
Freon 114	93	70-130
Chloromethane	82	70-130
Vinyl Chloride	92	70-130
1,3-Butadiene	84	70-130
Bromomethane	91	70-130
Chloroethane	94	70-130
Freon 11	109	70-130
Ethanol	83	70-130
Freon 113	107	70-130
1,1-Dichloroethene	105	70-130
Acetone	102	70-130
2-Propanol	97	70-130
Carbon Disulfide	94	70-130
3-Chloropropene	94	70-130
Methylene Chloride	112	70-130
Methyl tert-butyl ether	90	70-130
trans-1,2-Dichloroethene	100	70-130
Hexane	104	70-130
1,1-Dichloroethane	103	70-130
2-Butanone (Methyl Ethyl Ketone)	97	70-130
cis-1,2-Dichloroethene	97	70-130
Tetrahydrofuran	89	70-130
Chloroform	100	70-130
1,1,1-Trichloroethane	101	70-130
Cyclohexane	104	70-130
Carbon Tetrachloride	103	70-130
2,2,4-Trimethylpentane	98	70-130
Benzene	102	70-130
1,2-Dichloroethane	96	70-130
Heptane	95	70-130
Trichloroethene	108	70-130
1,2-Dichloropropane	100	70-130
1,4-Dioxane	98	70-130
Bromodichloromethane	99	70-130
cis-1,3-Dichloropropene	101	70-130
4-Methyl-2-pentanone	94	70-130
Toluene	103	70-130
trans-1,3-Dichloropropene	96	70-130
1,1,2-Trichloroethane	99	70-130
Tetrachloroethene	107	70-130
2-Hexanone	97	70-130

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Client Sample ID: LCS

Lab ID#: 1706492B-26B

EPA METHOD TO-15 GC/MS

File Name:	**j062907**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 12:26 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	101	70-130
1,2-Dibromoethane (EDB)	101	70-130
Chlorobenzene	98	70-130
Ethyl Benzene	97	70-130
m,p-Xylene	98	70-130
o-Xylene	99	70-130
Styrene	97	70-130
Bromoform	99	70-130
Cumene	96	70-130
1,1,2,2-Tetrachloroethane	95	70-130
Propylbenzene	97	70-130
4-Ethyltoluene	100	70-130
1,3,5-Trimethylbenzene	95	70-130
1,2,4-Trimethylbenzene	93	70-130
1,3-Dichlorobenzene	96	70-130
1,4-Dichlorobenzene	96	70-130
alpha-Chlorotoluene	96	70-130
1,2-Dichlorobenzene	96	70-130
1,2,4-Trichlorobenzene	92	70-130
Hexachlorobutadiene	90	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: LCSD
Lab ID#: 1706492B-26BB
EPA METHOD TO-15 GC/MS

File Name:	**j062908**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 12:53 PM**	

Compound	%Recovery	Method Limits
Freon 12	93	70-130
Freon 114	94	70-130
Chloromethane	82	70-130
Vinyl Chloride	93	70-130
1,3-Butadiene	83	70-130
Bromomethane	91	70-130
Chloroethane	94	70-130
Freon 11	110	70-130
Ethanol	83	70-130
Freon 113	107	70-130
1,1-Dichloroethene	105	70-130
Acetone	103	70-130
2-Propanol	95	70-130
Carbon Disulfide	95	70-130
3-Chloropropene	94	70-130
Methylene Chloride	111	70-130
Methyl tert-butyl ether	92	70-130
trans-1,2-Dichloroethene	101	70-130
Hexane	104	70-130
1,1-Dichloroethane	103	70-130
2-Butanone (Methyl Ethyl Ketone)	96	70-130
cis-1,2-Dichloroethene	97	70-130
Tetrahydrofuran	90	70-130
Chloroform	100	70-130
1,1,1-Trichloroethane	101	70-130
Cyclohexane	105	70-130
Carbon Tetrachloride	102	70-130
2,2,4-Trimethylpentane	98	70-130
Benzene	102	70-130
1,2-Dichloroethane	95	70-130
Heptane	95	70-130
Trichloroethene	106	70-130
1,2-Dichloropropane	99	70-130
1,4-Dioxane	97	70-130
Bromodichloromethane	97	70-130
cis-1,3-Dichloropropene	98	70-130
4-Methyl-2-pentanone	92	70-130
Toluene	101	70-130
trans-1,3-Dichloropropene	95	70-130
1,1,2-Trichloroethane	99	70-130
Tetrachloroethene	106	70-130
2-Hexanone	98	70-130

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Client Sample ID: LCSD

Lab ID#: 1706492B-26BB

EPA METHOD TO-15 GC/MS

File Name:	**j062908**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/29/17 12:53 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	100	70-130
1,2-Dibromoethane (EDB)	98	70-130
Chlorobenzene	99	70-130
Ethyl Benzene	98	70-130
m,p-Xylene	99	70-130
o-Xylene	99	70-130
Styrene	98	70-130
Bromoform	99	70-130
Cumene	95	70-130
1,1,2,2-Tetrachloroethane	96	70-130
Propylbenzene	97	70-130
4-Ethyltoluene	99	70-130
1,3,5-Trimethylbenzene	95	70-130
1,2,4-Trimethylbenzene	94	70-130
1,3-Dichlorobenzene	97	70-130
1,4-Dichlorobenzene	96	70-130
alpha-Chlorotoluene	94	70-130
1,2-Dichlorobenzene	96	70-130
1,2,4-Trichlorobenzene	92	70-130
Hexachlorobutadiene	93	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	100	70-130

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7/27/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: Vandenberg 11193
Project #:
Workorder #: 1707242A

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 7/17/2017 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1707242A

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	Vandenberg 11193
DATE RECEIVED:	07/17/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	07/25/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	6L Walking Indoor Comp 07132017	Modified TO-15	0.8 "Hg	4.8 psi
01B	6L Walking Indoor Comp 07132017	Modified TO-15	0.8 "Hg	4.8 psi
04A	GC4 07132017	Modified TO-15	1.4 "Hg	5 psi
04B	GC4 07132017	Modified TO-15	1.4 "Hg	5 psi
05A	Lab Blank	Modified TO-15	NA	NA
05B	Lab Blank	Modified TO-15	NA	NA
06A	CCV	Modified TO-15	NA	NA
06B	CCV	Modified TO-15	NA	NA
07A	LCS	Modified TO-15	NA	NA
07AA	LCSD	Modified TO-15	NA	NA
07B	LCS	Modified TO-15	NA	NA
07BB	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 07/26/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
Modified TO-15 Full Scan/SIM
GeoSyntec Consultants
Workorder# 1707242A

Two 6 Liter Summa Canister (SIM Certified) samples were received on July 17, 2017. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the Full Scan and SIM acquisition modes. The method involves concentrating up to 1.0 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-15***	***ATL Modifications***
ICAL %RSD acceptance criteria	</=30% RSD with 2 compounds allowed out to < 40% RSD	For Full Scan: 30% RSD with 4 compounds allowed out to < 40% RSD For SIM: Project specific; default criteria is </=30% RSD with 10% of compounds allowed out to < 40% RSD
Daily Calibration	+- 30% Difference	For Full Scan: </= 30% Difference with four allowed out up to </=40%.; flag and narrate outliers For SIM: Project specific; default criteria is </= 30% Difference with 10% of compounds allowed out up to </=40%.; flag and narrate outliers
Blank and standards	Zero air	Nitrogen
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A time was not provided by the field sampler.

The Chain of Custody was missing method information. EATL proceeded with the analysis as per the original contract or verbal agreement.

Analytical Notes

The results for each sample in this report were acquired from two separate data files originating from

the same analytical run. The two data files have the same base file name and are differentiated with a "sim" extension on the SIM data file.

Definition of Data Qualifying Flags

Nine qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

CN - See case narrative explanation

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

Client Sample ID: 6L Walking Indoor Comp 07132017

Lab ID#: 1707242A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 11	0.14	0.22	0.76	1.2
Ethanol	0.68	6.2	1.3	12
Acetone	0.68	9.0	1.6	21
2-Butanone (Methyl Ethyl Ketone)	0.68	1.0	2.0	3.1
Tetrahydrofuran	0.68	1.4	2.0	4.1

Client Sample ID: 6L Walking Indoor Comp 07132017

Lab ID#: 1707242A-01B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.027	0.43	0.13	2.1
cis-1,2-Dichloroethene	0.027	0.036	0.11	0.14
Carbon Tetrachloride	0.027	0.038	0.17	0.24
1,2-Dichloroethane	0.027	0.056	0.11	0.23
Trichloroethene	0.027	0.039	0.15	0.21
Toluene	0.027	0.054	0.10	0.20
Tetrachloroethene	0.027	1.1	0.18	7.5

Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 11	0.14	0.21	0.79	1.2
Ethanol	0.70	4.4	1.3	8.2
Acetone	0.70	9.2	1.7	22
2-Butanone (Methyl Ethyl Ketone)	0.70	1.0	2.1	3.0
Tetrahydrofuran	0.70	1.7	2.1	5.0

Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)

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Summary of Detected Compounds
MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.028	0.44	0.14	2.2
cis-1,2-Dichloroethene	0.028	0.031	0.11	0.12
Carbon Tetrachloride	0.028	0.035	0.18	0.22
1,2-Dichloroethane	0.028	0.032	0.11	0.13
Trichloroethene	0.028	0.029	0.15	0.15
Toluene	0.028	0.038	0.11	0.14
Tetrachloroethene	0.028	1.0	0.19	6.8

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Client Sample ID: 6L Walking Indoor Comp 07132017

Lab ID#: 1707242A-01A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071912**	**Date of Collection: 7/13/17 2:12:00 PM**	
Dil. Factor:	**1.36**	**Date of Analysis: 7/19/17 03:08 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.14	Not Detected	0.30	Not Detected
Bromomethane	0.68	Not Detected	2.6	Not Detected
Freon 11	0.14	0.22	0.76	1.2
Ethanol	0.68	6.2	1.3	12
Freon 113	0.14	Not Detected	1.0	Not Detected
Acetone	0.68	9.0	1.6	21
2-Propanol	0.68	Not Detected	1.7	Not Detected
Carbon Disulfide	0.68	Not Detected	2.1	Not Detected
3-Chloropropene	0.68	Not Detected	2.1	Not Detected
Methylene Chloride	0.27	Not Detected	0.94	Not Detected
Hexane	0.14	Not Detected	0.48	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.68	1.0	2.0	3.1
Tetrahydrofuran	0.68	1.4	2.0	4.1
Cyclohexane	0.14	Not Detected	0.47	Not Detected
2,2,4-Trimethylpentane	0.68	Not Detected	3.2	Not Detected
Heptane	0.14	Not Detected	0.56	Not Detected
1,2-Dichloropropane	0.14	Not Detected	0.63	Not Detected
1,4-Dioxane	0.14	Not Detected	0.49	Not Detected
Bromodichloromethane	0.14	Not Detected	0.91	Not Detected
cis-1,3-Dichloropropene	0.14	Not Detected	0.62	Not Detected
4-Methyl-2-pentanone	0.14	Not Detected	0.56	Not Detected
trans-1,3-Dichloropropene	0.14	Not Detected	0.62	Not Detected
2-Hexanone	0.68	Not Detected	2.8	Not Detected
Dibromochloromethane	0.14	Not Detected	1.2	Not Detected
Chlorobenzene	0.14	Not Detected	0.63	Not Detected
Styrene	0.14	Not Detected	0.58	Not Detected
Bromoform	0.14	Not Detected	1.4	Not Detected
Cumene	0.14	Not Detected	0.67	Not Detected
Propylbenzene	0.14	Not Detected	0.67	Not Detected
4-Ethyltoluene	0.14	Not Detected	0.67	Not Detected
1,3,5-Trimethylbenzene	0.14	Not Detected	0.67	Not Detected
1,2,4-Trimethylbenzene	0.14	Not Detected	0.67	Not Detected
1,3-Dichlorobenzene	0.14	Not Detected	0.82	Not Detected
alpha-Chlorotoluene	0.14	Not Detected	0.70	Not Detected
1,2-Dichlorobenzene	0.14	Not Detected	0.82	Not Detected
1,2,4-Trichlorobenzene	0.68	Not Detected	5.0	Not Detected
Hexachlorobutadiene	0.68	Not Detected	7.2	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	118	70-130

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Client Sample ID: 6L Walking Indoor Comp 07132017

Lab ID#: 1707242A-01A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071912**	**Date of Collection: 7/13/17 2:12:00 PM**	
Dil. Factor:	**1.36**	**Date of Analysis: 7/19/17 03:08 PM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
4-Bromofluorobenzene	90	70-130

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Client Sample ID: 6L Walking Indoor Comp 07132017

Lab ID#: 1707242A-01B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071912sim**	**Date of Collection:**	**7/13/17 2:12:00 PM**
Dil. Factor:	**1.36**	**Date of Analysis:**	**7/19/17 03:08 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.027	0.43	0.13	2.1
Freon 114	0.027	Not Detected	0.19	Not Detected
Chloromethane	0.68	Not Detected	1.4	Not Detected
Vinyl Chloride	0.014	Not Detected	0.035	Not Detected
Chloroethane	0.068	Not Detected	0.18	Not Detected
1,1-Dichloroethene	0.014	Not Detected	0.054	Not Detected
trans-1,2-Dichloroethene	0.14	Not Detected	0.54	Not Detected
Methyl tert-butyl ether	0.14	Not Detected	0.49	Not Detected
1,1-Dichloroethane	0.027	Not Detected	0.11	Not Detected
cis-1,2-Dichloroethene	0.027	0.036	0.11	0.14
Chloroform	0.027	Not Detected	0.13	Not Detected
1,1,1-Trichloroethane	0.027	Not Detected	0.15	Not Detected
Carbon Tetrachloride	0.027	0.038	0.17	0.24
Benzene	0.068	Not Detected	0.22	Not Detected
1,2-Dichloroethane	0.027	0.056	0.11	0.23
Trichloroethene	0.027	0.039	0.15	0.21
Toluene	0.027	0.054	0.10	0.20
1,1,2-Trichloroethane	0.027	Not Detected	0.15	Not Detected
Tetrachloroethene	0.027	1.1	0.18	7.5
1,2-Dibromoethane (EDB)	0.027	Not Detected	0.21	Not Detected
Ethyl Benzene	0.027	Not Detected	0.12	Not Detected
m,p-Xylene	0.054	Not Detected	0.24	Not Detected
o-Xylene	0.027	Not Detected	0.12	Not Detected
1,1,2,2-Tetrachloroethane	0.027	Not Detected	0.19	Not Detected
1,4-Dichlorobenzene	0.027	Not Detected	0.16	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	92	70-130

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Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071911**	**Date of Collection: 7/13/17 4:21:00 PM**	
Dil. Factor:	**1.41**	**Date of Analysis: 7/19/17 02:36 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.14	Not Detected	0.31	Not Detected
Bromomethane	0.70	Not Detected	2.7	Not Detected
Freon 11	0.14	0.21	0.79	1.2
Ethanol	0.70	4.4	1.3	8.2
Freon 113	0.14	Not Detected	1.1	Not Detected
Acetone	0.70	9.2	1.7	22
2-Propanol	0.70	Not Detected	1.7	Not Detected
Carbon Disulfide	0.70	Not Detected	2.2	Not Detected
3-Chloropropene	0.70	Not Detected	2.2	Not Detected
Methylene Chloride	0.28	Not Detected	0.98	Not Detected
Hexane	0.14	Not Detected	0.50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.70	1.0	2.1	3.0
Tetrahydrofuran	0.70	1.7	2.1	5.0
Cyclohexane	0.14	Not Detected	0.48	Not Detected
2,2,4-Trimethylpentane	0.70	Not Detected	3.3	Not Detected
Heptane	0.14	Not Detected	0.58	Not Detected
1,2-Dichloropropane	0.14	Not Detected	0.65	Not Detected
1,4-Dioxane	0.14	Not Detected	0.51	Not Detected
Bromodichloromethane	0.14	Not Detected	0.94	Not Detected
cis-1,3-Dichloropropene	0.14	Not Detected	0.64	Not Detected
4-Methyl-2-pentanone	0.14	Not Detected	0.58	Not Detected
trans-1,3-Dichloropropene	0.14	Not Detected	0.64	Not Detected
2-Hexanone	0.70	Not Detected	2.9	Not Detected
Dibromochloromethane	0.14	Not Detected	1.2	Not Detected
Chlorobenzene	0.14	Not Detected	0.65	Not Detected
Styrene	0.14	Not Detected	0.60	Not Detected
Bromoform	0.14	Not Detected	1.4	Not Detected
Cumene	0.14	Not Detected	0.69	Not Detected
Propylbenzene	0.14	Not Detected	0.69	Not Detected
4-Ethyltoluene	0.14	Not Detected	0.69	Not Detected
1,3,5-Trimethylbenzene	0.14	Not Detected	0.69	Not Detected
1,2,4-Trimethylbenzene	0.14	Not Detected	0.69	Not Detected
1,3-Dichlorobenzene	0.14	Not Detected	0.85	Not Detected
alpha-Chlorotoluene	0.14	Not Detected	0.73	Not Detected
1,2-Dichlorobenzene	0.14	Not Detected	0.85	Not Detected
1,2,4-Trichlorobenzene	0.70	Not Detected	5.2	Not Detected
Hexachlorobutadiene	0.70	Not Detected	7.5	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	117	70-130

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Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071911**	**Date of Collection: 7/13/17 4:21:00 PM**	
Dil. Factor:	**1.41**	**Date of Analysis: 7/19/17 02:36 PM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
4-Bromofluorobenzene	90	70-130

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Client Sample ID: GC4 07132017

