Prepared for

Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

FEASIBILITY STUDY

7th STREET AND MISSOURI AVENUE WATER QUALITY ASSURANCE REVOLVING FUND SITE PHOENIX, ARIZONA

Prepared by

Geosyntec consultants

engineers | scientists | innovators

11811 N. Tatum Blvd., Suite P-186
Phoenix, Arizona 85028

27 September, 2019

Trevor Carlson (Project Manager) — 7/10/2019 Date

Fabrizio Mascioni (R.G. 65652) — 7/10/2019 Date

REGISTERED GEOLOGIST
CERTIFICATE NO.
65652
FABRIZIO
MASCIONI
Date Signed 7/10/19
ARIZONA U.S.A.

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Purpose and Scope of the Feasibility Study Report 1
1.2 Report Organization 2

2. SITE BACKGROUND 3
2.1 Site Description 3
2.2 Site History 3
2.3 SVE Early Remedial Action and Ozone Sparge Pilot Study 5
2.3.1 SVE System 5
2.3.2 Ozone Sparge Pilot Study 6
2.4 Conceptual Site Model Summary 7
2.4.1 Site Geology and Hydrogeology 8
2.4.2 Extent of Contamination 9
2.5 Risk Evaluation 9

3. FEASIBILITY STUDY SCOPING 12
3.1 Regulatory Requirements 12
3.2 Delineation of Remediation Areas and Data Gaps 12
3.2.1 Vadose Zone 13
3.2.2 Groundwater 13
3.3 Remedial Objectives 14
3.3.1 ROs for Land Use 15
3.3.2 ROs for Groundwater Use 15
3.3.3 ROs for Surface Water Use 16

4. IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES 17
4.1 Screening Criteria and Assumptions 17
4.2 Screening of Treatment Technologies 17
4.2.1 No Action 18
4.2.2 Institutional Controls 18
4.2.3 Monitored Natural Attenuation 18
4.2.4 Soil Vapor Extraction 19

4.2.5 Air Sparging 20
4.2.6 Groundwater Extraction and Treatment 20
4.2.7 Enhanced Reductive Dechlorination 21
4.2.8 *In Situ* Chemical Reduction 22
4.2.9 *In Situ* Chemical Oxidation 22

5. DEVELOPMENT OF REFERENCE REMEDY AND ALTERNATIVE REMEDIES 24
5.1 Reference Remedy 25
5.1.1 Source Control and Plume Remediation 25
5.1.2 Monitoring 27
5.1.3 Contingencies 28
5.1.4 Permits and Agreements 29
5.2 More Aggressive Alternative Remedy 30
5.2.1 Source Control, Plume Remediation, and Controlled Migration 31
5.2.2 Monitoring 32
5.2.3 Contingencies 32
5.2.4 Permits and Agreements 33
5.3 Less Aggressive Alternative Remedy 33
5.3.1 Source Control and Plume Remediation 33
5.3.2 Monitoring 34
5.3.3 Contingencies 34
5.3.4 Permits and Agreements 35

6. COMPARISON OF REMEDIES 36
6.1 Comparison Criteria 36
6.1.1 Reference Remedy 36
6.1.2 More Aggressive Alternative Remedy 39
6.1.3 Less Aggressive Alternative Remedy 42
6.2 Comparison of Remedies 44
6.2.1 Practicability 44
6.2.2 Risk 46
6.2.3 Cost 46
6.2.4 Benefits 46

7. PROPOSED REMEDY 48
7.1 Process and Reason for Selection 48
7.2 Achievement of Remedial Objectives 48
7.3 Achievement of Remedial Action Criteria Pursuant to A.R.S. §49-282.06 48
7.4 Consistency with Water Management and Land Use Plans 49
7.5 Contingencies 49

8. COMMUNITY INVOLVEMENT 51

9. REFERENCES 52

TABLES

Table 1	Remediation Technology Screening Summary
Table 2	Remedy Evaluation
Table 3	Cost Summary
Table 4	Remedial Alternative Scoring

FIGURES

Figure 1	Site Location
Figure 2	Site Plan
Figure 3	PCE Concentration Isopleths – September 2017
Figure 4	Ozone Sparge Pilot Study System Layout and Proposed Reference Remedy Upgrades
Figure 5	Groundwater Elevations and Contours in Shallow Wells – December 2018
Figure 6	SVE ERA System Layout and Sampling Results
Figure 7	Proposed More Aggressive Remedy

APPENDICES

Appendix A	Ozone Sparge Pilot Study Results
Appendix B	RI Report Hydrologic Cross Sections
Appendix C	Bench Scale Evaluation of Ozone Report and Laboratory Treatability Study Report
Appendix D	Detailed Cost Sheets for Remedial Alternatives

LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AMA	Active Management Area
A.R.S.	Arizona Revised Statutes
AS	air sparge
AWQS	Aquifer Water Quality Standard
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
COP	City of Phoenix
cDCE	cis-1,2-dichloroethene
cfm	cubic feet per minute
tDCE	trans-1,2-dichloroethene
DEUR	Declaration of Environmental Use Restriction
EBI	EnviroBusiness, Inc.
EPA	United States Environmental Protection Agency
ERAs	Early Response Actions
ERD	enhanced reductive dechlorination
ESA	environmental site assessment
FS	Feasibility Study
ft bgs	feet below ground surface
ft/ft	feet per foot
Geosyntec	Geosyntec Consultants
GETS	groundwater extraction and treatment system
GPL	Groundwater Protection Level
gpm	gallons per minute
HGC	Hydro Geo Chem, Inc.
HP	horsepower
ISCO	in situ chemical oxidation
ISCR	in situ chemical reduction
ITRC	Interstate Technology & Research Council
lbs	pounds

LGAC	liquid-phase granular activated carbon
MAU	Middle Alluvial Unit
MCAQD	Maricopa County Air Quality Department
mg/kg	milligrams per kilogram
$\mu g/m^3$	micrograms per meter cube
MNA	monitored natural attenuation
O&M	operations and maintenance
PCE	tetrachloroethene
PI	Preliminary Investigation
PQGWP	Poor-Quality Groundwater Withdrawal Permit
PRAP	Proposed Remedial Action Plan
RI	Remedial Investigation
ROI	radius of influence
ROs	Remedial Objectives
RSL	Regional Screening Level
SiREM	SiREM Laboratory
Site	7th Street and Missouri Water Quality Assurance Revolving Fund Site
SRL	Soil Remediation Level
SRP	Salt River Project
SVE	soil vapor extraction
TCE	trichloroethene
UAU	Upper Alluvial Unit
VGAC	vapor-phase granular activated carbon
VC	vinyl chloride
VOCs	volatile organic compounds
VRP	Voluntary Remediation Program
WQARF	Water Quality Assurance Revolving Fund
ZVI	zero valent iron

1. INTRODUCTION

This Feasibility Study (FS) Report for the 7th Street and Missouri Avenue (7th & Missouri) Water Quality Assurance Revolving Fund (WQARF) Site (the Site) was prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of the Arizona Department of Environmental Quality (ADEQ). The 7th & Missouri WQARF Site is located in Phoenix, Arizona (the Site, Figure 1).

1.1 Purpose and Scope of the Feasibility Study Report

This FS Report was prepared in accordance with Arizona Administrative Code (A.A.C.) Title 18, Environmental Quality, Chapter 16, Department of Environmental Quality WQARF Program, Article 4, 407: Feasibility Study (R18-16-407) and is based on information reported in the following documents:

- *Remedial Investigation Report, North 7th Street and East Missouri Avenue, Phoenix, Arizona* (Pinyon Environmental, Inc. [Pinyon], 2018) (RI Report); and
- *Field Investigation Summary for Groundwater Monitoring Well Installation, 7th Street and Missouri Avenue, Phoenix, Arizona* (Pinyon, 2019a).

Information contained in the FS Report is drawn from the above referenced reports without attribution other than that noted here. The history of remedial investigations, early response actions (ERAs), and preliminary screening of remedial alternatives completed for the Site are presented in these referenced documents and are briefly summarized in Section 2.

The objectives of the FS are as follows:

- Identify remedial options and alternatives that will achieve the Remedial Objectives (ROs) as outlined in the Proposed ROs Report; and
- Evaluate the identified remedies, recommend alternatives, and comply with the requirements of Arizona Revised Statutes (A.R.S.) §49-282.06.

Based on the objectives stated above, the FS presents recommendations for the preferred remedy that:

- Protects public health, welfare, and the environment;
- To the extent practicable, provide for the monitoring, management, or cleanup of hazardous substances so as to allow for the increase in beneficial use of waters of the state;
- Is reasonable, necessary, cost-effective, and technically feasible; and
- Address wells (used for municipal, domestic, industrial, irrigation or agricultural purposes) that could produce water that would not be fit for its current or reasonably foreseeable end use without treatment.

1.2 Report Organization

The remainder of this FS Report is organized as follows:

- Section 2: "Site Background" includes Site description, site history, the nature and extent of contamination, ERAs, and risk evaluation;
- Section 3: "Feasibility Study Scoping" presents the regulatory requirements of pertinent statutes and rules, delineates the remediation areas, and presents the ROs identified by ADEQ;
- Section 4: "Identification and Screening of Remediation Technologies" presents an evaluation and screening of various remedial technologies related to contamination in soil and groundwater, and lists the technologies that have been retained for inclusion into the reference and alternative remedies;
- Section 5: "Development of Reference Remedy and Alternative Remedies" presents the evaluation process and selection of a Reference Remedy, a More Aggressive Remedy, and a Less Aggressive Remedy;
- Section 6: "Comparison of Remedies" presents a summary of the three remedial alternatives compared to each other based on practicability, risk, cost, and benefit, and includes a discussion of uncertainties associated with each remedy;
- Section 7: "Proposed Remedy" presents the recommended remedy and discusses how the remedy will meet the requirements of A.R.S. §49-282.06 and A.A.C. R18-16-407(I);
- Section 8: "Community Involvement" discusses public participation; and
- Section 9: "References" provides a list of references cited in this report.