Lab ID#: 1707242A-04B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071911sim**	**Date of Collection: 7/13/17 4:21:00 PM**	
Dil. Factor:	**1.41**	**Date of Analysis: 7/19/17 02:36 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.028	0.44	0.14	2.2
Freon 114	0.028	Not Detected	0.20	Not Detected
Chloromethane	0.70	Not Detected	1.4	Not Detected
Vinyl Chloride	0.014	Not Detected	0.036	Not Detected
Chloroethane	0.070	Not Detected	0.19	Not Detected
1,1-Dichloroethene	0.014	Not Detected	0.056	Not Detected
trans-1,2-Dichloroethene	0.14	Not Detected	0.56	Not Detected
Methyl tert-butyl ether	0.14	Not Detected	0.51	Not Detected
1,1-Dichloroethane	0.028	Not Detected	0.11	Not Detected
cis-1,2-Dichloroethene	0.028	0.031	0.11	0.12
Chloroform	0.028	Not Detected	0.14	Not Detected
1,1,1-Trichloroethane	0.028	Not Detected	0.15	Not Detected
Carbon Tetrachloride	0.028	0.035	0.18	0.22
Benzene	0.070	Not Detected	0.22	Not Detected
1,2-Dichloroethane	0.028	0.032	0.11	0.13
Trichloroethene	0.028	0.029	0.15	0.15
Toluene	0.028	0.038	0.11	0.14
1,1,2-Trichloroethane	0.028	Not Detected	0.15	Not Detected
Tetrachloroethene	0.028	1.0	0.19	6.8
1,2-Dibromoethane (EDB)	0.028	Not Detected	0.22	Not Detected
Ethyl Benzene	0.028	Not Detected	0.12	Not Detected
m,p-Xylene	0.056	Not Detected	0.24	Not Detected
o-Xylene	0.028	Not Detected	0.12	Not Detected
1,1,2,2-Tetrachloroethane	0.028	Not Detected	0.19	Not Detected
1,4-Dichlorobenzene	0.028	Not Detected	0.17	Not Detected

Container Type: 6 Liter Summa Canister (SIM Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	91	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1707242A-05A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071909**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 01:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1707242A-05A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071909**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 01:18 PM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
4-Bromofluorobenzene	88	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1707242A-05B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071909sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 01:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.020	Not Detected	0.099	Not Detected
Freon 114	0.020	Not Detected	0.14	Not Detected
Chloromethane	0.50	Not Detected	1.0	Not Detected
Vinyl Chloride	0.010	Not Detected	0.026	Not Detected
Chloroethane	0.050	Not Detected	0.13	Not Detected
1,1-Dichloroethene	0.010	Not Detected	0.040	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
1,1-Dichloroethane	0.020	Not Detected	0.081	Not Detected
cis-1,2-Dichloroethene	0.020	Not Detected	0.079	Not Detected
Chloroform	0.020	Not Detected	0.098	Not Detected
1,1,1-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Carbon Tetrachloride	0.020	Not Detected	0.12	Not Detected
Benzene	0.050	Not Detected	0.16	Not Detected
1,2-Dichloroethane	0.020	Not Detected	0.081	Not Detected
Trichloroethene	0.020	Not Detected	0.11	Not Detected
Toluene	0.020	Not Detected	0.075	Not Detected
1,1,2-Trichloroethane	0.020	Not Detected	0.11	Not Detected
Tetrachloroethene	0.020	Not Detected	0.14	Not Detected
1,2-Dibromoethane (EDB)	0.020	Not Detected	0.15	Not Detected
Ethyl Benzene	0.020	Not Detected	0.087	Not Detected
m,p-Xylene	0.040	Not Detected	0.17	Not Detected
o-Xylene	0.020	Not Detected	0.087	Not Detected
1,1,2,2-Tetrachloroethane	0.020	Not Detected	0.14	Not Detected
1,4-Dichlorobenzene	0.020	Not Detected	0.12	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	88	70-130

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Client Sample ID: CCV

Lab ID#: 1707242A-06A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071902**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 07:36 AM**	

Compound	%Recovery
1,3-Butadiene	91
Bromomethane	110
Freon 11	89
Ethanol	90
Freon 113	88
Acetone	91
2-Propanol	86
Carbon Disulfide	96
3-Chloropropene	112
Methylene Chloride	82
Hexane	98
2-Butanone (Methyl Ethyl Ketone)	95
Tetrahydrofuran	97
Cyclohexane	99
2,2,4-Trimethylpentane	105
Heptane	98
1,2-Dichloropropane	92
1,4-Dioxane	99
Bromodichloromethane	95
cis-1,3-Dichloropropene	98
4-Methyl-2-pentanone	101
trans-1,3-Dichloropropene	95
2-Hexanone	100
Dibromochloromethane	98
Chlorobenzene	92
Styrene	99
Bromoform	106
Cumene	99
Propylbenzene	97
4-Ethyltoluene	103
1,3,5-Trimethylbenzene	104
1,2,4-Trimethylbenzene	108
1,3-Dichlorobenzene	92
alpha-Chlorotoluene	98
1,2-Dichlorobenzene	90
1,2,4-Trichlorobenzene	109
Hexachlorobutadiene	97

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130

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Client Sample ID: CCV

Lab ID#: 1707242A-06A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071902**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 07:36 AM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: CCV

Lab ID#: 1707242A-06B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071902sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 07:36 AM**	

Compound	%Recovery
Freon 12	86
Freon 114	84
Chloromethane	76
Vinyl Chloride	79
Chloroethane	90
1,1-Dichloroethene	84
trans-1,2-Dichloroethene	85
Methyl tert-butyl ether	98
1,1-Dichloroethane	87
cis-1,2-Dichloroethene	89
Chloroform	76
1,1,1-Trichloroethane	85
Carbon Tetrachloride	117
Benzene	80
1,2-Dichloroethane	80
Trichloroethene	87
Toluene	84
1,1,2-Trichloroethane	92
Tetrachloroethene	84
1,2-Dibromoethane (EDB)	97
Ethyl Benzene	96
m,p-Xylene	98
o-Xylene	102
1,1,2,2-Tetrachloroethane	94
1,4-Dichlorobenzene	87

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: LCS

Lab ID#: 1707242A-07A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071903**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 08:30 AM**	

Compound	%Recovery	Method Limits
1,3-Butadiene	104	70-130
Bromomethane	122	70-130
Freon 11	103	70-130
Ethanol	104	70-130
Freon 113	98	70-130
Acetone	103	70-130
2-Propanol	106	70-130
Carbon Disulfide	93	70-130
3-Chloropropene	110	70-130
Methylene Chloride	93	70-130
Hexane	114	70-130
2-Butanone (Methyl Ethyl Ketone)	109	70-130
Tetrahydrofuran	108	70-130
Cyclohexane	114	70-130
2,2,4-Trimethylpentane	122	70-130
Heptane	114	70-130
1,2-Dichloropropane	107	70-130
1,4-Dioxane	111	70-130
Bromodichloromethane	109	70-130
cis-1,3-Dichloropropene	107	70-130
4-Methyl-2-pentanone	122	70-130
trans-1,3-Dichloropropene	109	70-130
2-Hexanone	122	70-130
Dibromochloromethane	107	70-130
Chlorobenzene	104	70-130
Styrene	125	70-130
Bromoform	114	70-130
Cumene	121	70-130
Propylbenzene	121	70-130
4-Ethyltoluene	126	70-130
1,3,5-Trimethylbenzene	126	70-130
1,2,4-Trimethylbenzene	128	70-130
1,3-Dichlorobenzene	109	70-130
alpha-Chlorotoluene	125	70-130
1,2-Dichlorobenzene	108	70-130
1,2,4-Trichlorobenzene	120	70-130
Hexachlorobutadiene	118	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130

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Client Sample ID: LCS

Lab ID#: 1707242A-07A

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071903**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 08:30 AM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
4-Bromofluorobenzene	104	70-130

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Client Sample ID: LCSD

Lab ID#: 1707242A-07AA

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071904**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:23 AM**	

Compound	%Recovery	Method Limits
1,3-Butadiene	101	70-130
Bromomethane	121	70-130
Freon 11	102	70-130
Ethanol	106	70-130
Freon 113	95	70-130
Acetone	101	70-130
2-Propanol	107	70-130
Carbon Disulfide	92	70-130
3-Chloropropene	111	70-130
Methylene Chloride	90	70-130
Hexane	110	70-130
2-Butanone (Methyl Ethyl Ketone)	107	70-130
Tetrahydrofuran	107	70-130
Cyclohexane	110	70-130
2,2,4-Trimethylpentane	116	70-130
Heptane	110	70-130
1,2-Dichloropropane	108	70-130
1,4-Dioxane	111	70-130
Bromodichloromethane	114	70-130
cis-1,3-Dichloropropene	108	70-130
4-Methyl-2-pentanone	122	70-130
trans-1,3-Dichloropropene	112	70-130
2-Hexanone	125	70-130
Dibromochloromethane	112	70-130
Chlorobenzene	101	70-130
Styrene	119	70-130
Bromoform	118	70-130
Cumene	115	70-130
Propylbenzene	112	70-130
4-Ethyltoluene	115	70-130
1,3,5-Trimethylbenzene	116	70-130
1,2,4-Trimethylbenzene	114	70-130
1,3-Dichlorobenzene	101	70-130
alpha-Chlorotoluene	119	70-130
1,2-Dichlorobenzene	100	70-130
1,2,4-Trichlorobenzene	106	70-130
Hexachlorobutadiene	100	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130

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Client Sample ID: LCSD

Lab ID#: 1707242A-07AA

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071904**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:23 AM**	

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: LCS

Lab ID#: 1707242A-07B

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071903sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 08:30 AM**	

Compound	%Recovery	Method Limits
Freon 12	98	70-130
Freon 114	99	70-130
Chloromethane	91	70-130
Vinyl Chloride	92	70-130
Chloroethane	103	70-130
1,1-Dichloroethene	95	70-130
trans-1,2-Dichloroethene	84	70-130
Methyl tert-butyl ether	109	70-130
1,1-Dichloroethane	98	70-130
cis-1,2-Dichloroethene	110	70-130
Chloroform	85	70-130
1,1,1-Trichloroethane	97	70-130
Carbon Tetrachloride	74	60-140
Benzene	89	70-130
1,2-Dichloroethane	90	70-130
Trichloroethene	97	70-130
Toluene	94	70-130
1,1,2-Trichloroethane	102	70-130
Tetrachloroethene	96	70-130
1,2-Dibromoethane (EDB)	110	70-130
Ethyl Benzene	111	70-130
m,p-Xylene	118	70-130
o-Xylene	124	70-130
1,1,2,2-Tetrachloroethane	106	70-130
1,4-Dichlorobenzene	105	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	105	70-130

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Client Sample ID: LCSD

Lab ID#: 1707242A-07BB

MODIFIED EPA METHOD TO-15 GC/MS SIM/FULL SCAN

File Name:	**21071904sim**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:23 AM**	

Compound	%Recovery	Method Limits
Freon 12	93	70-130
Freon 114	96	70-130
Chloromethane	89	70-130
Vinyl Chloride	90	70-130
Chloroethane	101	70-130
1,1-Dichloroethene	93	70-130
trans-1,2-Dichloroethene	81	70-130
Methyl tert-butyl ether	108	70-130
1,1-Dichloroethane	97	70-130
cis-1,2-Dichloroethene	106	70-130
Chloroform	84	70-130
1,1,1-Trichloroethane	96	70-130
Carbon Tetrachloride	73	60-140
Benzene	88	70-130
1,2-Dichloroethane	91	70-130
Trichloroethene	96	70-130
Toluene	90	70-130
1,1,2-Trichloroethane	105	70-130
Tetrachloroethene	95	70-130
1,2-Dibromoethane (EDB)	114	70-130
Ethyl Benzene	107	70-130
m,p-Xylene	111	70-130
o-Xylene	117	70-130
1,1,2,2-Tetrachloroethane	108	70-130
1,4-Dichlorobenzene	97	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

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7/26/2017
Mr. William Wertz
GeoSyntec Consultants
26 Century Hill Drive
Suite 205
Latham NY 12110

Project Name: Vandenberg 11193
Project #:
Workorder #: 1707242B

Dear Mr. William Wertz

The following report includes the data for the above referenced project for sample(s) received on 7/17/2017 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Ausha Scott

Project Manager

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WORK ORDER #: 1707242B

Work Order Summary

CLIENT:	Mr. William Wertz GeoSyntec Consultants 26 Century Hill Drive Suite 205 Latham, NY 12110	**BILL TO:**	Mr. Paul Nicholson GeoSyntec Consultants 130 Stone Road West Guelph, Ontario N1G3Z2
PHONE:	518-779-3582	**P.O. #**	
FAX:		**PROJECT #**	Vandenberg 11193
DATE RECEIVED:	07/17/2017	**CONTACT:**	Ausha Scott
DATE COMPLETED:	07/26/2017		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
02A	SVP-3SS 07132017	TO-15	2 "Hg	15.2 psi
03A	SSV 07132017	TO-15	1 "Hg	14.5 psi
04A	Lab Blank	TO-15	NA	NA
04B	Lab Blank	TO-15	NA	NA
05A	CCV	TO-15	NA	NA
05B	CCV	TO-15	NA	NA
06A	LCS	TO-15	NA	NA
06AA	LCSD	TO-15	NA	NA
06B	LCS	TO-15	NA	NA
06BB	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 07/26/17

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
EPA Method TO-15
GeoSyntec Consultants
Workorder# 1707242B

Two 1 Liter Summa Canister samples were received on July 17, 2017. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A time was not provided by the field sampler.

The Chain of Custody was missing method information. EATL proceeded with the analysis as per the original contract or verbal agreement.

Analytical Notes

All Quality Control Limit exceedances and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged (analytical batch from 07/25/17).

Dilution was performed on samples SVP-3SS 07132017 and SSV 07132017 due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS

Client Sample ID: SVP-3SS 07132017

Lab ID#: 1707242B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Trichloroethene	11	150	58	790
Tetrachloroethene	11	7400	74	50000

Client Sample ID: SSV 07132017

Lab ID#: 1707242B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
cis-1,2-Dichloroethene	2.0	26	8.1	100
Trichloroethene	2.0	21	11	110
Tetrachloroethene	2.0	650	14	4400
Ethyl Benzene	2.0	4.8	8.9	21
m,p-Xylene	2.0	2.9	8.9	13
Cumene	2.0	2.5	10	12
Propylbenzene	2.0	2.9	10	14
1,3,5-Trimethylbenzene	2.0	3.2	10	16
1,2,4-Trimethylbenzene	2.0	8.4	10	41

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Client Sample ID: SVP-3SS 07132017

Lab ID#: 1707242B-02A

EPA METHOD TO-15 GC/MS

File Name:	**14072531**	**Date of Collection:**	**7/13/17 3:23:00 PM**
Dil. Factor:	**2.18**	**Date of Analysis:**	**7/26/17 09:11 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	11	Not Detected	54	Not Detected
Freon 114	11	Not Detected	76	Not Detected
Chloromethane	44	Not Detected	90	Not Detected
Vinyl Chloride	11	Not Detected	28	Not Detected
1,3-Butadiene	11	Not Detected	24	Not Detected
Bromomethane	44	Not Detected	170	Not Detected
Chloroethane	44	Not Detected	120	Not Detected
Freon 11	11	Not Detected	61	Not Detected
Ethanol	44	Not Detected	82	Not Detected
Freon 113	11	Not Detected	84	Not Detected
1,1-Dichloroethene	11	Not Detected	43	Not Detected
Acetone	44	Not Detected	100	Not Detected
2-Propanol	44	Not Detected	110	Not Detected
Carbon Disulfide	44	Not Detected	140	Not Detected
3-Chloropropene	44	Not Detected	140	Not Detected
Methylene Chloride	44	Not Detected	150	Not Detected
Methyl tert-butyl ether	11	Not Detected	39	Not Detected
trans-1,2-Dichloroethene	11	Not Detected	43	Not Detected
Hexane	11	Not Detected	38	Not Detected
1,1-Dichloroethane	11	Not Detected	44	Not Detected
2-Butanone (Methyl Ethyl Ketone)	44	Not Detected	130	Not Detected
cis-1,2-Dichloroethene	11	Not Detected	43	Not Detected
Tetrahydrofuran	11	Not Detected	32	Not Detected
Chloroform	11	Not Detected	53	Not Detected
1,1,1-Trichloroethane	11	Not Detected	59	Not Detected
Cyclohexane	11	Not Detected	38	Not Detected
Carbon Tetrachloride	11	Not Detected	68	Not Detected
2,2,4-Trimethylpentane	11	Not Detected	51	Not Detected
Benzene	11	Not Detected	35	Not Detected
1,2-Dichloroethane	11	Not Detected	44	Not Detected
Heptane	11	Not Detected	45	Not Detected
Trichloroethene	11	150	58	790
1,2-Dichloropropane	11	Not Detected	50	Not Detected
1,4-Dioxane	44	Not Detected UJ	160	Not Detected UJ
Bromodichloromethane	11	Not Detected	73	Not Detected
cis-1,3-Dichloropropene	11	Not Detected	49	Not Detected
4-Methyl-2-pentanone	11	Not Detected	45	Not Detected
Toluene	11	Not Detected	41	Not Detected
trans-1,3-Dichloropropene	11	Not Detected	49	Not Detected
1,1,2-Trichloroethane	11	Not Detected	59	Not Detected
Tetrachloroethene	11	7400	74	50000
2-Hexanone	44	Not Detected	180	Not Detected

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Client Sample ID: SVP-3SS 07132017

Lab ID#: 1707242B-02A

EPA METHOD TO-15 GC/MS

File Name:	**14072531**	**Date of Collection: 7/13/17 3:23:00 PM**	
Dil. Factor:	**2.18**	**Date of Analysis: 7/26/17 09:11 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	11	Not Detected	93	Not Detected
1,2-Dibromoethane (EDB)	11	Not Detected	84	Not Detected
Chlorobenzene	11	Not Detected	50	Not Detected
Ethyl Benzene	11	Not Detected	47	Not Detected
m,p-Xylene	11	Not Detected	47	Not Detected
o-Xylene	11	Not Detected	47	Not Detected
Styrene	11	Not Detected	46	Not Detected
Bromoform	11	Not Detected	110	Not Detected
Cumene	11	Not Detected	54	Not Detected
1,1,2,2-Tetrachloroethane	11	Not Detected	75	Not Detected
Propylbenzene	11	Not Detected	54	Not Detected
4-Ethyltoluene	11	Not Detected	54	Not Detected
1,3,5-Trimethylbenzene	11	Not Detected	54	Not Detected
1,2,4-Trimethylbenzene	11	Not Detected	54	Not Detected
1,3-Dichlorobenzene	11	Not Detected	66	Not Detected
1,4-Dichlorobenzene	11	Not Detected	66	Not Detected
alpha-Chlorotoluene	11	Not Detected	56	Not Detected
1,2-Dichlorobenzene	11	Not Detected	66	Not Detected
1,2,4-Trichlorobenzene	44	Not Detected	320	Not Detected
Hexachlorobutadiene	44	Not Detected	460	Not Detected

UJ = Analyte associated with low bias in the CCV.

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

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Client Sample ID: SSV 07132017

Lab ID#: 1707242B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071928**	**Date of Collection: 7/13/17 3:44:00 PM**	
Dil. Factor:	**4.11**	**Date of Analysis: 7/20/17 08:16 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	2.0	Not Detected	10	Not Detected
Freon 114	2.0	Not Detected	14	Not Detected
Chloromethane	20	Not Detected	42	Not Detected
Vinyl Chloride	2.0	Not Detected	5.2	Not Detected
1,3-Butadiene	2.0	Not Detected	4.5	Not Detected
Bromomethane	20	Not Detected	80	Not Detected
Chloroethane	8.2	Not Detected	22	Not Detected
Freon 11	2.0	Not Detected	12	Not Detected
Ethanol	8.2	Not Detected	15	Not Detected
Freon 113	2.0	Not Detected	16	Not Detected
1,1-Dichloroethene	2.0	Not Detected	8.1	Not Detected
Acetone	20	Not Detected	49	Not Detected
2-Propanol	8.2	Not Detected	20	Not Detected
Carbon Disulfide	8.2	Not Detected	26	Not Detected
3-Chloropropene	8.2	Not Detected	26	Not Detected
Methylene Chloride	20	Not Detected	71	Not Detected
Methyl tert-butyl ether	8.2	Not Detected	30	Not Detected
trans-1,2-Dichloroethene	2.0	Not Detected	8.1	Not Detected
Hexane	2.0	Not Detected	7.2	Not Detected
1,1-Dichloroethane	2.0	Not Detected	8.3	Not Detected
2-Butanone (Methyl Ethyl Ketone)	8.2	Not Detected	24	Not Detected
cis-1,2-Dichloroethene	2.0	26	8.1	100
Tetrahydrofuran	2.0	Not Detected	6.0	Not Detected
Chloroform	2.0	Not Detected	10	Not Detected
1,1,1-Trichloroethane	2.0	Not Detected	11	Not Detected
Cyclohexane	2.0	Not Detected	7.1	Not Detected
Carbon Tetrachloride	2.0	Not Detected	13	Not Detected
2,2,4-Trimethylpentane	2.0	Not Detected	9.6	Not Detected
Benzene	2.0	Not Detected	6.6	Not Detected
1,2-Dichloroethane	2.0	Not Detected	8.3	Not Detected
Heptane	2.0	Not Detected	8.4	Not Detected
Trichloroethene	2.0	21	11	110
1,2-Dichloropropane	2.0	Not Detected	9.5	Not Detected
1,4-Dioxane	8.2	Not Detected	30	Not Detected
Bromodichloromethane	2.0	Not Detected	14	Not Detected
cis-1,3-Dichloropropene	2.0	Not Detected	9.3	Not Detected
4-Methyl-2-pentanone	2.0	Not Detected	8.4	Not Detected
Toluene	2.0	Not Detected	7.7	Not Detected
trans-1,3-Dichloropropene	2.0	Not Detected	9.3	Not Detected
1,1,2-Trichloroethane	2.0	Not Detected	11	Not Detected
Tetrachloroethene	2.0	650	14	4400
2-Hexanone	8.2	Not Detected	34	Not Detected

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Client Sample ID: SSV 07132017

Lab ID#: 1707242B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071928**	**Date of Collection: 7/13/17 3:44:00 PM**	
Dil. Factor:	**4.11**	**Date of Analysis: 7/20/17 08:16 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	2.0	Not Detected	18	Not Detected
1,2-Dibromoethane (EDB)	2.0	Not Detected	16	Not Detected
Chlorobenzene	2.0	Not Detected	9.5	Not Detected
Ethyl Benzene	2.0	4.8	8.9	21
m,p-Xylene	2.0	2.9	8.9	13
o-Xylene	2.0	Not Detected	8.9	Not Detected
Styrene	2.0	Not Detected	8.8	Not Detected
Bromoform	2.0	Not Detected	21	Not Detected
Cumene	2.0	2.5	10	12
1,1,2,2-Tetrachloroethane	2.0	Not Detected	14	Not Detected
Propylbenzene	2.0	2.9	10	14
4-Ethyltoluene	2.0	Not Detected	10	Not Detected
1,3,5-Trimethylbenzene	2.0	3.2	10	16
1,2,4-Trimethylbenzene	2.0	8.4	10	41
1,3-Dichlorobenzene	2.0	Not Detected	12	Not Detected
1,4-Dichlorobenzene	2.0	Not Detected	12	Not Detected
alpha-Chlorotoluene	2.0	Not Detected	11	Not Detected
1,2-Dichlorobenzene	2.0	Not Detected	12	Not Detected
1,2,4-Trichlorobenzene	8.2	Not Detected	61	Not Detected
Hexachlorobutadiene	8.2	Not Detected	88	Not Detected

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130
1,2-Dichloroethane-d4	99	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1707242B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 11:24 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	5.0	Not Detected	19	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	5.0	Not Detected	12	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
Methyl tert-butyl ether	2.0	Not Detected	7.2	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1707242B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 11:24 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	100	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1707242B-04B

EPA METHOD TO-15 GC/MS

File Name:	**14072509**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 03:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	5.0	Not Detected	25	Not Detected
Freon 114	5.0	Not Detected	35	Not Detected
Chloromethane	20	Not Detected	41	Not Detected
Vinyl Chloride	5.0	Not Detected	13	Not Detected
1,3-Butadiene	5.0	Not Detected	11	Not Detected
Bromomethane	20	Not Detected	78	Not Detected
Chloroethane	20	Not Detected	53	Not Detected
Freon 11	5.0	Not Detected	28	Not Detected
Ethanol	20	Not Detected	38	Not Detected
Freon 113	5.0	Not Detected	38	Not Detected
1,1-Dichloroethene	5.0	Not Detected	20	Not Detected
Acetone	20	Not Detected	48	Not Detected
2-Propanol	20	Not Detected	49	Not Detected
Carbon Disulfide	20	Not Detected	62	Not Detected
3-Chloropropene	20	Not Detected	63	Not Detected
Methylene Chloride	20	Not Detected	69	Not Detected
Methyl tert-butyl ether	5.0	Not Detected	18	Not Detected
trans-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Hexane	5.0	Not Detected	18	Not Detected
1,1-Dichloroethane	5.0	Not Detected	20	Not Detected
2-Butanone (Methyl Ethyl Ketone)	20	Not Detected	59	Not Detected
cis-1,2-Dichloroethene	5.0	Not Detected	20	Not Detected
Tetrahydrofuran	5.0	Not Detected	15	Not Detected
Chloroform	5.0	Not Detected	24	Not Detected
1,1,1-Trichloroethane	5.0	Not Detected	27	Not Detected
Cyclohexane	5.0	Not Detected	17	Not Detected
Carbon Tetrachloride	5.0	Not Detected	31	Not Detected
2,2,4-Trimethylpentane	5.0	Not Detected	23	Not Detected
Benzene	5.0	Not Detected	16	Not Detected
1,2-Dichloroethane	5.0	Not Detected	20	Not Detected
Heptane	5.0	Not Detected	20	Not Detected
Trichloroethene	5.0	Not Detected	27	Not Detected
1,2-Dichloropropane	5.0	Not Detected	23	Not Detected
1,4-Dioxane	20	Not Detected UJ	72	Not Detected UJ
Bromodichloromethane	5.0	Not Detected	34	Not Detected
cis-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
4-Methyl-2-pentanone	5.0	Not Detected	20	Not Detected
Toluene	5.0	Not Detected	19	Not Detected
trans-1,3-Dichloropropene	5.0	Not Detected	23	Not Detected
1,1,2-Trichloroethane	5.0	Not Detected	27	Not Detected
Tetrachloroethene	5.0	Not Detected	34	Not Detected
2-Hexanone	20	Not Detected	82	Not Detected

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Client Sample ID: Lab Blank

Lab ID#: 1707242B-04B

EPA METHOD TO-15 GC/MS

File Name:	**14072509**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 03:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Dibromochloromethane	5.0	Not Detected	42	Not Detected
1,2-Dibromoethane (EDB)	5.0	Not Detected	38	Not Detected
Chlorobenzene	5.0	Not Detected	23	Not Detected
Ethyl Benzene	5.0	Not Detected	22	Not Detected
m,p-Xylene	5.0	Not Detected	22	Not Detected
o-Xylene	5.0	Not Detected	22	Not Detected
Styrene	5.0	Not Detected	21	Not Detected
Bromoform	5.0	Not Detected	52	Not Detected
Cumene	5.0	Not Detected	24	Not Detected
1,1,2,2-Tetrachloroethane	5.0	Not Detected	34	Not Detected
Propylbenzene	5.0	Not Detected	24	Not Detected
4-Ethyltoluene	5.0	Not Detected	24	Not Detected
1,3,5-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,2,4-Trimethylbenzene	5.0	Not Detected	24	Not Detected
1,3-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,4-Dichlorobenzene	5.0	Not Detected	30	Not Detected
alpha-Chlorotoluene	5.0	Not Detected	26	Not Detected
1,2-Dichlorobenzene	5.0	Not Detected	30	Not Detected
1,2,4-Trichlorobenzene	20	Not Detected	150	Not Detected
Hexachlorobutadiene	20	Not Detected	210	Not Detected

UJ = Analyte associated with low bias in the CCV.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: CCV

Lab ID#: 1707242B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071902**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:22 AM**	

Compound	%Recovery
Freon 12	92
Freon 114	89
Chloromethane	108
Vinyl Chloride	98
1,3-Butadiene	96
Bromomethane	92
Chloroethane	97
Freon 11	92
Ethanol	95
Freon 113	89
1,1-Dichloroethene	92
Acetone	96
2-Propanol	106
Carbon Disulfide	100
3-Chloropropene	96
Methylene Chloride	104
Methyl tert-butyl ether	92
trans-1,2-Dichloroethene	108
Hexane	99
1,1-Dichloroethane	96
2-Butanone (Methyl Ethyl Ketone)	99
cis-1,2-Dichloroethene	96
Tetrahydrofuran	105
Chloroform	93
1,1,1-Trichloroethane	89
Cyclohexane	97
Carbon Tetrachloride	92
2,2,4-Trimethylpentane	100
Benzene	93
1,2-Dichloroethane	96
Heptane	96
Trichloroethene	91
1,2-Dichloropropane	98
1,4-Dioxane	100
Bromodichloromethane	96
cis-1,3-Dichloropropene	105
4-Methyl-2-pentanone	96
Toluene	94
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	96
Tetrachloroethene	90
2-Hexanone	104

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Client Sample ID: CCV

Lab ID#: 1707242B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071902**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:22 AM**	

Compound	%Recovery
Dibromochloromethane	94
1,2-Dibromoethane (EDB)	93
Chlorobenzene	95
Ethyl Benzene	96
m,p-Xylene	101
o-Xylene	102
Styrene	100
Bromoform	96
Cumene	95
1,1,2,2-Tetrachloroethane	103
Propylbenzene	98
4-Ethyltoluene	92
1,3,5-Trimethylbenzene	100
1,2,4-Trimethylbenzene	94
1,3-Dichlorobenzene	93
1,4-Dichlorobenzene	93
alpha-Chlorotoluene	98
1,2-Dichlorobenzene	90
1,2,4-Trichlorobenzene	86
Hexachlorobutadiene	85

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	103	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: CCV

Lab ID#: 1707242B-05B

EPA METHOD TO-15 GC/MS

File Name:	**14072502**	**Date of Collection: NA**
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 10:49 AM**

Compound	%Recovery
Freon 12	102
Freon 114	97
Chloromethane	98
Vinyl Chloride	102
1,3-Butadiene	100
Bromomethane	94
Chloroethane	103
Freon 11	110
Ethanol	107
Freon 113	100
1,1-Dichloroethene	102
Acetone	115
2-Propanol	138 Q
Carbon Disulfide	97
3-Chloropropene	90
Methylene Chloride	109
Methyl tert-butyl ether	103
trans-1,2-Dichloroethene	99
Hexane	101
1,1-Dichloroethane	101
2-Butanone (Methyl Ethyl Ketone)	106
cis-1,2-Dichloroethene	102
Tetrahydrofuran	105
Chloroform	105
1,1,1-Trichloroethane	108
Cyclohexane	96
Carbon Tetrachloride	102
2,2,4-Trimethylpentane	100
Benzene	92
1,2-Dichloroethane	104
Heptane	98
Trichloroethene	95
1,2-Dichloropropane	97
1,4-Dioxane	69 Q
Bromodichloromethane	106
cis-1,3-Dichloropropene	102
4-Methyl-2-pentanone	117
Toluene	92
trans-1,3-Dichloropropene	99
1,1,2-Trichloroethane	92
Tetrachloroethene	98
2-Hexanone	104

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Client Sample ID: CCV

Lab ID#: 1707242B-05B

EPA METHOD TO-15 GC/MS

File Name:	**14072502**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 10:49 AM**	

Compound	%Recovery
Dibromochloromethane	103
1,2-Dibromoethane (EDB)	98
Chlorobenzene	94
Ethyl Benzene	102
m,p-Xylene	96
o-Xylene	95
Styrene	100
Bromoform	103
Cumene	108
1,1,2,2-Tetrachloroethane	98
Propylbenzene	102
4-Ethyltoluene	104
1,3,5-Trimethylbenzene	103
1,2,4-Trimethylbenzene	94
1,3-Dichlorobenzene	108
1,4-Dichlorobenzene	106
alpha-Chlorotoluene	111
1,2-Dichlorobenzene	109
1,2,4-Trichlorobenzene	96
Hexachlorobutadiene	110

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: LCS

Lab ID#: 1707242B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071903**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:47 AM**	

Compound	%Recovery	Method Limits
Freon 12	96	70-130
Freon 114	95	70-130
Chloromethane	112	70-130
Vinyl Chloride	102	70-130
1,3-Butadiene	97	70-130
Bromomethane	97	70-130
Chloroethane	105	70-130
Freon 11	98	70-130
Ethanol	112	70-130
Freon 113	90	70-130
1,1-Dichloroethene	99	70-130
Acetone	96	70-130
2-Propanol	109	70-130
Carbon Disulfide	91	70-130
3-Chloropropene	92	70-130
Methylene Chloride	109	70-130
Methyl tert-butyl ether	94	70-130
trans-1,2-Dichloroethene	94	70-130
Hexane	98	70-130
1,1-Dichloroethane	101	70-130
2-Butanone (Methyl Ethyl Ketone)	106	70-130
cis-1,2-Dichloroethene	121	70-130
Tetrahydrofuran	105	70-130
Chloroform	94	70-130
1,1,1-Trichloroethane	91	70-130
Cyclohexane	98	70-130
Carbon Tetrachloride	94	70-130
2,2,4-Trimethylpentane	104	70-130
Benzene	97	70-130
1,2-Dichloroethane	96	70-130
Heptane	102	70-130
Trichloroethene	94	70-130
1,2-Dichloropropane	101	70-130
1,4-Dioxane	97	70-130
Bromodichloromethane	99	70-130
cis-1,3-Dichloropropene	99	70-130
4-Methyl-2-pentanone	99	70-130
Toluene	94	70-130
trans-1,3-Dichloropropene	103	70-130
1,1,2-Trichloroethane	102	70-130
Tetrachloroethene	96	70-130
2-Hexanone	107	70-130

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Client Sample ID: LCS

Lab ID#: 1707242B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071903**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 09:47 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	98	70-130
1,2-Dibromoethane (EDB)	98	70-130
Chlorobenzene	97	70-130
Ethyl Benzene	101	70-130
m,p-Xylene	105	70-130
o-Xylene	106	70-130
Styrene	104	70-130
Bromoform	102	70-130
Cumene	98	70-130
1,1,2,2-Tetrachloroethane	107	70-130
Propylbenzene	103	70-130
4-Ethyltoluene	101	70-130
1,3,5-Trimethylbenzene	101	70-130
1,2,4-Trimethylbenzene	98	70-130
1,3-Dichlorobenzene	97	70-130
1,4-Dichlorobenzene	96	70-130
alpha-Chlorotoluene	106	70-130
1,2-Dichlorobenzene	95	70-130
1,2,4-Trichlorobenzene	94	70-130
Hexachlorobutadiene	91	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	105	70-130
4-Bromofluorobenzene	99	70-130

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Client Sample ID: LCSD

Lab ID#: 1707242B-06AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071904**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 10:12 AM**	