2. SITE BACKGROUND

This section presents a summary of the Site background, physiographic setting, the nature and extent of contamination, and a risk evaluation. Additional background details are presented in the RI Report.

2.1 Site Description

The Site is located in Phoenix, Arizona (Figure 1). Contamination from the Site emanates from a potential source area identified near the former Kino Drapery Cleaners located on the southwest corner of the intersection of 7th Street and Missouri Avenue (Figure 2). The contaminants of concern (COCs) identified during previous investigations include tetrachloroethene (PCE) and its degradation products, including trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene (tDCE), and vinyl chloride (VC). The former Kino Drapery Cleaners operated from 1969 to approximately 1980, at which time the property was demolished for construction of the Missouri Falls office building and associated underground parking garage. Currently, the Missouri Falls building is still present on Site and it is occupied by multiple office spaces. The Site is surrounded by commercial and residential properties.

Benzene was also detected over standards at the Site in monitoring well MVW-3, located on the northwest corner of 7th Street and Missouri Avenue. The RI stated that benzene was not considered a Site COC, as petroleum hydrocarbons associated with leaking underground storage tank (LUST) releases are regulated under ADEQ's LUST program. However, a determination by ADEQ's LUST section stated that the benzene contamination present in MVW-3 did not warrant re-opening of the LUST case. Therefore, as the benzene contamination is not being regulated under LUST and may impact remediation at the Site, benzene is added as a COC to the Site.

2.2 Site History

The following is a summary of Site history based on information from the RI Report (Pinyon, 2018). According to the RI, a Preliminary Investigation (PI) was completed by Hydro Geo Chem, Inc. (HGC) on behalf of ADEQ between 2008 and 2016. A Phase II Environmental Site Assessment (ESA) was also completed by EnviroBusiness, Inc. (EBI) on behalf of a private entity for the Missouri Falls property, and the results of this Phase II ESA were also included in the PI Report. A discussion of the PI and Phase II ESA investigations is provided in the RI Report, and the results of these investigations are summarized below.

In 1995, a LUST investigation was initiated at the Circle K convenience store, located at

the northwest corner of 7th Street and Missouri Avenue. During this investigation, chlorinated solvents including PCE and TCE were detected in groundwater. PCE concentrations in groundwater samples collected from Circle K monitoring well MVW-2 were reported as high as 720 micrograms per liter (µg/L). In addition, PCE was detected at a Salt River Project (SRP) production well, SRP Well 14.0E-9.6N (Arizona Department of Water Resources [ADWR] #55-608424), located approximately 450 feet northwest of the former Kino Drapery Cleaner and the Circle K gas station. Potential sources of PCE and TCE investigated by HGC in 2008 as part of the PI included the former 7th Street Cleaners, former Fashion Cleaners, and the former Kino Drapery Cleaners. Results of the PI indicated that a release had occurred at the Fashion Cleaners facility, which later entered into a Voluntary Cleanup Program (VRP) with ADEQ. However, based on the estimated groundwater flow direction, and the PCE detections at the SRP Well 14.0E-9.6N and at wells installed at Circle K, the area of the former Kino Drapery Cleaners was identified as the most likely source of impacts to those wells.

Passive soil-gas investigations were completed 2008. According to the RI, the results of the investigations indicated that elevated PCE concentrations were detected near North 8th Place and East Missouri Avenue, near the Fashion Cleaners. Lower PCE concentrations were detected near the Circle K and Kino Drapery Cleaners locations. These data were the basis of installation of groundwater monitoring wells MW-101, MW-102, and MW-103, and Fashion Cleaners entering into a VRP with ADEQ.

Because of the PCE detections in the SRP well and at Circle K, and the predominant groundwater flow direction towards the north, subsequent soil, soil-gas, and groundwater investigations were completed as part of a Phase II ESA in 2013 on the Missouri Falls property to evaluate potential impacts from a former Chevron station and the former Kino Drapery Cleaners Facility. These investigations resulted in elevated COCs detections. Samples collected below the Missouri Falls parking garage resulted in soil-gas PCE concentrations as high as 91,500 micrograms per cubic meter ($\mu g/m^3$) (DP-03 at 37 feet below ground surface [ft bgs]) and in soil PCE concentrations up to 0.360 milligram per kilogram (mg/kg) in DP-03 at 47 ft bgs. Groundwater samples collected during the PI in 2013 resulted in concentrations as high as 850 µg/L at MW-8 (located downgradient of the 7th Street and Missouri Avenue intersection).

The Site was added to the WQARF registry on June 24, 2016, based on results of the PI activities. The WQARF Site boundaries are defined by the extent of the PCE groundwater plume exceeding the Aquifer Water Quality Standard (AWQS) of 5 µg/L (Figure 3). The groundwater plume underlies an area that is a mix of commercial and residential land uses.

The sampling results collected during the RI indicated that the highest groundwater PCE detection was encountered at MW-201 (collocated with the former Kino Drapery Cleaners) at a concentration of 6,400 µg/L (April 2017 sampling event).