Compound	%Recovery	Method Limits
Freon 12	94	70-130
Freon 114	94	70-130
Chloromethane	106	70-130
Vinyl Chloride	101	70-130
1,3-Butadiene	97	70-130
Bromomethane	96	70-130
Chloroethane	100	70-130
Freon 11	96	70-130
Ethanol	112	70-130
Freon 113	90	70-130
1,1-Dichloroethene	98	70-130
Acetone	94	70-130
2-Propanol	106	70-130
Carbon Disulfide	90	70-130
3-Chloropropene	89	70-130
Methylene Chloride	105	70-130
Methyl tert-butyl ether	93	70-130
trans-1,2-Dichloroethene	93	70-130
Hexane	98	70-130
1,1-Dichloroethane	96	70-130
2-Butanone (Methyl Ethyl Ketone)	100	70-130
cis-1,2-Dichloroethene	120	70-130
Tetrahydrofuran	102	70-130
Chloroform	93	70-130
1,1,1-Trichloroethane	89	70-130
Cyclohexane	98	70-130
Carbon Tetrachloride	91	70-130
2,2,4-Trimethylpentane	100	70-130
Benzene	95	70-130
1,2-Dichloroethane	95	70-130
Heptane	100	70-130
Trichloroethene	92	70-130
1,2-Dichloropropane	100	70-130
1,4-Dioxane	98	70-130
Bromodichloromethane	98	70-130
cis-1,3-Dichloropropene	100	70-130
4-Methyl-2-pentanone	99	70-130
Toluene	94	70-130
trans-1,3-Dichloropropene	97	70-130
1,1,2-Trichloroethane	97	70-130
Tetrachloroethene	91	70-130
2-Hexanone	102	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1707242B-06AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**a071904**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/19/17 10:12 AM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	93	70-130
1,2-Dibromoethane (EDB)	91	70-130
Chlorobenzene	92	70-130
Ethyl Benzene	95	70-130
m,p-Xylene	100	70-130
o-Xylene	104	70-130
Styrene	100	70-130
Bromoform	96	70-130
Cumene	94	70-130
1,1,2,2-Tetrachloroethane	102	70-130
Propylbenzene	98	70-130
4-Ethyltoluene	97	70-130
1,3,5-Trimethylbenzene	95	70-130
1,2,4-Trimethylbenzene	94	70-130
1,3-Dichlorobenzene	93	70-130
1,4-Dichlorobenzene	91	70-130
alpha-Chlorotoluene	100	70-130
1,2-Dichlorobenzene	92	70-130
1,2,4-Trichlorobenzene	90	70-130
Hexachlorobutadiene	88	70-130

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	101	70-130
4-Bromofluorobenzene	96	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1707242B-06B

EPA METHOD TO-15 GC/MS

File Name:	**14072503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 12:04 PM**	

Compound	%Recovery	Method Limits
Freon 12	106	70-130
Freon 114	101	70-130
Chloromethane	95	70-130
Vinyl Chloride	105	70-130
1,3-Butadiene	100	70-130
Bromomethane	96	70-130
Chloroethane	105	70-130
Freon 11	111	70-130
Ethanol	120	70-130
Freon 113	100	70-130
1,1-Dichloroethene	107	70-130
Acetone	112	70-130
2-Propanol	112	70-130
Carbon Disulfide	86	70-130
3-Chloropropene	88	70-130
Methylene Chloride	108	70-130
Methyl tert-butyl ether	100	70-130
trans-1,2-Dichloroethene	85	70-130
Hexane	102	70-130
1,1-Dichloroethane	104	70-130
2-Butanone (Methyl Ethyl Ketone)	94	70-130
cis-1,2-Dichloroethene	118	70-130
Tetrahydrofuran	102	70-130
Chloroform	106	70-130
1,1,1-Trichloroethane	105	70-130
Cyclohexane	102	70-130
Carbon Tetrachloride	104	70-130
2,2,4-Trimethylpentane	102	70-130
Benzene	96	70-130
1,2-Dichloroethane	102	70-130
Heptane	96	70-130
Trichloroethene	100	70-130
1,2-Dichloropropane	93	70-130
1,4-Dioxane	55 Q	70-130
Bromodichloromethane	104	70-130
cis-1,3-Dichloropropene	91	70-130
4-Methyl-2-pentanone	112	70-130
Toluene	97	70-130
trans-1,3-Dichloropropene	101	70-130
1,1,2-Trichloroethane	93	70-130
Tetrachloroethene	99	70-130
2-Hexanone	96	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1707242B-06B

EPA METHOD TO-15 GC/MS

File Name:	**14072503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 12:04 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	100	70-130
1,2-Dibromoethane (EDB)	96	70-130
Chlorobenzene	95	70-130
Ethyl Benzene	97	70-130
m,p-Xylene	99	70-130
o-Xylene	97	70-130
Styrene	101	70-130
Bromoform	103	70-130
Cumene	106	70-130
1,1,2,2-Tetrachloroethane	94	70-130
Propylbenzene	104	70-130
4-Ethyltoluene	102	70-130
1,3,5-Trimethylbenzene	103	70-130
1,2,4-Trimethylbenzene	91	70-130
1,3-Dichlorobenzene	108	70-130
1,4-Dichlorobenzene	105	70-130
alpha-Chlorotoluene	113	70-130
1,2-Dichlorobenzene	109	70-130
1,2,4-Trichlorobenzene	101	70-130
Hexachlorobutadiene	116	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	104	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1707242B-06BB

EPA METHOD TO-15 GC/MS

File Name:	**14072504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 12:28 PM**	

Compound	%Recovery	Method Limits
Freon 12	107	70-130
Freon 114	100	70-130
Chloromethane	97	70-130
Vinyl Chloride	104	70-130
1,3-Butadiene	100	70-130
Bromomethane	94	70-130
Chloroethane	98	70-130
Freon 11	109	70-130
Ethanol	124	70-130
Freon 113	102	70-130
1,1-Dichloroethene	108	70-130
Acetone	112	70-130
2-Propanol	115	70-130
Carbon Disulfide	85	70-130
3-Chloropropene	96	70-130
Methylene Chloride	107	70-130
Methyl tert-butyl ether	99	70-130
trans-1,2-Dichloroethene	86	70-130
Hexane	101	70-130
1,1-Dichloroethane	103	70-130
2-Butanone (Methyl Ethyl Ketone)	96	70-130
cis-1,2-Dichloroethene	114	70-130
Tetrahydrofuran	104	70-130
Chloroform	103	70-130
1,1,1-Trichloroethane	106	70-130
Cyclohexane	97	70-130
Carbon Tetrachloride	105	70-130
2,2,4-Trimethylpentane	102	70-130
Benzene	93	70-130
1,2-Dichloroethane	101	70-130
Heptane	98	70-130
Trichloroethene	96	70-130
1,2-Dichloropropane	91	70-130
1,4-Dioxane	67 Q	70-130
Bromodichloromethane	103	70-130
cis-1,3-Dichloropropene	94	70-130
4-Methyl-2-pentanone	110	70-130
Toluene	93	70-130
trans-1,3-Dichloropropene	102	70-130
1,1,2-Trichloroethane	95	70-130
Tetrachloroethene	98	70-130
2-Hexanone	93	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1707242B-06BB

EPA METHOD TO-15 GC/MS

File Name:	**14072504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/25/17 12:28 PM**	

Compound	%Recovery	Method Limits
Dibromochloromethane	103	70-130
1,2-Dibromoethane (EDB)	96	70-130
Chlorobenzene	94	70-130
Ethyl Benzene	95	70-130
m,p-Xylene	97	70-130
o-Xylene	100	70-130
Styrene	99	70-130
Bromoform	108	70-130
Cumene	108	70-130
1,1,2,2-Tetrachloroethane	97	70-130
Propylbenzene	105	70-130
4-Ethyltoluene	106	70-130
1,3,5-Trimethylbenzene	104	70-130
1,2,4-Trimethylbenzene	97	70-130
1,3-Dichlorobenzene	114	70-130
1,4-Dichlorobenzene	111	70-130
alpha-Chlorotoluene	119	70-130
1,2-Dichlorobenzene	112	70-130
1,2,4-Trichlorobenzene	112	70-130
Hexachlorobutadiene	128	70-130

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	106	70-130

ENTAGLEMENT DATA

Sample #	data file	collection time	sample volume [L]	TCE [ug/m3]	MDL [ug/m3]	cisDCE [ug/m3]	fitter notes	comments
1	field blank	7:30	0.005	7.7	10.0	39.7	cisDCE bad fit	measured with van air
2	building indoor air	7:50	0.005	8.8	10.0	43.5	cisDCE bad fit	measurement of indoor air and initial tubing backgrounds
3	building indoor air	8:05	0.005	6.3	10.0	18.9	cisDCE bad fit	indoor air, prior to connecting to vent tube
4	subslab ventilator sample	8:24	0.005	734.9	10.0	556.3		static line, prior to start of venting fan
5	subslab ventilator sample	8:37	0.005	960.8	10.0	682.1		vent started, ~8:30, approx 30in vacuum
6	subslab ventilator sample	8:51	0.005	956.7	10.0	892.8		
7	subslab ventilator sample	9:05	0.005	1027.7	10.0	955.7		
8	subslab ventilator sample	9:25	0.005	1043.7	10.0	878.1		
9	subslab ventilator sample	9:40	0.005	954.5	10.0	935.1		
10	subslab ventilator sample	9:55	0.005	963.4	10.0	848.7		
11	subslab ventilator sample	10:09	0.005	920.2	10.0	949.7		co-sampled with TO-15 #101635
12	subslab ventilator sample	10:22	0.005	898.8	10.0	1018.7		
13	subslab ventilator sample	10:36	0.005	878.1	10.0	946.2		
14	subslab ventilator sample	10:50	0.005	839.1	10.0	939.8		
15	subslab ventilator sample	11:04	0.005	854.8	10.0	991.8		
16	subslab ventilator sample	11:17	0.005	834.3	10.0	957.5		
17	subslab ventilator sample	11:31	0.005	835.8	10.0	892.5		
18	subslab ventilator sample	11:45	0.005	849.8	10.0	923.1		
19	subslab ventilator sample	11:59	0.005	845.4	10.0	907.1		
20	subslab ventilator sample	12:12	0.005	851.2	10.0	880.2		
21	subslab ventilator sample	12:26	0.005	840.5	10.0	868.5		
22	subslab ventilator sample	12:40	0.005	821.8	10.0	872.3		
23	subslab ventilator sample	12:54	0.005	826.2	10.0	885.2		
24	subslab ventilator sample	13:07	0.005	816.1	10.0	871.1		
25	subslab ventilator sample	13:21	0.005	824.0	10.0	982.2		
26	subslab ventilator sample	13:35	0.005	808.0	10.0	849.3		
27	subslab ventilator sample	13:48	0.005	817.0	10.0	888.2		
28	subslab ventilator sample	14:02	0.005	787.6	10.0	884.0		
29	subslab ventilator sample	14:16	0.005	779.0	10.0	836.3		
30	subslab ventilator sample	14:30	0.005	771.1	10.0	816.2		
31	subslab ventilator sample	14:43	0.005	759.3	10.0	804.5		
32	subslab ventilator sample	14:57	0.005	768.7	10.0	801.2		
33	subslab ventilator sample	15:11	0.005	820.0	10.0	866.8		pressure transient testing, started ~15:00
34	subslab ventilator sample	15:25	0.005	889.8	10.0	911.0		
35	subslab ventilator sample	15:38	0.005	733.7	10.0	757.9		changed vent flow for 10in vacuum
36	subslab ventilator sample	15:52	0.005	805.9	10.0	835.0		
37	subslab ventilator sample	16:06	0.005	833.1	10.0	820.3		
38	subslab ventilator sample	16:20	0.005	858.9	10.0	819.4		
39	subslab ventilator sample	16:33	0.005	831.2	10.0	808.5		
40	subslab ventilator sample	16:47	0.005	844.7	10.0	797.6		
41	subslab ventilator sample	17:01	0.005	838.5	10.0	807.8		
42	subslab ventilator sample	17:15	0.005	867.7	10.0	812.3		
43	aa ccv	17:49	0.005	248.4	10.0	255.6		aa calibration standard, cal factor = 0.92
44	field blank	18:08	0.005	3.8	10.0	50.1	cisDCE bad fit	field blank

EMLab P&K
A TestAmerica Company

Report for:

Darius Mali
Geosyntec Consultants, Inc.
130 Research Lane Suite 2
Guelph, ON N1G5A5 Canada

Regarding: Project: TRO479.02C; ESTCP
EML ID: 1749206

Approved by:

Certified Radon Analyst
Theo Golubic

Dates of Analysis:
Radon in Air: 06-27-2017

Service SOPs: Radon in Air (EM-BC-S-1201)
AARST-NRPP Certified ID: RT-106267 & AL-102969

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

EMLab P&K
1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: Geosyntec Consultants, Inc.
C/O: Darius Mali
Re: TRO479.02C; ESTCP

Date of Receipt: 06-26-2017
Date of Report: 06-27-2017

RADON: S CHAMBER E-PERM® SYSTEM

Location:	1: B11193-061917-SVP4-Dup	2: B11193-061917-SVP4	3: B11193-061917-SVP2	4: B11193-061917-SVP1	5: B11193-061917-SVP3
Comments (see below)	None	None	None	None	None
Lab ID-Version‡:	8167544-1	8167545-1	8167546-1	8167547-1	8167548-1
Analysis Date:	06/27/2017	06/27/2017	06/27/2017	06/27/2017	06/27/2017
Sample type	Radon Canister	Radon Canister	Radon Canister	Radon Canister	Radon Canister
Elevation	512 ft	512 ft	512 ft	512 ft	512 ft
Electret Serial Number	SJF405	SJF993	SIQ580	SIQ565	SJF891
Electret Type	Short Term (SST)	Short Term (SST)	Short Term (SST)	Short Term (SST)	Short Term (SST)
Start Test	6/16/2017 04:35 PM	6/16/2017 04:35 PM	6/16/2017 04:47 PM	6/16/2017 04:40 PM	6/16/2017 04:50 PM
End Test	6/19/2017 09:00 AM	6/19/2017 09:00 AM	6/19/2017 09:00 AM	6/19/2017 09:00 AM	6/19/2017 09:00 AM
SPER-1 Electret Reader S/N	00702	00702	00702	00702	00702
Test State	California	California	California	California	California
Background Gamma	6.6 µR/Hr	6.6 µR/Hr	6.6 µR/Hr	6.6 µR/Hr	6.6 µR/Hr
§ Radon Concentration	1.42 ± 0.22 pCi/L	1.20 ± 0.20 pCi/L	1.38 ± 0.23 pCi/L	1.28 ± 0.22 pCi/L	1.54 ± 0.22 pCi/L

pCi/L = Picocuries per Liter µR/Hr = Microroentgen per Hour

Comments:

§ Radon Concentration and measurement uncertainty has been rounded to the nearest 0.01 pCi/L to reflect analytical precision. Measurement uncertainty cannot be calculated when the Radon Concentration is below the detection limit. A measurement uncertainty value that is greater than the actual Radon Concentration can sometimes occur when the Radon Concentration is very low. The Limit of Detection is the lowest Radon Concentration that can be calculated relative to the unique parameters of each sample (i.e. short term vs. long term, difference in voltage, duration of sampling, elevation and background gamma). For more information on calculating Limit of Detection or Analytical Sensitivity please contact the laboratory Quality Assurance Department.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

For the United States Environmental Protection Agency recommendations regarding Radon Concentration, please refer to www.epa.gov/radon

Radon Analysis (EPA Method GS: Grab Sample/Scintillation Cell counting)

For Geosyntec

Client Project Number: TR0479.02C

Samples Collected by: Darius Mali

Sample Dates: 6/19/17-6/21/17

Sample containers: Tedlar bags

Location: Vandenberg AFB

Assumed Site Pressure **1.00** atm

Analysts: Doug Hammond

based on an estimated elevation of 369 ft

Phone: 310-490-7896

Time Zone adjustment: add to decay time

email: dhammond@usc.edu

0 hours

Collect (PDT)

Run (PDT)

Summary

		Collection		Analysis					Lab Duplicates			
		Date	time (PDT)	Date	time (PDT)	Vol run (cc)	Conc. pCi/L	±1 sig pCi/L	mean pCi/L	±1ssd pCi/L	Notes	
Received 6/23/17												
1	B11193-0619-SSV-1-44-0 (ba	6/19/17	15:00	6/23/17	12:57	40	31.1	1.6				
2	B11193-0620-SSV-2-22-0 (ba	6/20/17	7:30	6/23/17	12:59	40	30.2	1.6				
3	B11193-0621-SSV-3-54-10 (b	6/21/17	8:34	6/23/17	13:19	40	18.3	1.2	18.3	0.0		
	Lab dupe	6/21/17	8:34	6/26/17	16:31	40	18.3	1.0				
4	B11193-0621-SSV-4-65-10 (b	6/21/17	12:20	6/24/17	18:10	40	18.4	0.9				
5	B11193-0621-SSV-5-65-5 (ba	6/21/17	13:40	6/24/17	18:13	40	18.5	0.9				
6	B11193-0621-SSV-6-58-5 (ba	6/21/17	17:34	6/24/17	18:16	40	16.5	0.8				

Uncertainty given in pCi/liter is based on counting statistics for low activity samples. For high activity samples uncertainty is ±5%.

The Lower Limit of Detection for Rn (95% confidence level as recommended by EPA 402-R-95-012, Oct. 97) is 0.14 pCi/liter.

Results are reported based on standardization with NIST-traceable radon sources.

These results are for application of naturally-occurring radon as a tracer of soil vapor intrusion, but are not intended for evaluation of radon hazards.

Results corrected to in situ pressure as noted above

Raw Data, Calculation factors, and Analytical Details

		Collection		Analysis													count	
	Sample ID	Date	Time (PDT)	Date	Time (PDT)	Count in cell/ch	He eff	Air/He eff	Vol run (cc)	Press factor	obs dpm	sig dpm	Decay T (hours)	Decay factor	Concentration dpm/liter	pCi/liter	stats pCi/liter ±1 sig	Notes
Received 6/23/17																		
1	B11193-0619-SSV-1-44-0 (bag 1)	6/19/17	15:00	6/23/17	12:57	77/32	0.915	0.99	40	1.00	1.23	0.01	94.0	2.033	69	31.1	0.2	
2	B11193-0620-SSV-2-22-0 (bag 2)	6/20/17	7:30	6/23/17	12:59	58/31	0.900	0.99	40	1.00	1.33	0.07	77.5	1.796	67	30.2	1.6	
3	B11193-0621-SSV-3-54-10 (bag 3)	6/21/17	8:34	6/23/17	13:19	61/33	0.822	0.99	40	1.00	0.89	0.06	52.8	1.490	41	18.3	1.2	
	Lab dupe	6/21/17	8:34	6/26/17	16:31	77/32	0.915	0.99	40	1.00	0.56	0.03	128.0	2.629	41	18.3	1.0	
4	B11193-0621-SSV-4-65-10 (bag 4)	6/21/17	12:20	6/24/17	18:10	72/22	0.937	0.99	40	1.00	0.84	0.02	77.8	1.800	41	18.4	0.4	
5	B11193-0621-SSV-5-65-5 (bag 5)	6/21/17	13:40	6/24/17	18:13	81/31	0.788	0.99	40	1.00	0.72	0.02	76.6	1.783	41	18.5	0.5	
6	B11193-0621-SSV-6-58-5 (bag 6)	6/21/17	17:34	6/24/17	18:16	61/33	0.822	0.99	40	1.00	0.69	0.02	72.7	1.732	37	16.5	0.5	

Decay corrections based on Rn decay constant of 0.1813 per day

Conversion from dpm based on 0.4504 pCi/dpm

Blanks are negligible.