In June 2018, a soil vapor extraction (SVE) pilot study was initiated at the Site. The SVE system was intended to decrease PCE contamination in the vadose zone near the former Kino Drapery Cleaners. During the SVE pilot test, the concentration of PCE observed in soil-gas at SVE-5 decreased during installation of the SVE wells from 28,750,00 µg/m^3 to 13,200,000 µg/m^3 detected at SVE-5, with an estimated 1.65 pounds (lbs) of PCE removal (Pinyon, 2018). Operation of the SVE system was later expanded as part of an ERA at the Site (Subsection 2.3.1).

In November 2018, a pilot-scale ozone sparging system was installed for the remediation of groundwater. The system is comprised of an ozone sparge unit and two dual-nested ozone injection wells (7M-SW-01 and 7M-SW-02) within the source area at the Site. The system has been operational since November 26, 2018. Additional details about the ozone pilot study are provided in Subsection 2.3.2.

Three additional groundwater monitoring wells were constructed in 2018 (Pinyon, 2019a). Monitoring wells MW-207, MW-208, and MW-209 were installed to further delineate PCE within the central portion of the plume. PCE was not encountered above standards during drilling. Groundwater samples from post-well installations were <1.0 µg/L for PCE (Pinyon, 2019b).

2.3 SVE Early Remedial Action and Ozone Sparge Pilot Study

Summaries of the SVE and ozone pilot study installations and results are provided in the following subsections.

2.3.1 SVE System

After completion of the SVE pilot study and as part of the vadose zone ERA, additional soil-gas and soil samples were collected during the SVE wells installation at the Missouri Falls property. Samples were collected at various depths below the floor of the bottom of the parking garage. The highest PCE concentrations were detected in SVE-5 at approximately 37 ft bgs (10 feet below the garage floor), with detected concentrations of 28,750,000 µg/m^3 in soil-gas, and 10,400 mg/kg in soil. This soil concentration, along with previously collected data, exceeded the Non-Residential Soil Remediation Level (SRL) for PCE of 13 mg/kg, and the Site-specific Groundwater Protection Level (GPL) of 6.7 mg/kg. The SVE consists of a skid-mounted vacuum blower system with 75 standard cubic feet per minute (cfm) capacity, and two 55-pound vapor-phase granular activated carbon (VGAC) vessels

connected in series for removal of the volatile organic compounds (VOCs) from the extracted soil vapor. A total of eight SVE wells were installed, screened from 15 to 25 feet below the bottom of the Missouri Falls parking garage (approximately 45 to 55 ft bgs). Currently the SVE system is extracting from 5 out of the 8 SVE wells.

The initial start-up for the SVE system occurred on October 17, 2018 and the system was in continuous operation with periodic shut-downs for carbon change out, maintenance, and repair at the time of submittal of this report. From start-up to May 3, 2019, the SVE system removed approximately 537 lbs of PCE and operated for 3,439 hours (reference pending, Pinyon, 2019c).

2.3.2 Ozone Sparge Pilot Study

The pilot-scale ozone sparging system is comprised of an ozone sparge unit (H2O Engineering, OSUXX-104) and two dual-nested ozone injection wells (7M-SW-01 and 7M-SW-02). The system was installed on the Missouri Falls property in October 2018 and commissioned in November 2018. During drilling of the injection wells, soil vapor samples were collected approximately every 10 ft to profile the vadose zone. Laboratory data results are presented in Appendix A. Soil-gas results ranged from non-detected to 2,480 ug/m^3 in 7M-SW-02 at 70 ft bgs. The nested ozone injection wells have shallow well screens from 119 to124 ft bgs and deep well screens from 144 to 149 ft bgs. An ozone sparge system layout is shown on Figure 4 and additional construction details are summarized in Appendix A.

Six rounds of groundwater sampling were conducted between November 7, 2018 and April 4, 2019 to monitor the effect of ozone sparging; the VOC results suggest positive remedial effect associated with the ozone treatment in areas downgradient of the source area. In the vicinity of the source area, VOC reductions have been modest, likely due to continued source addition from ongoing dissolution of PCE from the vadose zone into the local area groundwater.

Results from the groundwater sampling events are presented in Appendix A in both summary table format and time-series plots. The main observations from these results are:

- Results from MW-201, located within the source area, indicate that PCE decreased slightly during the initial few weeks of ozone sparging, but slightly

increased in concentrations, likely due to continued dissolution of PCE into groundwater at the source area;