Radon Conc = [(0.4504)(1000)(obs dpm)(decay factor)(Press factor)]/[(cc used)(He eff)(Air/He)] (in pCi/liter)

Definitions:

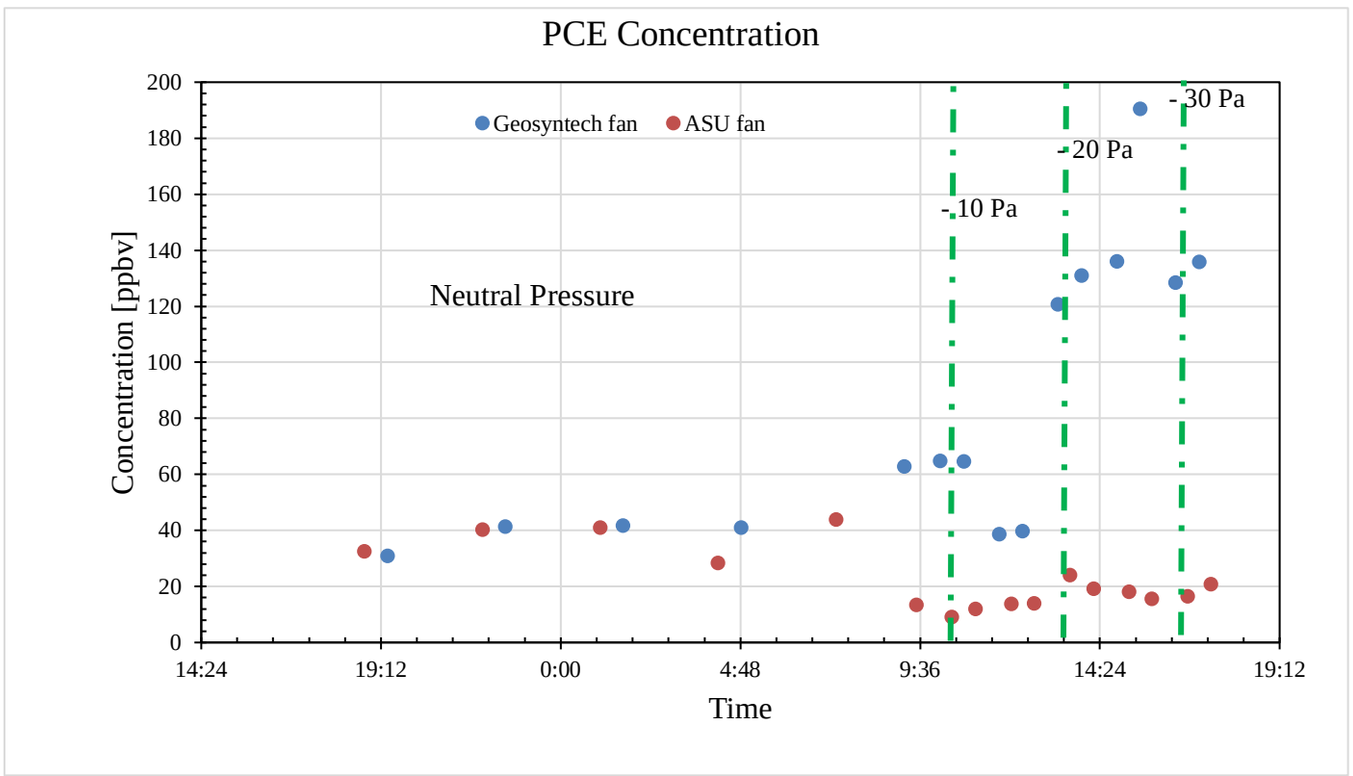
Cell/ch:	Counting cell and channel used	sig dpm	uncertainty (± 1 sig) in dpm based on counting statistics
He eff:	Cell and counter efficiency using helium matrix	Decay T:	time elapsed from sampling to analysis
Air/He:	Correction for matrix counting gas density	Decay factor:	Correction factor for decay from collection to analysis
Sample vol:	Volume analyzed (cc)	dpm/liter:	Radon concentration in disintigrations per minute per liter of sample
Press factor:	Correction to in situ pressure based on collection altitude	piC/liter:	Radon concentration in picoCuries per liter
obs dpm:	observed radon activity (disintigrations per minute) when analyzed	count stats:	uncertainty in observed radon based on counting statistics

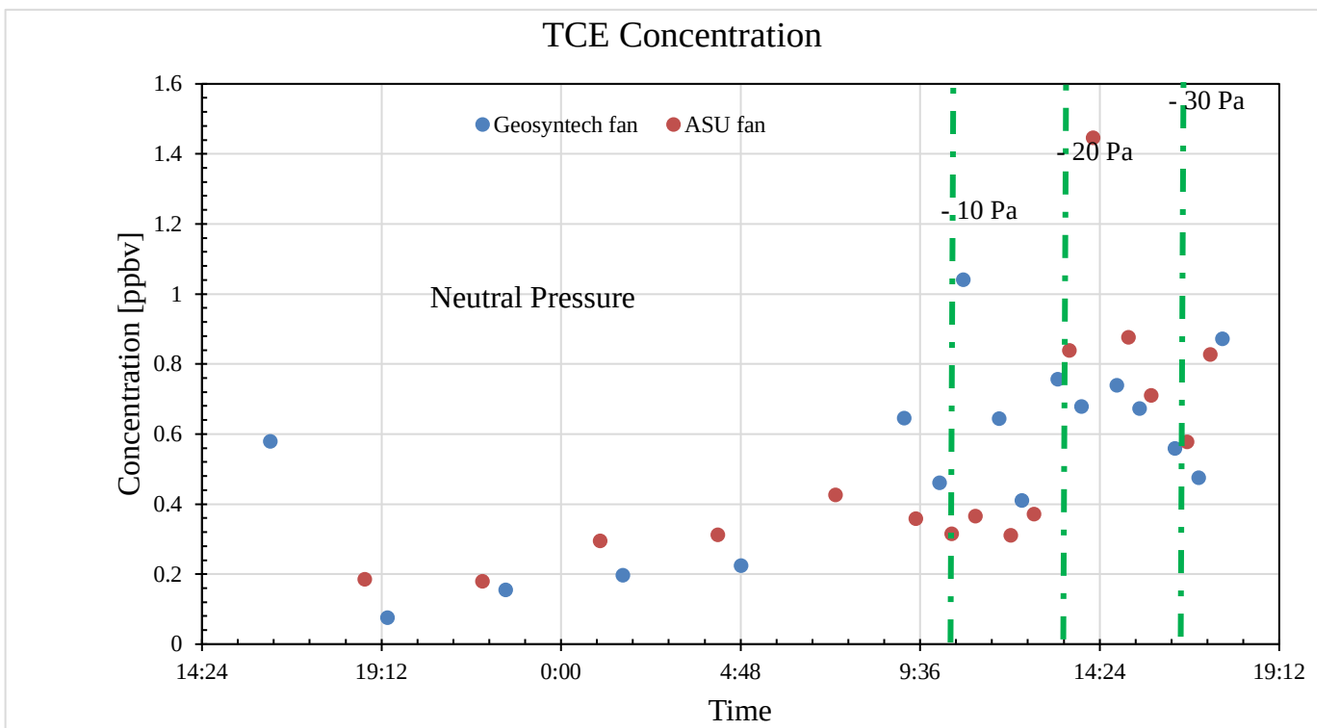
Summary of pressure step test

Results shows the summary of two analyticals (ECD and DELCD)
GC-ECD results are used for Concentrations less than 10 ppbv; and GC-DELCD results are used for Concentrations greater than 10 ppbv.

dP Setting	Start Time
- 10 Pa	6/13/2017 9:50
- 20 Pa	6/13/2017 13:05
- 30 Pa	6/13/2017 16:41

Location	Geosyntech fan				Location	ASU fan			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/12/2017 16:14	Port1-ECD-01	0.579092	Port1-DELCD-01		6/12/2017 18:45	Port9-ECD-01	0.18463	Port9-DELCD-01	32.33004
6/12/2017 19:22	Port1-ECD-02	0.075164	Port1-DELCD-02	30.71253	6/12/2017 21:54	Port9-ECD-02	0.179502	Port9-DELCD-02	40.07745
6/12/2017 22:31	Port1-ECD-03	0.154792	Port1-DELCD-03	41.152	6/13/2017 1:03	Port9-ECD-03	0.295172	Port9-DELCD-03	40.89037
6/13/2017 1:40	Port1-ECD-04	0.196563	Port1-DELCD-04	41.51655	6/13/2017 4:12	Port9-ECD-04	0.311965	Port9-DELCD-04	28.2198
6/13/2017 4:49	Port1-ECD-05	0.224329	Port1-DELCD-05	40.87461	6/13/2017 7:21	Port9-ECD-05	0.426103	Port9-DELCD-05	43.76827
6/13/2017 9:11	Port1-ECD-01	0.645357	Port1-DELCD-01	62.62672	6/13/2017 9:30	Port2-ECD-01	0.357663	Port2-DELCD-01	13.33715
6/13/2017 10:08	Port1-ECD-02	0.460986	Port4-DELCD-01	64.72989	6/13/2017 10:27	Port5-ECD-01	0.315362	Port5-ECD-01	8.882322
6/13/2017 10:46	Port1-ECD-03	1.040863	Port6-DELCD-01	64.48577	6/13/2017 11:05	Port7-ECD-01	0.365091	Port7-DELCD-01	11.82324
6/13/2017 11:43	Port4-ECD-01	0.644359	Port9-DELCD-01	38.45221	6/13/2017 12:02	Port10-ECD-01	0.310561	Port10-DELCD-01	13.56452
6/13/2017 12:20	Port4-ECD-02	0.410654	Port1-DELCD-02	39.52737	6/13/2017 12:39	Port2-ECD-02	0.37105	Port2-DELCD-02	13.85252
6/13/2017 13:17	Port4-ECD-03	0.756558	Port4-DELCD-02	120.5755	6/13/2017 13:36	Port5-ECD-02	0.838187	Port5-DELCD-02	23.88719
6/13/2017 13:55	Port6-ECD-01	0.678248	Port6-DELCD-02	130.892	6/13/2017 14:14	Port7-ECD-02	1.446043	Port7-DELCD-02	19.07081
6/13/2017 14:51	Port6-ECD-02	0.738766	Port9-DELCD-02	135.9034	6/13/2017 15:10	Port10-ECD-02	0.876254	Port10-DELCD-02	17.95404
6/13/2017 15:28	Port6-ECD-03	0.672295	Port1-DELCD-03	190.4186	6/13/2017 15:47	Port2-ECD-03	0.709946	Port2-DELCD-03	15.52725
6/13/2017 16:25	Port9-ECD-01	0.558481	Port4-DELCD-03	128.2616	6/13/2017 16:44	Port5-ECD-03	0.576651	Port5-DELCD-03	16.30432
6/13/2017 17:03	Port9-ECD-02	0.474552	Port6-DELCD-03	135.635	6/13/2017 17:22	Port7-ECD-03	0.827221	Port7-DELCD-03	20.76146
6/13/2017 17:41	Port8-ECD-03	0.871349							





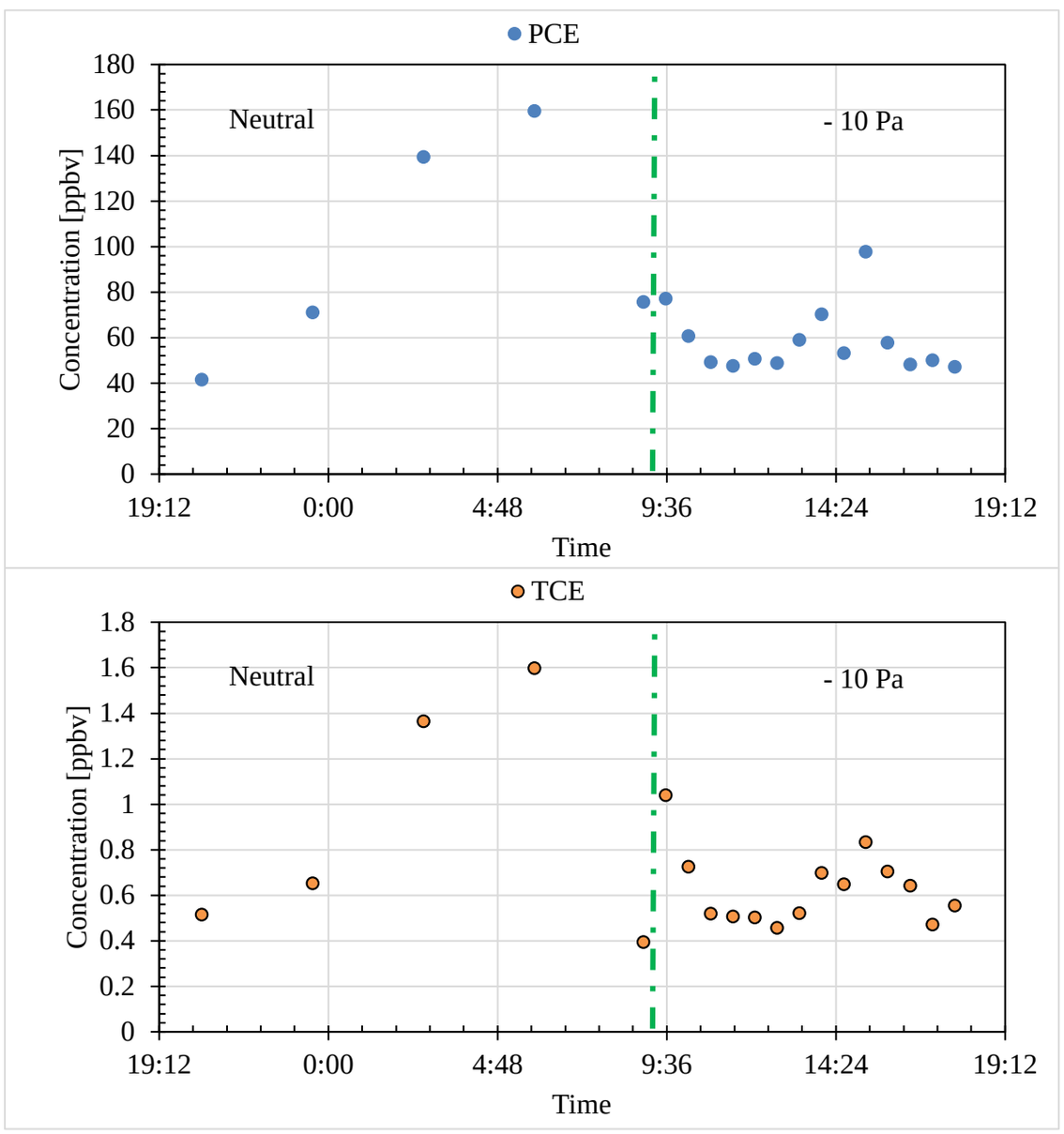
Location	GC-3				Location	GC-6			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/12/2017 16:51	Port3-ECD-01	2.401551	Port3-ECD-01	447.5108	6/12/2017 17:48	Port6-ECD-01	0.092069	Port6-ECD-01	9.422288
6/12/2017 20:00	Port3-ECD-02	0.362463	Port3-DELCD-02	69.11775	6/12/2017 20:57	Port6-ECD-02	0.056911	Port6-ECD-02	4.974075
6/12/2017 23:09	Port3-ECD-03	0.314807	Port3-DELCD-03	55.06568	6/13/2017 0:06	Port6-ECD-03	0.091177	Port6-ECD-03	7.939019
6/13/2017 2:18	Port3-ECD-04	0.405175	Port3-DELCD-04	78.13631	6/13/2017 3:15	Port6-ECD-04	0.098782	Port6-ECD-04	9.144084
6/13/2017 5:27	Port3-ECD-05	0.38135	Port3-DELCD-05	57.9166	6/13/2017 6:24	Port6-ECD-05	0.106819	Port6-ECD-05	9.658214
6/13/2017 9:49	Port3-ECD-01	0.987779	Port3-DELCD-01	179.101	6/13/2017 11:24	Port8-ECD-01	1.341364	Port8-ECD-01	0.665324
6/13/2017 12:58	Port3-ECD-02	0.830074	Port3-DELCD-02	129.5392	6/13/2017 14:33	Port8-ECD-02	6.994685	Port8-ECD-02	7.2461
6/13/2017 16:06	Port3-ECD-03	2.314072	Port3-DELCD-03	412.6362	6/13/2017 17:41	Port8-ECD-03	0.871349	Port8-DELCD-03	127.9972