- PCE concentrations at MVW-103 and MW-108, located immediately downgradient of the source area, slightly increased during the initial stage of ozone sparging. The increase in PCE concentrations could be due to the circulation effect created by ozone sparging into groundwater, which likely mobilized PCE further downgradient and accelerated PCE dissolution at the source. The subsequent concentration decrease starting in December 2018 is likely attributable to the ozonation effect overcoming the circulation effect;
- PCE concentrations increased at downgradient well MW-106, likely due to mobilization of PCE from the circulation effect created by ozone sparging. However, PCE oxidation is expected to occur at MW-106 because of the following:
    - Ozone was detected in ambient readings near the top of the well at MW-106, suggesting that it has migrated to this well through groundwater, the vadose zone, or both; and,
    - Elevated carbon dioxide concentrations (up to 2,000 parts per million by volume), and the lack of hydrocarbons, indicating that the mineralization of organic compounds by ozone is occurring at MW-106.
- Petroleum hydrocarbon related VOCs concentrations detected at downgradient monitoring well MVW-3 (Figure 5), near the Circle K facility, decreased since the start of ozone sparging. VOC compounds such as benzene, ethylbenzene, toluene and xylenes (BTEX), decreased at MVW-3 by one to two orders of magnitude. For example, benzene decreased from 350 μg/L in November 2018 to 29 μg/L in May 2019, and total xylenes decreased from 480 μg/L to non-detect during the same time period. Time-series plots of these concentrations are presented in Appendix A. These data indicate that petroleum hydrocarbon related VOCs are being reduced in concentration by the ozone injection, and possibly competing for ozone with chlorinated hydrocarbon.

2.4 Conceptual Site Model Summary

The following summarizes the Site hydrogeology and extent of contamination presented in the RI Report (Pinyon, 2018).

2.4.1 Site Geology and Hydrogeology

The Site is located within the East Salt River Valley Sub-Basin of the Phoenix Active Management Area (AMA). The sub-basin includes the Middle Alluvial Unit (MAU), the principal water-bearing unit, and the overlying Upper Alluvial Unit (UAU), which is saturated in limited areas. The Site is directly underlain by fine-grained material, consisting of silts, clays, and sands with minor gravel components in the upper 45 feet. A lean clay layer is encountered below the Site from approximately 45 to 60 ft bgs. This clay layer appears to be laterally discontinuous immediately north of the Site. From 60 to approximately 240 ft bgs, the lithology is comprised of mostly silty sand with minor sand and gravel lenses. The lithology off-site to the north is generally more silty sand, with less clay and gravel. Major lithologic layers appear to dip slightly towards the north, based on lithologic observations recorded during drilling activities and respective surveyed elevations.

There are no surface water bodies within the Site or its immediate proximity. The closest surface water bodies are: the Grand Canal, which is located approximately 1 mile south; the Arizona Canal, located approximately 1.8 miles northeast; and the Salt River, located approximately 6.5 miles south of the Site.

Historically, the groundwater flow direction shown in the Circle K groundwater monitoring program indicated that groundwater flows towards the north to northwest. However, the groundwater flow direction in recent years has shifted towards the northeast. According to the RI Report (Pinyon, 2018), the likely contributing factors to the shift in groundwater flow direction from northwest to northeast are the lining of the Grand Canal, which occurred between 1995 and 2007, and the limited pumping of SRP well 14.0E-9.6N, which is located northwest of the Site and would have drawn groundwater towards that direction during pumping. The depths to groundwater at the Site measured in September 2017 range between approximately 87 to 125 ft bgs. Depths to groundwater appear to be generally increasing with time, when compared to historical measurements. The groundwater gradient in September 2017 was approximately 0.007 feet per foot (ft/ft), measured in the vicinity of the former Kino Drapery Cleaners between MW-105 and MW-107. Site-wide groundwater elevation measurements were also collected in December 2018 (Pinyon, 2019a) after installation of the three most recent groundwater monitoring wells (MW-207 thru MW-209). The groundwater flow direction did not change since 2017, and appears to be constant towards the northeast (Figure 5); however, the groundwater gradient appears to be slightly lower at 0.005 ft/ft.

According to the RI Report (Pinyon, 2018), the UAU has a reported hydraulic conductivity ranging from 180 to 1,700 feet per day and a storage coefficient ranging

from 0.1 to 0.25. However, the hydraulic conductivity of the UAU in the Central and Camelback WQARF Site, located approximately 0.7 miles southwest, have been estimated between 15 and 75 feet per day (HGC, 2015).

2.4.2 Extent of Contamination

Based on the results of the investigations summarized in Subsection 2.2 and the data currently available, a potential source of chlorinated solvents, including PCE and its degradation products, exists in the vadose zone below the former Kino Drapery Cleaners facility. Soil-gas results collected during the ERA SVE well installations indicate that soil-gas impacts have been detected up to 28,750,000 $\mu g/m^3$ at 37 ft bgs (10 ft below the parking garage floor) within the presumed source area (Figure 6). Subsequent soil-gas investigations indicate that elevated soil-gas impacts appear to be limited to the extent of the Missouri Falls Property.