8-h Building depressurization test @ -10 Pa

-10 Pa 6/14/2017 9:05
-20 Pa 6/14/2017 14:30

Location	ASU fan				Location	GC-3			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/13/2017 20:24	Port9-ECD-01	0.513185	Port9-DELCD-01	41.51678	6/13/2017 18:30	Port3-ECD-01	3.808976	Port3-DELCD-01	798.9916
6/13/2017 23:33	Port9-ECD-02	0.652298	Port9-DELCD-02	70.94429	6/13/2017 21:39	Port3-ECD-02	0.619783	Port3-DELCD-02	86.00831
6/14/2017 2:41	Port9-ECD-03	1.363913	Port9-DELCD-03	139.364	6/14/2017 0:47	Port3-ECD-03	1.321953	Port3-DELCD-03	177.4187
6/14/2017 5:50	Port9-ECD-04	1.59767	Port9-DELCD-04	159.4709	6/14/2017 3:56	Port3-ECD-04	1.869399	Port3-DELCD-04	216.2746
6/14/2017 8:56	Port1-ECD-01	0.392897	Port1-ECD-01	75.55977	6/14/2017 7:05	Port3-ECD-05	1.968687	Port3-DELCD-05	228.2117
6/14/2017 9:34	Port3-ECD-01	1.038073	Port3-DELCD-01	77.03902	6/14/2017 9:15	Port2-ECD-01	1.551215	Port2-DELCD-01	177.4409
6/14/2017 10:12	Port5-ECD-01	0.723627	Port5-DELCD-01	60.57349	6/14/2017 12:24	Port2-ECD-02	0.719199	Port2-DELCD-02	162.2555
6/14/2017 10:50	Port7-ECD-01	0.517516	Port7-DELCD-01	49.16088	6/14/2017 15:33	Port2-ECD-03	0.797048	Port2-DELCD-03	179.814
6/14/2017 11:28	Port9-ECD-01	0.505196	Port9-DELCD-01	47.49047					
6/14/2017 12:05	Port1-ECD-02	0.501276	Port1-DELCD-02	50.49607					
6/14/2017 12:43	Port3-ECD-02	0.456506	Port3-DELCD-02	48.78132					
6/14/2017 13:21	Port5-ECD-02	0.520277	Port5-DELCD-02	58.92278					
6/14/2017 13:59	Port7-ECD-02	0.698439	Port7-DELCD-02	70.15077					
6/14/2017 14:37	Port9-ECD-02	0.646475	Port9-DELCD-02	53.15698					
6/14/2017 15:14	Port1-ECD-03	0.832568	Port1-DELCD-03	97.63465					
6/14/2017 15:52	Port3-ECD-03	0.704231	Port3-DELCD-03	57.72273					
6/14/2017 16:30	Port5-ECD-03	0.641755	Port5-DELCD-03	48.04904					
6/14/2017 17:08	Port7-ECD-03	0.469912	Port7-DELCD-03	49.97312					
6/14/2017 17:46	Port9-ECD-03	0.554606	Port9-DELCD-03	47.13911					

Location	GC-7			
Time	File ID	TCE	File ID	PCE
6/13/2017 19:46	Port7-ECD-01	0.236677	Port7-DELCD-01	18.80911
6/13/2017 22:55	Port7-ECD-02	0.226737	Port7-DELCD-02	31.11452
6/14/2017 2:03	Port7-ECD-03	0.753691	Port7-DELCD-03	84.13903
6/14/2017 5:12	Port7-ECD-04	1.310549	Port7-DELCD-04	140.8157
6/14/2017 8:21	Port7-DELCD-05	0.719488	Port7-DELCD-05	34.66801
6/14/2017 11:09	Port8-ECD-01	0.847975	Port8-DELCD-01	63.99238
6/14/2017 14:18	Port8-ECD-02	0.623379	Port8-DELCD-02	79.44603
6/14/2017 17:27	Port8-ECD-03	0.567535	Port8-DELCD-03	62.41276



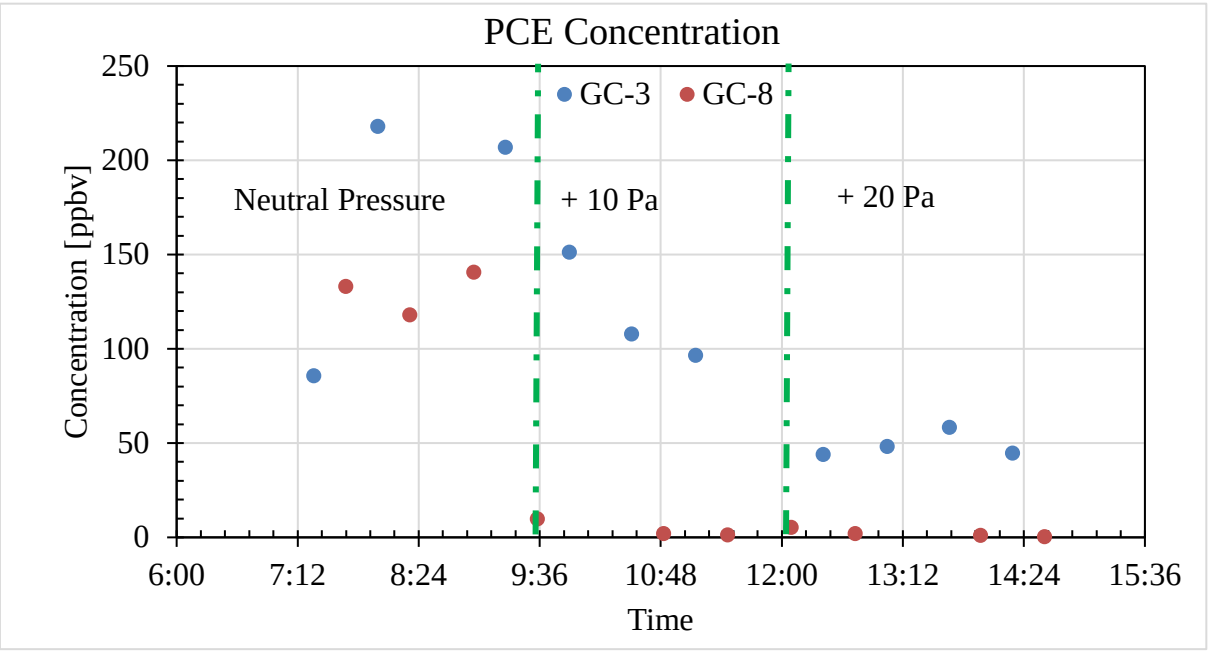
Location	GC-4				Location	GC-6			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/13/2017 18:49	Port4-ECD-01	0.906987	Port4-DELCD-01	127.498	6/13/2017 19:27	Port6-ECD-01	0.207158	Port6-DELCD-01	16.35882
6/13/2017 21:58	Port4-ECD-02	0.510875	Port4-DELCD-02	67.3526	6/13/2017 22:36	Port6-ECD-02	0.170636	Port6-DELCD-02	26.14103
6/14/2017 1:06	Port4-ECD-03	1.17707	Port4-DELCD-03	149.4623	6/14/2017 1:44	Port6-ECD-03	0.57788	Port6-DELCD-03	75.24659
6/14/2017 4:15	Port4-ECD-04	1.664399	Port4-DELCD-04	184.6766	6/14/2017 4:53	Port6-ECD-04	1.071512	Port6-DELCD-04	121.0672
6/14/2017 7:24	Port4-ECD-05	1.836415	Port4-DELCD-05	200.0057	6/14/2017 8:02	Port6-ECD-05	1.285777	Port6-DELCD-05	138.8715
6/14/2017 9:53	Port4-ECD-01	1.213819	Port4-DELCD-01	133.5014	6/14/2017 10:31	Port6-ECD-01	0.337939	Port6-DELCD-01	26.95153
6/14/2017 13:02	Port4-ECD-02	0.606132	Port4-DELCD-02	114.8484	6/14/2017 13:40	Port6-ECD-02	0.306592	Port6-DELCD-02	21.23507
6/14/2017 16:11	Port4-ECD-03	0.532154	Port4-DELCD-03	110.7716	6/14/2017 16:49	Port6-ECD-03	0.232989	Port6-DELCD-03	25.11089

Location	GC-8			
Time	File ID	TCE	File ID	PCE
6/13/2017 20:05	Port8-ECD-01	0.521647	Port8-DELCD-01	37.47035
6/13/2017 23:14	Port8-ECD-02	0.614761	Port8-DELCD-02	66.11177
6/14/2017 2:22	Port8-ECD-03	1.306237	Port8-DELCD-03	135.4105
6/14/2017 5:31	Port8-ECD-04	1.630048	Port8-DELCD-04	164.6642
6/14/2017 11:47	Port10-ECD-01	0.600748	Port10-DELCD-01	54.11118
6/14/2017 14:56	Port10-ECD-02	0.367195	Port10-DELCD-02	54.32597
6/14/2017 18:06	Port10-ECD-03	0.260052	Port10-DELCD-03	58.24098

Building pressurization test

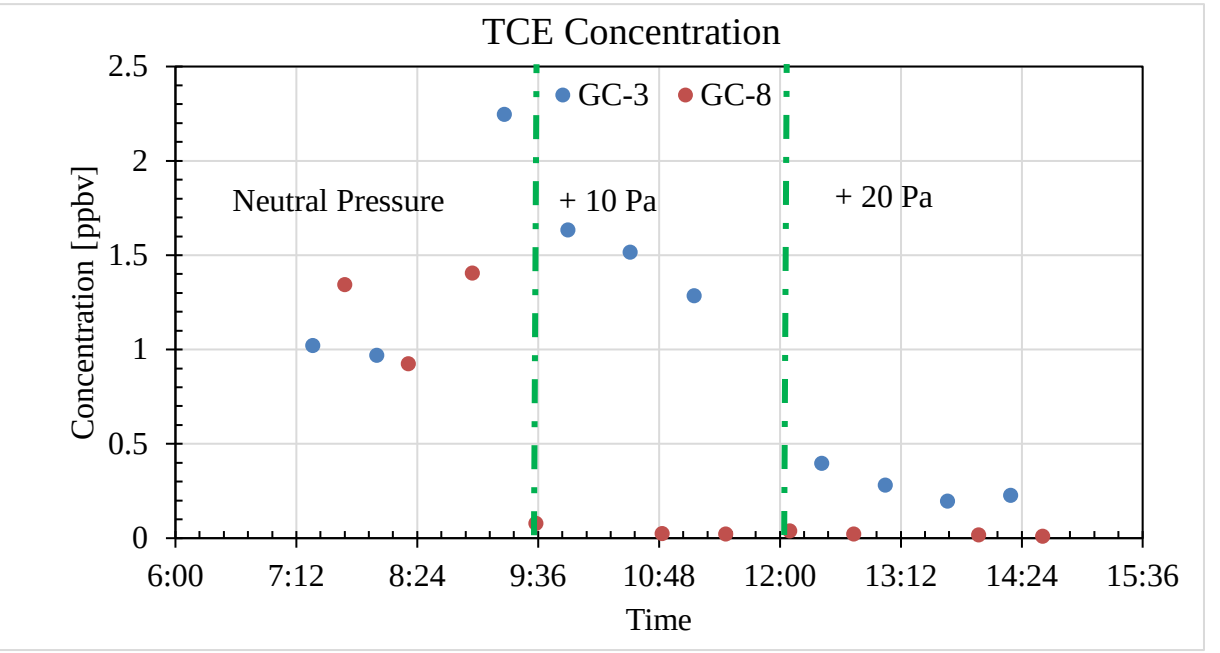
+ 10 Pa	6/15/2017 9:05
+ 20 Pa	6/15/2017 12:55
Single sampling location near rear window, window closed	6/15/2017 15:14
Window open	6/15/2017 16:00

Location	GC-3			
Time	File ID	TCE	File ID	PCE
6/15/2017 7:21	Port1-ECD-01	1.020263	Port1-DELCD-01.C	85.65377
6/15/2017 7:59	Port3-ECD-01	0.970356	Port3-DELCD-01	217.8772
6/15/2017 9:15	Port7-ECD-01	2.247484	Port7-DELCD-01	206.8343
6/15/2017 9:53	Port9-ECD-01	1.633827	Port9-DELCD-01	151.1832
6/15/2017 10:30	Port1-ECD-02	1.517123	Port1-DELCD-02.C	107.7429
6/15/2017 11:08	Port3-ECD-02	1.284067	Port3-DELCD-02	96.37972
6/15/2017 12:24	Port7-ECD-02	0.396293	Port7-DELCD-02	43.86695
6/15/2017 13:02	Port9-ECD-02	0.281521	Port9-DELCD-02	48.06473
6/15/2017 13:39	Port1-ECD-03	0.196943	Port1-DELCD-03.C	58.24098
6/15/2017 14:17	Port3-ECD-03	0.226247	Port3-DELCD-03	44.54557



Location	Rear window			
Time	File ID	TCE	File ID	PCE
6/15/2017 15:14	Port6-ECD-03	0.710537	Port6-DELCD-03	132.5776
6/15/2017 15:33	Port7-ECD-03	0.021564	Port7-DELCD-03	8.991801
6/15/2017 15:52	Port8-ECD-03	0.02215	Port8-DELCD-03	4.556798
6/15/2017 16:11	Port9-ECD-03	0.014528	Port9-DELCD-03	5.381393
6/15/2017 16:30	Port10-ECD-03	0.020941	Port10-DELCD-03	9.665953
6/15/2017 16:48	Port1-ECD-04	0.04667	Port1-DELCD-04.C	14.24412
6/15/2017 17:07	Port2-ECD-04	0.039311	Port2-DELCD-04	14.02706
6/15/2017 17:26	Port3-ECD-04	0.03746	Port3-DELCD-04	19.74996

Location	GC-8				Location	GC-4			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/15/2017 7:40	Port2-ECD-01	1.343251	Port2-DELCD-01	133.0603	6/15/2017 11:56	Port5-ECD-02	0.039321	Port5-ECD-02	0.025284
6/15/2017 8:18	Port4-ECD-01	0.924735	Port4-DELCD-01	118.0292	6/15/2017 15:05	Port5-ECD-03	0.009591	Port5-ECD-03	0.008801
6/15/2017 8:56	Port6-ECD-01	1.405238	Port6-DELCD-01	140.4818					
6/15/2017 9:34	Port8-ECD-01	0.077562	Port8-ECD-01	9.584978					
6/15/2017 10:49	Port2-ECD-02	0.024735	Port2-ECD-02	1.792275					
6/15/2017 11:27	Port4-ECD-02	0.021725	Port4-ECD-02	1.207581					
6/15/2017 12:05	Port6-ECD-02	0.039462	Port6-ECD-02	5.267801					
6/15/2017 12:43	Port8-ECD-02	0.022213	Port8-ECD-02	1.933914					
6/15/2017 13:58	Port2-ECD-03	0.018544	Port2-ECD-03	0.864531					
6/15/2017 14:36	Port4-ECD-03	0.010168	Port4-ECD-03	0.266708					



Location	GC-10 Wander sampler			
Time	File ID	TCE	File ID	PCE
6/15/2017 10:22	Port10-ECD-01	1.30944	Port10-DELCD-01	405.7613
6/15/2017 13:31	Port10-ECD-02	0.252164	Port10-DELCD-02	46.99245

Natural Pressure Condition over weekend 06/15-06/20

Location	GC-1				Location	GC-2				Location	GC-3			
Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE	Time	File ID	TCE	File ID	PCE
6/15/2017 18:16	Port1-ECD-01.CHR	0.537231	Port1-DELCD-01	51.97421	6/15/2017 18:47	Port2-ECD-01.CHR	0.07888	Port2-DELCD-01	16.0505	6/15/2017 19:18	Port3-ECD-01.CHR	0.063658	Port3-DELCD-01	21.23765
6/15/2017 23:25	Port1-ECD-02.CHR	0.663442	Port1-DELCD-02	97.4072	6/15/2017 23:56	Port2-ECD-02.CHR	0.961445	Port2-DELCD-02	134.3292	6/16/2017 0:27	Port3-ECD-02.CHR	1.069045	Port3-DELCD-02	155.5409
6/16/2017 4:34	Port1-DELCD-03	0.910745	Port1-DELCD-03	169.3962	6/16/2017 5:05	Port2-DELCD-03	1.086833	Port2-DELCD-03	191.8149	6/16/2017 5:36	Port3-DELCD-03	1.265666	Port3-DELCD-03	223.1617
6/16/2017 9:43	Port1-DELCD-04	1.339563	Port1-DELCD-04	248.9726	6/16/2017 10:14	Port2-DELCD-04	1.10679	Port2-DELCD-04	176.1967	6/16/2017 10:45	Port3-DELCD-04	0.897424	Port3-DELCD-04	147.875
6/16/2017 14:52	Port1-DELCD-05	0.367337	Port1-DELCD-05	99.61747	6/16/2017 15:24	Port2-DELCD-05	0.337526	Port2-DELCD-05	84.54852	6/16/2017 15:55	Port3-DELCD-05	0.355559	Port3-DELCD-05	66.40932
6/16/2017 20:17	Port1-ECD-01	0.296645	Port1-DELCD-01	50.40444	6/16/2017 20:46	Port2-ECD-01	0.841692	Port2-DELCD-01	112.8247	6/16/2017 21:15	Port3-ECD-01	1.251246	Port3-DELCD-01	136.2609
6/17/2017 1:06	Port1-ECD-01	1.212428	Port1-DELCD-02	120.5587	6/17/2017 1:35	Port2-ECD-02	1.613706	Port2-DELCD-02	169.2416	6/17/2017 2:04	Port3-ECD-02	1.771313	Port3-DELCD-02	195.1896
6/17/2017 5:55	Port1-ECD-01.CHR	1.813051	Port1-DELCD-03	180.1575	6/17/2017 6:24	Port2-ECD-03	2.038305	Port2-DELCD-03	221.048	6/17/2017 6:53	Port3-ECD-03	2.074311	Port3-DELCD-03	275.7327
6/17/2017 10:44	Port1-ECD-02	1.974958	Port1-DELCD-04	256.9002	6/17/2017 11:13	Port2-ECD-04	1.548898	Port2-DELCD-04	151.6584	6/17/2017 11:42	Port3-ECD-04	1.289712	Port3-DELCD-04	137.8103
6/17/2017 15:33	Port1-ECD-02	1.031469	Port1-DELCD-05	148.7338	6/17/2017 16:02	Port2-ECD-05	0.712233	Port2-DELCD-05	85.59427	6/17/2017 16:31	Port3-ECD-05	0.573971	Port3-DELCD-05	70.67357
6/17/2017 20:12	Port1-ECD-02.CHR	0.291981	Port1-DELCD-01	39.47333	6/17/2017 20:41	Port2-ECD-01	1.047018	Port2-DELCD-01	129.2529	6/17/2017 21:10	Port3-ECD-01	1.597246	Port3-DELCD-01	180.8634
6/18/2017 1:01	Port1-ECD-03	1.262667	Port1-DELCD-02	134.8139	6/18/2017 1:30	Port2-ECD-02	1.790956	Port2-DELCD-02	187.4878	6/18/2017 1:59	Port3-ECD-02	1.886313	Port3-DELCD-02	205.7817
6/18/2017 5:50	Port1-ECD-03	1.986634	Port1-DELCD-03	177.3938	6/18/2017 6:18	Port2-ECD-03	2.357588	Port2-DELCD-03	239.1796	6/18/2017 6:47	Port3-ECD-03	2.406743	Port3-DELCD-03	285.8344
6/18/2017 10:38	Port1-ECD-03.CHR	2.054299	Port1-DELCD-04	268.4996	6/18/2017 11:07	Port2-ECD-04	1.085389	Port2-DELCD-04	107.2451	6/18/2017 11:36	Port3-ECD-04	0.899521	Port3-DELCD-04	98.25954
6/18/2017 15:27	Port1-ECD-04	0.52085	Port1-DELCD-05	104.048	6/18/2017 15:56	Port2-ECD-05	0.307004	Port2-DELCD-05	47.81174	6/18/2017 16:25	Port3-ECD-05	0.26582	Port3-DELCD-05	44.05794
6/18/2017 20:28	Port1-ECD-04	0.155179	Port1-DELCD-01	27.54603	6/18/2017 20:57	Port2-ECD-01.CHR	0.517288	Port2-DELCD-01	86.09289	6/18/2017 21:26	Port3-ECD-01.CHR	0.967248	Port3-DELCD-01	133.3663
6/19/2017 1:17	Port1-ECD-04.CHR	0.902461	Port1-DELCD-02	107.1831	6/19/2017 1:46	Port2-ECD-02.CHR	1.497935	Port2-DELCD-02	170.5069	6/19/2017 2:15	Port3-ECD-02.CHR	1.617913	Port3-DELCD-02	196.7827
6/19/2017 6:06	Port1-ECD-05	1.552907	Port1-DELCD-03	162.8824	6/19/2017 6:35	Port2-ECD-03.CHR	1.937954	Port2-DELCD-03	209.1792	6/19/2017 7:04	Port3-ECD-03.CHR	2.337436	Port3-DELCD-03	262.8999
6/19/2017 10:55	Port1-ECD-05	1.04258	Port1-DELCD-04	139.642	6/19/2017 11:24	Port2-ECD-04.CHR	0.573658	Port2-DELCD-04	70.99355	6/19/2017 11:53	Port3-ECD-04.CHR	0.594562	Port3-DELCD-04	73.08339
6/19/2017 15:44	Port1-ECD-05.CHR	0.127122	Port1-DELCD-05	23.2786	6/19/2017 23:49	Port2-ECD-01.CHR	0.550275	Port2-DELCD-01.C	84.48099	6/19/2017 16:42	Port3-ECD-05.CHR	1.977574	Port3-DELCD-05	273.8343
6/19/2017 23:25	Port1-ECD-01.CHR	0.616427	Port1-DELCD-01.C	32.91833	6/20/2017 3:48	Port2-ECD-02.CHR	0.89609	Port2-DELCD-02.C	110.971	6/20/2017 0:13	Port3-ECD-01.CHR	0.683976	Port3-DELCD-01.C	111.3266
6/20/2017 3:24	Port1-ECD-02.CHR	0.556306	Port1-DELCD-02.C	69.55673						6/20/2017 4:12	Port3-ECD-02.CHR	1.122023	Port3-DELCD-02.C	130.4036
6/20/2017 7:23	Port1-ECD-03.CHR	0.798266	Port1-DELCD-03.C	77.62291										

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6/16/2017 0:58	Port4-ECD-02.CHR	1.073609	Port4-DELCD-02	135.9685	6/16/2017 1:29	Port5-ECD-01	0.841145	Port5-DELCD-02	111.4795
6/16/2017 6:07	Port4-DELCD-03	1.050848	Port4-DELCD-03	177.5677	6/16/2017 6:38	Port5-DELCD-02	0.729795	Port5-DELCD-03	139.6466
6/16/2017 11:16	Port4-DELCD-04	0.957673	Port4-DELCD-04	131.5266	6/16/2017 11:48	Port5-DELCD-03	0.818765	Port5-DELCD-04	67.1867
6/16/2017 16:26	Port4-DELCD-05	0.393082	Port4-DELCD-05	69.18339	6/16/2017 16:57	Port5-DELCD-04	0.403558	Port5-DELCD-05	46.03432
6/16/2017 21:44	Port4-ECD-01	1.182004	Port4-DELCD-01	120.6201	6/16/2017 22:13	Port5-DELCD-05	0.263531	Port5-DELCD-01	93.14629
6/17/2017 2:33	Port4-ECD-02	1.653403	Port4-DELCD-02	156.8631	6/17/2017 3:02	Port5-ECD-01	1.063875	Port5-DELCD-02	114.7981
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6/17/2017 12:11	Port4-ECD-04	1.353104	Port4-DELCD-04	136.7461	6/17/2017 12:40	Port5-ECD-03	1.69856	Port5-DELCD-04	78.09902
6/17/2017 17:00	Port4-ECD-05	0.737965	Port4-DELCD-05	73.20859	6/17/2017 17:29	Port5-ECD-04	0.502477	Port5-DELCD-05	76.6963
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6/18/2017 7:16	Port4-ECD-03	2.215699	Port4-DELCD-03	215.2209	6/18/2017 7:45	Port5-ECD-02.CHR	1.190504	Port5-DELCD-03	159.114
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6/18/2017 16:54	Port4-ECD-05	0.41625	Port4-DELCD-05	54.41093	6/18/2017 17:23	Port5-ECD-04.CHR	0.228569	Port5-DELCD-05	48.90312
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6/19/2017 2:44	Port4-ECD-02.CHR	1.510732	Port4-DELCD-02	156.2226	6/19/2017 3:13	Port5-ECD-02	1.229475	Port5-DELCD-02	107.8035
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6/19/2017 17:11	Port4-ECD-05.CHR	0.446588	Port4-DELCD-05	70.02177	6/19/2017 17:40	Port5-ECD-05	0.727767	Port5-DELCD-05	56.31985
6/20/2017 0:37	Port4-ECD-01.CHR	0.702137	Port4-DELCD-01.C	99.97216	6/20/2017 1:01	Port5-ECD-01.CHR	0.452725	Port5-DELCD-01.C	63.66155
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6/16/2017 22:42	Port6-ECD-01	0.607315	Port6-DELCD-01	75.9193	6/16/2017 23:11	Port7-ECD-01	0.787993	Port7-DELCD-01	75.35481	6/16/2017 23:40	Port8-ECD-01	0.879236	Port8-DELCD-01	80.1649
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6/17/2017 8:20	Port6-ECD-03	1.349105	Port6-DELCD-03	132.5341	6/17/2017 8:49	Port7-ECD-03	1.433828	Port7-DELCD-03	131.4075	6/17/2017 9:18	Port8-ECD-03	1.631152	Port8-DELCD-03	153.9872
6/17/2017 13:09	Port6-ECD-04	0.591473	Port6-DELCD-04	69.97979	6/17/2017 13:38	Port7-ECD-04	0.667008	Port7-DELCD-04	66.54385	6/17/2017 14:07	Port8-ECD-04	1.364107	Port8-DELCD-04	123.2165
6/17/2017 17:58	Port6-ECD-05	0.776624	Port6-DELCD-05	73.59785	6/17/2017 18:27	Port7-ECD-05	0.962119	Port7-DELCD-05	75.50533	6/17/2017 18:56	Port8-ECD-05	1.040793	Port8-DELCD-05	86.14003
6/17/2017 22:37	Port6-ECD-01	0.631929	Port6-DELCD-01	89.27577	6/17/2017 23:06	Port7-ECD-01	0.817535	Port7-DELCD-01	90.98317	6/17/2017 23:35	Port8-ECD-01	1.010053	Port8-DELCD-01	94.15028
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6/18/2017 13:03	Port6-ECD-04	0.305695	Port6-DELCD-04	44.97136	6/18/2017 13:32	Port7-ECD-04	0.243403	Port7-DELCD-04	36.07051	6/18/2017 14:01	Port8-ECD-04	0.656362	Port8-DELCD-04	79.17645
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6/16/2017 19:01	Port9-DELCD-05	0.746416	Port9-DELCD-05	87.23747	6/16/2017 19:32	Port10-DELCD-05	0.635621	Port10-DELCD-05	75.00618
6/17/2017 0:09	Port9-ECD-01	1.000495	Port9-DELCD-01	85.89978	6/17/2017 0:38	Port10-ECD-01	1.110183	Port10-DELCD-01	110.8485
6/17/2017 4:58	Port9-ECD-02	1.577545	Port9-DELCD-02	145.2663	6/17/2017 5:27	Port10-ECD-02	1.471354	Port10-DELCD-02	138.7803
6/17/2017 9:47	Port9-ECD-03	1.418074	Port9-DELCD-03	137.5201	6/17/2017 10:16	Port10-ECD-03	1.2246	Port10-DELCD-03	115.6292
6/17/2017 14:36	Port9-ECD-04	0.896273	Port9-DELCD-04	88.27163	6/17/2017 15:05	Port10-ECD-04	0.687417	Port10-DELCD-04	77.96972
6/17/2017 19:25	Port9-ECD-05	1.492981	Port9-DELCD-05	110.5465	6/17/2017 19:54	Port10-ECD-05	0.827725	Port10-DELCD-05	75.9719
6/18/2017 0:04	Port9-ECD-01	1.152835	Port9-DELCD-01	103.9338	6/18/2017 0:33	Port10-ECD-01	1.170235	Port10-DELCD-01	120.4217
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6/18/2017 14:30	Port9-ECD-04	0.421451	Port9-DELCD-04	56.20996	6/18/2017 14:59	Port10-ECD-04	0.113821	Port10-DELCD-04	24.94097
6/18/2017 19:19	Port9-ECD-05	0.196628	Port9-DELCD-05	29.06728	6/18/2017 19:48	Port10-ECD-05	0.316606	Port10-DELCD-05	41.91733
6/19/2017 0:20	Port9-ECD-01.CHR	0.817787	Port9-DELCD-01	76.86758	6/19/2017 0:49	Port10-ECD-01.CH	0.954906	Port10-DELCD-01	95.26939
6/19/2017 5:09	Port9-ECD-02.CHR	1.57609	Port9-DELCD-02	151.618	6/19/2017 5:38	Port10-ECD-02.CH	1.463098	Port10-DELCD-02	145.0796
6/19/2017 9:58	Port9-ECD-03.CHR	0.403276	Port9-DELCD-03	36.70767	6/19/2017 10:27	Port10-ECD-03.CH	0.341288	Port10-DELCD-03	36.71844
6/19/2017 14:47	Port9-ECD-04.CHR	0.617123	Port9-DELCD-04	52.97334	6/19/2017 15:16	Port10-ECD-04.CH	0.232562	Port10-DELCD-04	41.589
6/19/2017 19:36	Port9-ECD-05.CHR	0.339028	Port9-DELCD-05	41.25674	6/19/2017 20:05	Port10-ECD-05.CH	0.254868	Port10-DELCD-05	40.10867
6/20/2017 2:37	Port9-ECD-01.CHR	0.64442	Port9-DELCD-01.C	78.30729	6/20/2017 3:01	Port10-ECD-01.CH	0.590275	Port10-DELCD-01.	71.3196
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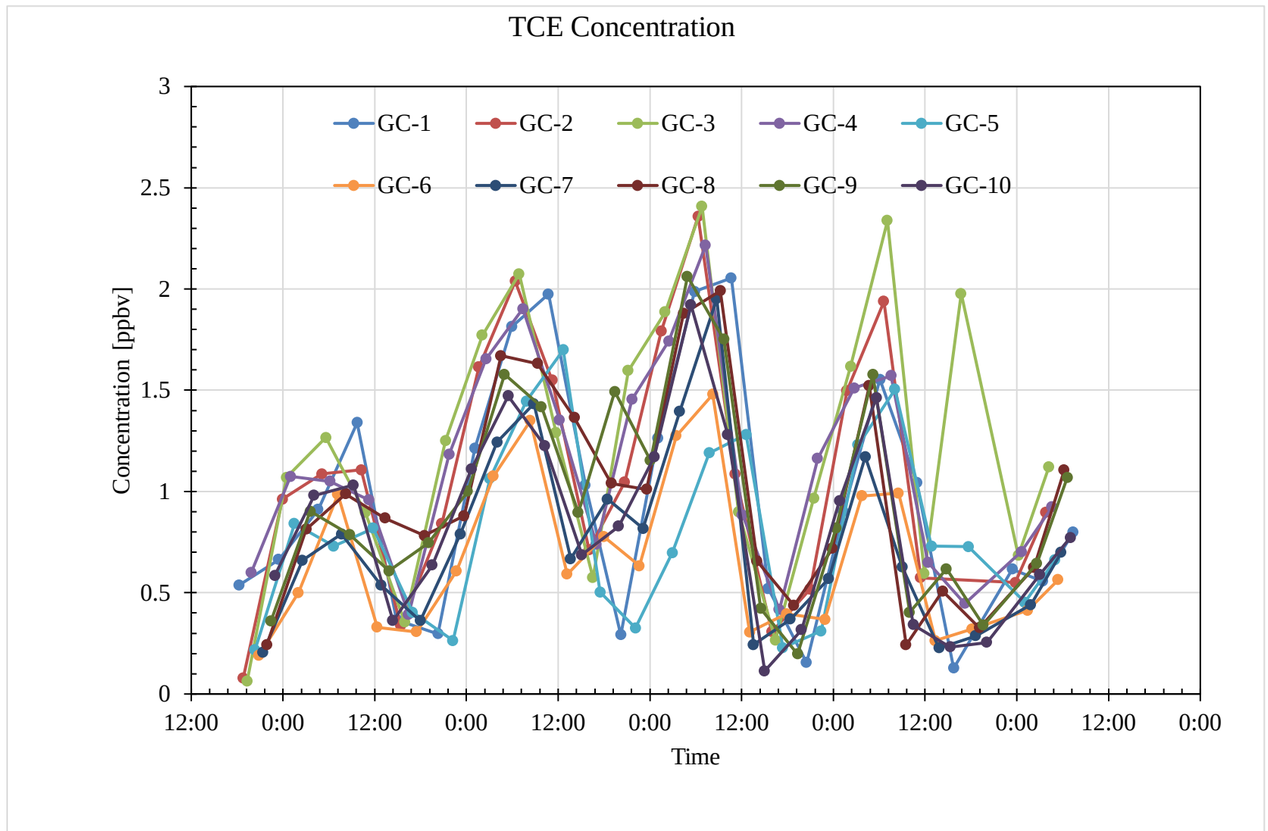
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GC-3
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GC-5
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2
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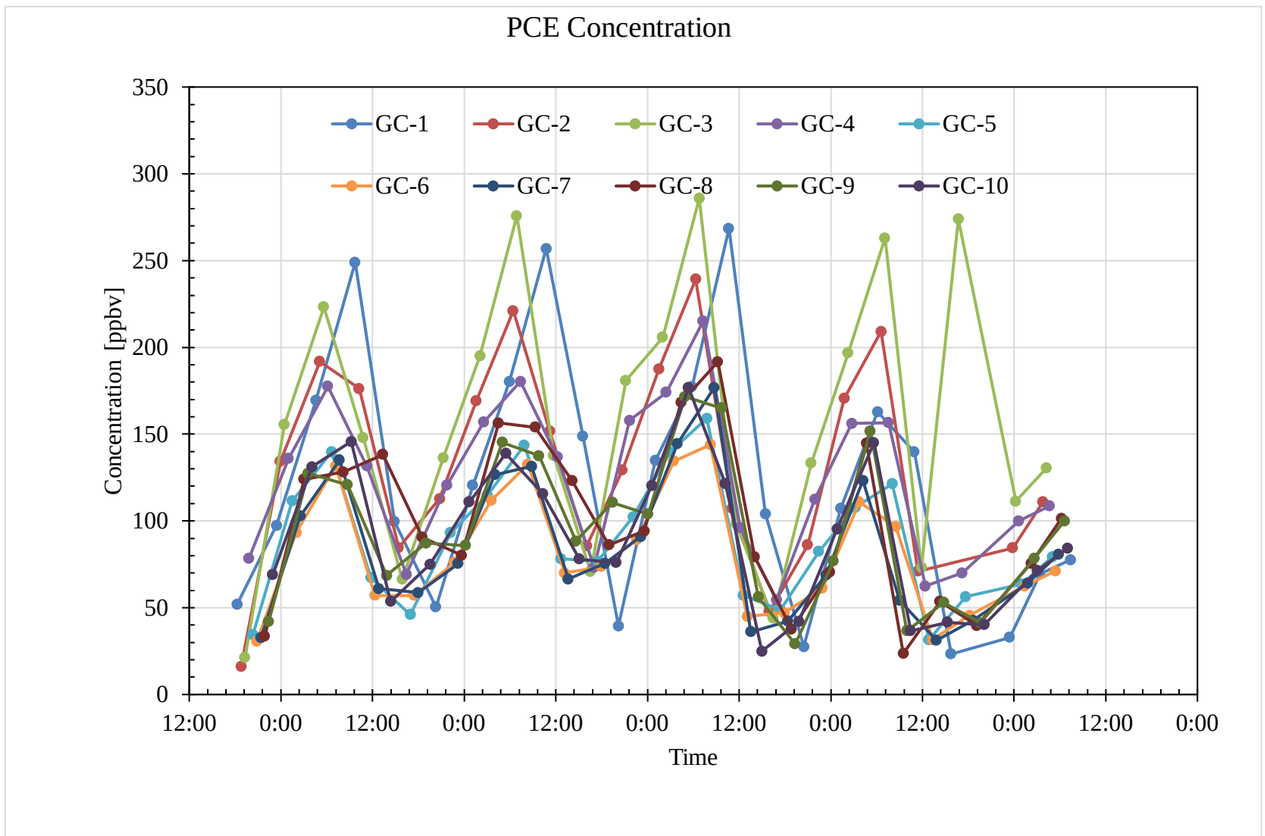
PCE Concentration
Concentration [ppbv]
Time
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GC-2
GC-3
GC-4
GC-5
GC-6
GC-7
GC-8
GC-9
GC-10
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300
250
200
150
100
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APPENDIX E. COST MODELS