Contamination in the vadose zone has reached the water table, encountered at approximately 89 ft bgs at the source area well (MW-201), as evidenced by the highest Site PCE concentration ever detected in groundwater of 6,400 μg/L in April 2017. This migration of PCE from the vadose zone to the water table has resulted in an approximately 1-mile long groundwater plume, extending from the source area towards the northeast. The groundwater plume, as defined by the 5 μg/L (AWQS) PCE contour in September 2017, which is approximately bounded to the north by East Bethany Home Road, to the south by East Georgia Avenue, to the east by North 12th Street, and to the west by East 6th Street. Figure 3 presents the PCE concentration isopleths from the January 2017 groundwater monitoring event. Based on the September 2017 groundwater monitoring results (the most recent Site-wide groundwater monitoring event), PCE was detected in most monitor wells with concentrations ranging from 1.4 μg/L in cross-gradient well MW-102 to 4,000 μg/L at MW-201. PCE was not detected in upgradient well MW-107, cross-gradient well MW-203, and downgradient wells MW-204 and MW-205, and City of Phoenix (COP) well COP-57, located north of East Bethany Home Road. PCE was also not detected in MW-202d, located within the central portion of the plume, in the deepest sampled interval of 230 ft bgs. However, PCE was detected in the shallow (130 ft bgs) and middle (171 and 180 ft bgs) sample intervals at MW-202. The data collected at MW-202 appear to suggest that the vertical extent of PCE is limited to the shallow and middle portions of the UAU.

2.5 Risk Evaluation

A risk evaluation documented in the RI Report (Pinyon, 2018) assessed COCs and potential exposure pathways present at the Site. The exposure pathways considered

included: inhalation of impacted vapors; dermal exposure to impacted soil, groundwater, or surface water; and ingestion of impacted soil, groundwater, or surface water. The following discussion summarizes the results of the risk assessment in the RI.

- Vapor Pathways – COC-impacted vapors from the vadose zone could potentially reach receptors in the residential and commercial properties within the Site. Indoor air samples collected within the garage spaces at the Missouri Falls property were above the residential and industrial indoor air Regional Screening Levels (RSLs). However, due to the short duration of the time spent by individuals in a parking garage, and the implementation of SVE as an ERA for the Site vadose zone, the risk to receptors was considered low.

  Soil-gas samples collected near the Kinderland Daycare and Circle K were above the United States Environmental Protection Agency (EPA) residential indoor air vapor intrusion screening levels; however, indoor samples collected inside and outside these facilities did not exceed COCs concentrations above the laboratory reporting limit. Therefore, these detections in soil-gas in the vicinity of these facilities are not considered a risk to Site occupants.

  Because of the decrease in groundwater COC concentrations with distance away from the source area, and the depth of groundwater increasing further downgradient, the risk of off-gassing and potential vapor intrusion to receptors downgradient from the Site was considered low.

- Soil Pathway – Because a portion of the source area was excavated and disposed off-site during the construction of the Missouri Falls property, and the physical barrier in place with the concrete parking garage floor, the risk of direct dermal exposure and ingestion is considered low.

- Surface Water Pathways – As mentioned in Subsection 2.3.1, the closest surface water bodies are: the Grand Canal, which is located approximately 1 mile to the south; the Arizona Canal, located approximately 1.8 miles northeast; and the Salt River, located approximately 6.5 miles south of the Site. Due to the distance between surface water bodies and the Site source area, and the depth to groundwater relative to these surface water bodies, it is highly unlikely that the Site has impacted either of these surface water bodies. Groundwater from the SRP well 14.0E-9.6N, located within the Site and approximately 450 feet northwest of the source area, has been historically pumped for irrigation use, but is currently only pumped occasionally for testing. Based on sampling performed by SRP in January 2018, PCE was detected at a concentration of 19 μg/L. In the Land and Water Use Questionnaire presented in the RI Report (Pinyon, 2018), SRP stated

that the well is used "very little", but that future groundwater uses from this well will be transitioned from irrigation to drinking water in 2020-2021. A review of information available on the ADWR Well Registry Website, indicates that SRP well 14.0E-9.6N was last operated in 2013, when 0.35 acre-feet of water was pumped. Currently this pathway is considered incomplete, however change in well operation by SRP in the future may result in a complete pathway.

- Groundwater Pathways – Three production wells were evaluated for risk in the vicinity of the Site: COP Well 57, located north of the toe of the plume; SRP well 14.0E-9.6N; and SRP well 13.5E-9.4N, located approximately 0.5 miles west and cross-gradient from the Site. COP Well 57 is currently not in use because of pesticide impacts, which preclude it from active pumping. However, COP reported in the Land and Water Use Questionnaire provided in the RI that future operation of this well is possible as a supplementary water supply well due to changes in supply or demand in the Phoenix area.

  According to the Land and Water Use Questionnaire presented in the RI Report (Pinyon, 2018), both SRP well 14.0E-9.6N and SRP well 13.5E-9.4N are in sporadic use by SRP. According to information available on the ADWR Well Registry Information website, SRP Well 14.0E-9.6N was last operated in 2013 when 0.35 Acre-ft of water were removed. Samples collected in January 2018 from these wells had detected PCE concentration of 19 μg/L and 9.7 μg/L, respectively. Because SRP anticipates that these wells will be transitioned from irrigation to drinking water use, exposure to PCE through ingestion or dermal contact represents a potential risk.

- Ecological Risk – Because the Site and its immediate vicinity are located within an urban environment, and it does not contain a suitable habitat for federally listed species, the risk assessment presented in the RI did not consider impacted soil, soil-gas, and groundwater to be a risk to terrestrial or aquatic biota.

3. FEASIBILITY STUDY SCOPING

The following presents the regulatory requirements of pertinent statutes and rules, delineation of the remediation areas, and the ROs identified by ADEQ.

3.1 Regulatory Requirements

Per A.R.S. §49-282.06, the following factors must be considered for selecting remedial actions:

- Population, environmental, and welfare concerns at risk;
- Routes of exposure;
- Amount, concentration, hazardous properties, environmental fate, such as the ability to bio-accumulate, persistence and probability of reaching the waters of the state, and the form of the substance present;
- Physical factors affecting environmental exposure, such as hydrogeology, climate, and the extent of previous and expected migration;
- The extent to which the amount of water available for beneficial use will be preserved by a particular type of remedial action;
- The technical practicability and cost-effectiveness of alternative remedial actions applicable to a site; and
- The availability of other appropriate federal or state remedial action and enforcement mechanisms, including funding sources established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to respond to the release.

A.A.C. R18-16-407(A) states that an FS is a process to identify a Reference Remedy and alternative remedies that appear to be capable of achieving ROs and to evaluate the remedies based on the comparison criteria to select a remedy that complies with A.R.S. §49-282.06.

3.2 Delineation of Remediation Areas and Data Gaps

The following subsections discuss the delineation of impacts to the vadose zone and groundwater at the Site, as well as the uncertainties associated with the delineations.

3.2.1 Vadose Zone

Sample results indicate soil at the Site is impacted by PCE and daughter biproducts. The potential source of contamination is in the vicinity of the former Kino Drapery Cleaners facility. Prior soil and soil-gas investigations conducted as part of the PI, RI, and ERA indicate that PCE and degradation products have impacted the vadose zone vertically from below the floor of the parking garage of the Missouri Falls building to at least 77 ft bgs. The highest detected PCE concentrations in soil and soil-gas, have been directly below the former Kino Drapery Cleaners, approximately 10 feet below the concrete garage floor.

Soil-gas results from samples collected during the ERA SVE well installations indicate that soil-gas impacts decrease vertically with depth from approximately 28,750,000 $\mu g/m^3$ at 37 ft bgs (10 feet below the parking garage floor) to 35,400 $\mu g/m^3$ at 77 ft bgs. Detected PCE soil-gas concentrations in samples collected in 2013 along the alley located west of the Missouri Falls property indicate that concentrations decreased by as much as five orders of magnitude from the source area (5,480,000 $\mu g/m^3$) towards the alley to the west (highest concentration of 67.8 $\mu g/m^3$). Soil-gas detections measured in 2017 indicate that PCE also decreases significantly from the source area towards the north at the Circle K facility (highest concentration of 353 $\mu g/m^3$), and towards the south at the Head and Toe Therapy facility (highest concentration of 27.1 $\mu g/m^3$). Elevated soil and soil-gas concentrations in the vadose zone appear to be contained within the Missouri Falls property footprint and extend vertically from near surface to groundwater.

3.2.1.1 *Vadose Zone Data Gaps*

No vadose zone data gaps have been identified at this time.

3.2.2 Groundwater

Groundwater monitoring conducted at the source and its vicinity shows that COC exceedances of AWQSs are currently limited to the UAU. Groundwater data collected from triple-nested well MW-202 as part of the RI (Pinyon, 2018), screened at approximately 85 to 134 ft bgs (MW-202s), 170 to 190 ft bgs (MW-202m), and 225 to 235 ft bgs (MW-202d), indicates that PCE is not detected in the deeper MW-202d screen. PCE appears to be limited to the shallow and middle portion of the UAU, with concentrations decreasing below 5 $\mu g/L$ between MW-202m and MW-202d. Remedies described in the FS Report are therefore focused on the UAU. Cross-sectional figures from the RI Report (Pinyon, 2018) depicting the UAU and the projected PCE impacts are included in Appendix B. According to data presented in the RI (Pinyon, 2018), the PCE

plume is vertically delineated down gradient from the source area at MW-202d, BH-204, and BH-206, where results below 5 μg/L were detected at approximately 230 ft bgs (Appendix B); however, data gaps exist cross-gradient of the source area to the east.

3.2.2.1 *Groundwater Data Gaps*

This section presents the groundwater data gaps identified and addressed as part of this FS:

- As of September 2017, the plume was laterally bound by cross-gradient wells MW-203 to the west, and MW-102, and MW-103 to the east. Groundwater results from wells MW-207, MW-208 and MW-209, installed in October 2018, appear to indicate that the plume is delineated on the northwest and northeast side at these two locations.
- Monitoring well MW-106, located downgradient from the source area, and cross-gradient wells MW-101, MW-102, MW-103 are screened up to a depth of approximately 120 ft bgs. Elevated PCE concentrations have historically been detected at MW-106, ranging from 420 μg/L in September 2017 to 1,400 μg/L in April 2019. Two additional monitoring wells may be considered east of MW-106 to monitor the upper and middle portion of the UAU, to confirm how far east PCE exceedances are found, and whether PCE has impacted the aquifer below 120 ft bgs. Installation of two additional monitoring wells have been included as part of the three remedies discussed in the Section 5.