Cost Comparison of Conventional Approach Versus Optimized Approach at Building 205

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**27**	**No. of Vent pipes**	**2**
No. of Fans	**9**	**No. of Fans**	**2**
Area of Building	**64,000**	**Area of Building**	**64,000**
Total System Flow	**500**	**Total System Flow**	**100**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 9,600	$ 100	$ 9,700	$ 9,600	$ 100	$ 9,700	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 4,700	$ 500	$ 5,200	$ 4,700	$ 500	$ 5,200	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 9,600	$ 200	$ 9,800	$ 9,600	$ 200	$ 9,800	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 1,280	$ 960	$ 2,240	$ 1,280	$ 960	$ 2,240	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 1,920	$ 640	$ 2,560	$ 1,920	$ 640	$ 2,560	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 1,600	$ 640	$ 2,240	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 3,840	$ 3,200	$ 7,040	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 1,280	$ 3,200	$ 4,480	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 9,100	$ -	$ 9,100	$ 1,600	$ -	$ 1,600	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 35,100	$ 108,000	$ 143,100	$ 2,500	$ 5,500	$ 8,000	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 1,125	$ 8,100	$ 9,225	$ 250	$ 1,700	$ 1,950	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 1,125	$ 16,200	$ 17,325	$ 250	$ 3,500	$ 3,750	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 1,125	$ 13,500	$ 14,625	$ 250	$ 3,000	$ 3,250	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 2,700	$ -	$ 2,700	$ 200	$ -	$ 200	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 2,300	$ 4,800	$ 2,500	$ 2,300	$ 4,800	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 23,000	$ 48,000	$ 25,000	$ 23,000	$ 48,000	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 46,121	$ 46,121	$ -	$ 10,249	$ 10,249	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 31,536	$ 31,536	$ -	$ 6,307	$ 6,307	Based on a energy cost of \$0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)				$ -	$ -	$ -	$ -	Optional entry if multiple mobilizations are needed to complete the system
Maintenance	Periodic repairs or balancing (if needed)		$ 1,800	$ 900	$ 2,700	$ 400	$ 200	$ 600	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 9,000	$ 27,000	$ 36,000	$ 2,000	$ 6,000	$ 8,000	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ 4,000	$ 2,000	$ 6,000	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 405,607			$ 159,291	
Total incremental cost of optimization activities								$ 21,210	
Net Savings								$ 246,316	
Return on Investment								11.6	

Cost Comparison of Conventional Approach Versus Optimized Approach at Building 200

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**3**	**No. of Vent pipes**	**2**
No. of Fans	**1**	**No. of Fans**	**2**
Area of Building	**1,100**	**Area of Building**	**1,100**
Total System Flow	**10**	**Total System Flow**	**15**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 165	$ 100	$ 265	$ 165	$ 100	$ 265	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 1,555	$ 500	$ 2,055	$ 1,555	$ 500	$ 2,055	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 165	$ 200	$ 365	$ 165	$ 200	$ 365	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 200	$ 150	$ 350	$ 200	$ 150	$ 350	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 300	$ 100	$ 400	$ 300	$ 100	$ 400	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 250	$ 100	$ 350	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 600	$ 500	$ 1,100	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 200	$ 500	$ 700	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 1,900	$ -	$ 1,900	$ 1,600	$ -	$ 1,600	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 3,900	$ 12,000	$ 15,900	$ 2,500	$ 5,500	$ 8,000	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 125	$ 900	$ 1,025	$ 250	$ 1,700	$ 1,950	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 125	$ 1,800	$ 1,925	$ 250	$ 3,500	$ 3,750	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 125	$ 1,500	$ 1,625	$ 250	$ 3,000	$ 3,250	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 300	$ -	$ 300	$ 200	$ -	$ 200	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 1,100	$ 3,600	$ 2,500	$ 1,100	$ 3,600	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 11,000	$ 36,000	$ 25,000	$ 11,000	$ 36,000	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 5,125	$ 5,125	$ -	$ 10,249	$ 10,249	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 631	$ 631	$ -	$ 946	$ 946	Based on a energy cost of $0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)		$ 50,000	$ 20,000	$ 70,000	$ -	$ -	$ -	9 monitoring events, system expansion, blower upgrade, noise suppression, etc.
Maintenance	Periodic repairs or balancing (if needed)		$ 200	$ 100	$ 300	$ 400	$ 200	$ 600	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 1,000	$ 3,000	$ 4,000	$ 2,000	$ 6,000	$ 8,000	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ 4,000	$ 2,000	$ 6,000	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 156,640			$ 103,055	
Total incremental cost of optimization activities								$ 9,600	
Net Savings								$ 53,585	
Return on Investment								5.6	

Cost Comparison of Conventional Approach Versus Optimized Approach at Sun Devil Manor with Land Drain Closed

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**1**	**No. of Vent pipes**	**0**
No. of Fans	**1**	**No. of Fans**	**0**
Area of Building	**900**	**Area of Building**	**900**
Total System Flow	**100**	**Total System Flow**	**0**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 135	$ 100	$ 235	$ 135	$ 100	$ 235	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 1,545	$ 500	$ 2,045	$ 1,545	$ 500	$ 2,045	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 135	$ 200	$ 335	$ 135	$ 200	$ 335	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 200	$ 150	$ 350	$ 200	$ 150	$ 350	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 300	$ 100	$ 400	$ 300	$ 100	$ 400	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 250	$ 100	$ 350	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 600	$ 500	$ 1,100	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 200	$ 500	$ 700	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 1,300	$ -	$ 1,300	$ -	$ -	$ -	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 1,300	$ 4,000	$ 5,300	$ -	$ -	$ -	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 125	$ 900	$ 1,025	$ -	$ -	$ -	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 125	$ 1,800	$ 1,925	$ -	$ -	$ -	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 125	$ 1,500	$ 1,625	$ -	$ -	$ -	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 100	$ -	$ 100	$ -	$ -	$ -	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 1,100	$ 3,600	$ -	$ -	$ -	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 11,000	$ 36,000	$ -	$ -	$ -	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 5,125	$ 5,125	$ -	$ -	$ -	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 6,307	$ 6,307	$ -	$ -	$ -	Based on a energy cost of \$0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)				$ -	$ -	$ -	$ -	Optional entry if multiple mobilizations are needed to complete the system
Maintenance	Periodic repairs or balancing (if needed)		$ 200	$ 100	$ 300	$ -	$ -	$ -	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 1,000	$ 3,000	$ 4,000	$ -	$ -	$ -	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ -	$ -	$ -	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 80,847			$ 18,840	
Total incremental cost of optimization activities								$ 9,600	
Net Savings								$ 62,007	
Return on Investment								6.5	

Cost Comparison of Conventional Approach Versus Optimized Approach at Sun Devil Manor with Land Drain Open

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**1**	**No. of Vent pipes**	**1**
No. of Fans	**1**	**No. of Fans**	**1**
Area of Building	**900**	**Area of Building**	**900**
Total System Flow	**100**	**Total System Flow**	**100**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 135	$ 100	$ 235	$ 135	$ 100	$ 235	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 1,545	$ 500	$ 2,045	$ 1,545	$ 500	$ 2,045	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 135	$ 200	$ 335	$ 135	$ 200	$ 335	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 200	$ 150	$ 350	$ 200	$ 150	$ 350	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 300	$ 100	$ 400	$ 300	$ 100	$ 400	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 250	$ 100	$ 350	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 600	$ 500	$ 1,100	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 200	$ 500	$ 700	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 1,300	$ -	$ 1,300	$ 1,300	$ -	$ 1,300	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 1,300	$ 4,000	$ 5,300	$ 1,250	$ 2,750	$ 4,000	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 125	$ 900	$ 1,025	$ 125	$ 850	$ 975	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 125	$ 1,800	$ 1,925	$ 125	$ 1,750	$ 1,875	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 125	$ 1,500	$ 1,625	$ 125	$ 1,500	$ 1,625	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 100	$ -	$ 100	$ 100	$ -	$ 100	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 1,100	$ 3,600	$ 2,500	$ 1,100	$ 3,600	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 11,000	$ 36,000	$ 25,000	$ 11,000	$ 36,000	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 5,125	$ 5,125	$ -	$ 5,125	$ 5,125	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 6,307	$ 6,307	$ -	$ 6,307	$ 6,307	Based on a energy cost of \$0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)				$ -	$ -	$ -	$ -	Optional entry if multiple mobilizations are needed to complete the system
Maintenance	Periodic repairs or balancing (if needed)		$ 200	$ 100	$ 300	$ 200	$ 100	$ 300	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 1,000	$ 3,000	$ 4,000	$ 1,000	$ 3,000	$ 4,000	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ 4,000	$ 2,000	$ 6,000	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 80,847			$ 90,047	
Total incremental cost of optimization activities								$ 9,600	
Net Savings								$ (9,200)	
Return on Investment								-1.0	

Cost Comparison of Conventional Approach Versus Optimized Approach at Building 11193 with 5 Vent Pipes

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**5**	**No. of Vent pipes**	**1**
No. of Fans	**5**	**No. of Fans**	**1**
Area of Building	**11,000**	**Area of Building**	**11,000**
Total System Flow	**250**	**Total System Flow**	**25**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 1,650	$ 100	$ 1,750	$ 1,650	$ 100	$ 1,750	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 2,050	$ 500	$ 2,550	$ 2,050	$ 500	$ 2,550	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 1,650	$ 200	$ 1,850	$ 1,650	$ 200	$ 1,850	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 220	$ 165	$ 385	$ 220	$ 165	$ 385	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 330	$ 110	$ 440	$ 330	$ 110	$ 440	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 275	$ 110	$ 385	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 660	$ 550	$ 1,210	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 220	$ 550	$ 770	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 2,500	$ -	$ 2,500	$ 1,300	$ -	$ 1,300	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 6,500	$ 20,000	$ 26,500	$ 1,250	$ 2,750	$ 4,000	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 625	$ 4,500	$ 5,125	$ 125	$ 850	$ 975	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 625	$ 9,000	$ 9,625	$ 125	$ 1,750	$ 1,875	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 625	$ 7,500	$ 8,125	$ 125	$ 1,500	$ 1,625	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 500	$ -	$ 500	$ 100	$ -	$ 100	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 1,460	$ 3,960	$ 2,500	$ 1,460	$ 3,960	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 14,600	$ 39,600	$ 25,000	$ 14,600	$ 39,600	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 25,623	$ 25,623	$ -	$ 5,125	$ 5,125	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 15,768	$ 15,768	$ -	$ 1,577	$ 1,577	Based on a energy cost of $0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)				$ -	$ -	$ -	$ -	Optional entry if multiple mobilizations are needed to complete the system
Maintenance	Periodic repairs or balancing (if needed)		$ 1,000	$ 500	$ 1,500	$ 200	$ 100	$ 300	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 5,000	$ 15,000	$ 20,000	$ 1,000	$ 3,000	$ 4,000	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ 4,000	$ 2,000	$ 6,000	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 176,676			$ 93,101	
Total incremental cost of optimization activities								$ 9,815	
Net Savings								$ 83,575	
Return on Investment								8.5	

Cost Comparison of Conventional Approach Versus Optimized Approach at Building 11193 with 8 Vent Pipes

Inputs

Duration of the mitigation system = **30**

Conventional Approach		Optimized Approach	
No. of Vent pipes	**8**	**No. of Vent pipes**	**1**
No. of Fans	**8**	**No. of Fans**	**1**
Area of Building	**11,000**	**Area of Building**	**11,000**
Total System Flow	**750**	**Total System Flow**	**25**

Category	Item	Unit Costs	Labor	Expenses	Total	Labor	Expenses	Total	Descriptions and comments
Initiation	Contracting		$ 2,000	$ -	$ 2,000	$ 2,000	$ -	$ 2,000	Contractor procurement, ordering equipment. Assumed equal for both conventional and optimized
	Data review & CSM update		$ 1,000	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	Assumed equal for both conventional and optimized
	Conceptual design & Workplan	$0.15 /sq. ft	$ 1,650	$ 100	$ 1,750	$ 1,650	$ 100	$ 1,750	Dependent on building size. Assumed equal for both conventional and optimized
	Regulatory Negotiation		$ 500	$ -	$ 500	$ 500	$ -	$ 500	Dependent on the level of regulatory approval based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Permits (as needed)		$ 125	$ 200	$ 325	$ 125	$ 200	$ 325	Dependent on the permitting process based on applicable regulating agencies. Assumed equal for both conventional and optimized
	Notifications / Fact Sheets		$ 500	$ 100	$ 600	$ 500	$ 100	$ 600	Assumed equal for both conventional and optimized
Reconnaissance	Building inspection (Inc. travel)	$0.05 /sq. ft	$ 2,050	$ 500	$ 2,550	$ 2,050	$ 500	$ 2,550	Dependent on building size. Assumed equal for both conventional and optimized
	Sealing obvious floor penetrations	$0.15 /sq. ft	$ 1,650	$ 200	$ 1,850	$ 1,650	$ 200	$ 1,850	Dependent on building size but can vary greatly based on condition of the slab. Assumed equal for both conventional and optimized
	Install sump for pilot test (assume one per 10,000 ft2 of building)		$ 200	$ 1,000	$ 1,200	$ 200	$ 1,000	$ 1,200	Assumes asbestos test, geophysical locates and concrete corer. Assumed equal for both conventional and optimized
	Baseline cross-slab pressure logging		$ -	$ -	$ -	$ 500	$ 200	$ 700	1 week with two locations monitored via dataloggers
Pilot Test	Install subslab probes		$ 220	$ 165	$ 385	$ 220	$ 165	$ 385	Assumes hammerdrill and Vapor Pin® rental
	Measure static vacuum levels		$ 330	$ 110	$ 440	$ 330	$ 110	$ 440	Conventional vacuum vs distance measurements during pilot scale extraction
	Measure transient vacuum responses		$ -	$ -	$ -	$ 275	$ 110	$ 385	Assumes each cycle is about 2 min duration
	Helium Tracer Tests		$ -	$ -	$ -	$ 660	$ 550	$ 1,210	Assumes each test is about 10 min, 2 tests per fan)
	Measure mass emission rate		$ -	$ -	$ -	$ 220	$ 550	$ 770	Sample each vent pipe and measure flow rate.
	Stress test with blower door and/or HVAC		$ -	$ -	$ -	$ 3,000	$ 2,000	$ 5,000	3 steps: 1)-10Pa building, 2) add SSV, 3) only SSV. Costs would change bases on building size and use of HVAC for depressurization.
	Calculate ROI		$ 250	$ -	$ 250	$ 2,000	$ -	$ 2,000	Semi-log plot versus Hantush-Jacob model and multiple lines of evidence
	Design number and location of suction points	$300 /VP	$ 3,400	$ -	$ 3,400	$ 1,300	$ -	$ 1,300	Assumed equal for both conventional and optimized
Installation	Installation of sump, vent pipe, placards and manometer	$5,300 /VP	$ 10,400	$ 32,000	$ 42,400	$ 1,250	$ 2,750	$ 4,000	Based on number of vent pipes. Includes oversight, materials and labor
	Roof or wall penetration	$1,025 /VP	$ 1,000	$ 7,200	$ 8,200	$ 125	$ 850	$ 975	Based on number of fans. Includes oversight, materials and labor
	Fan installation and alarms	$1,925 /VP	$ 1,000	$ 14,400	$ 15,400	$ 125	$ 1,750	$ 1,875	Based on number of fans. Includes oversight, materials and labor
	Electrical connection	$1,625 /VP	$ 1,000	$ 12,000	$ 13,000	$ 125	$ 1,500	$ 1,625	Based on number of fans. Includes oversight, materials and labor
	Initial Startup and Balancing	$100 /VP	$ 800	$ -	$ 800	$ 100	$ -	$ 100	Based on number of vent pipes. Includes labor
Operation	Confirmatory sampling (Inc. travel, 1 OA, min 1 IA, max 6 IA)	1 sample /5000 ft^2	$ 2,500	$ 1,460	$ 3,960	$ 2,500	$ 1,460	$ 3,960	Based on collecting 1 OA, 1 IA/5000 ft^2, up to a maximum of 6 IA samples
	Periodic monitoring & inspection assume (10 events Inc. travel and sampling)	1 sample /5000 ft^2	$ 25,000	$ 14,600	$ 39,600	$ 25,000	$ 14,600	$ 39,600	Based on a total of 10 monitoring events
	Cost of Electricity	$ 0.13 /kWhr	$ -	$ 40,997	$ 40,997	$ -	$ 5,125	$ 5,125	Based on a fan drawing power at 150 W
	Cost of loss of conditioned air	$ 0.08 /10000 ft^3	$ -	$ 47,304	$ 47,304	$ -	$ 1,577	$ 1,577	Based on a energy cost of $0.08/10,000 ft^3
	System Modifications and additional monitoring (optional entry)				$ -	$ -	$ -	$ -	Optional entry if multiple mobilizations are needed to complete the system
Maintenance	Periodic repairs or balancing (if needed)		$ 1,600	$ 800	$ 2,400	$ 200	$ 100	$ 300	Often not necessary, but worth an occasional check
Fan Replacement	Hardware and labor		$ 8,000	$ 24,000	$ 32,000	$ 1,000	$ 3,000	$ 4,000	Assuming a 10-year service life
Training	AARST Mitigation course / Reading ESTCP report and relevant literature		$ 3,000	$ 2,000	$ 5,000	$ 4,000	$ 2,000	$ 6,000	Baseline AARST Mitigation, plus read ESTCP Report
TOTALS					$ 267,311			$ 93,101	
Total incremental cost of optimization activities								$ 9,815	
Net Savings								$ 174,209	
Return on Investment								17.7	