3.3 Remedial Objectives

The ROs for the Site were developed by ADEQ pursuant to A.A.C. R18-16-406(I). ROs are established for the current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by a release of a hazardous substance. Pursuant to A.A.C. R18-16-406(D), it is specified that reasonably foreseeable uses of land are those likely to occur at the Site and the reasonably foreseeable uses of water are those likely to occur within one hundred years, unless Site-specific information suggests a longer time period is more appropriate.

Reasonably foreseeable uses are those likely to occur, based on information provided by water providers, well owners, land owners, government agencies, and others. The ROs are based on land and water use study questionnaires collected in 2017 and 2018, the solicitation of the proposed ROs during the public comment period of the Draft RI Report in 2018 (Pinyon, 2018). The land and water use questionnaires are included in Appendix K of the 2018 RI Report.

The ROs are stated in the following terms: (1) protecting against the loss or impairment of each use; (2) restoring, replacing, or otherwise providing for each use; (3) when action is needed to protect or provide for the use; and (4) how long action is needed to protect or provide for the use.

3.3.1 ROs for Land Use

The RO for Land Use is:

Because the property with the SRL exceedances is currently and will for the foreseeable future be zoned for non-residential use, non-residential SRLs apply. Site-specific GPLs are also exceeded in this location. Based on this information, the remedial objective for the soil to meet SRLs and to be protective groundwater is:

> **To restore soil conditions at the site to remediation standards for non-residential use as specified in A.A.C. R18-7-204 (background remediation standards), A.A.C. R18-7-205 (pre-determined remediation standards), or A.A.C. R18-7-206 (site-specific remediation standards) that are applicable to the hazardous substances identified which are. The concentrations remaining in soil after remediation standards are met will not cause or threaten to cause a violation of groundwater remediation standards specified in A.A.C. R18-7-203. This action is needed for the present time and for as long as the level of soil contamination exceeds applicable cleanup standards.**

3.3.2 ROs for Groundwater Use

The RO for Groundwater Use is:

Current groundwater use in the site is for irrigation. Future groundwater use at this site is for irrigation and municipal purposes. Multiple monitoring wells and one SRP well have exceeded AWQS for site COCs. Therefore, the RO for groundwater use at the site is:

> **To restore, replace, or otherwise provide for water for its designated municipal use that is lost or impaired by contamination associated with the 7th Street and Missouri Avenue WQARF site. This action is needed for the present time and for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Street and Missouri Avenue WQARF site prohibits or limits the designated municipal use of groundwater.**

3.3.3 ROs for Surface Water Use

Current surface water use in the area of the site is irrigation from man-made canals containing pumped groundwater; projected future use of Grand Canal water includes drinking water. Therefore, ROs for surface water use are not necessary, as ROs for groundwater pumped into the canal are applicable.

4. IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES

This section provides a discussion of the identification and screening of remediation technologies for potential implementation at the Site. Technologies are identified and screened separately for remediation of the vadose zone and groundwater.

4.1 Screening Criteria and Assumptions

Remediation technologies that would meet Site ROs and comply with requirements of A.A.C. R18-16-407 and A.R.S. §49-282.06 were identified and screened according to the following criteria:

- Contaminant treatment effectiveness;
- Constructability;
- Flexibility/expandability;
- Operations and maintenance (O&M) requirements;
- Operational hazards; and
- Cost-effectiveness.

The remediation technologies that passed screening were retained for use in development of the Reference Remedy and alternative remedies described in Section 5. The following were assumed during the identification and screening of remedial technologies:

- PCE exists at a concentration up to 4,000 µg/L in groundwater in a primary source area near monitor well MW-201;
- A plume of 5 µg/L or greater extends to approximately 3,500 feet downgradient of the source area; and
- PCE is still present in the vadose zone near the source area with soil concentrations greater than Non-Residential SRLs.

4.2 Screening of Treatment Technologies

Technologies described below are commonly used for remediation of chlorinated hydrocarbons. The basic treatment mechanisms and the suitability and limitations of the technologies are also discussed. An initial screening is presented below for each technology for applicability to Site conditions, plume extent, and VOC concentrations. Those technologies that are potentially applicable were then evaluated using the

technology screening criteria discussed above. The results of the initial technology screening are summarized in Table 1.

4.2.1 No Action

The No Action Alternative assumes that no remediation efforts would be implemented for the Site, and that current conditions would continue in the Project Area. The vadose zone soil would not be remediated, resulting in a continued source of chlorinated solvents to groundwater, and the dilute groundwater plume could potentially propagate further downgradient. As a result, under the No Action Alternative, the ROs for the Site would not be met and the alternative is not retained.

4.2.2 Institutional Controls

Institutional controls such as a land use restriction are commonly utilized for sites where residual soil impacts may exist and the future use of a property is likely to be commercial or industrial. Institutional controls can consist of items such as a deed restriction limiting the use of a property to non-residential development and/or the utilization of an engineering control. A.R.S. §49-152 allows for the use of an institutional control consisting of a deed restriction through the implementation of a Declaration of Environmental Use Restriction (DEUR) for facilities that have residual impacts above the Residential SRLs but below the Non-Residential SRLs. If soil impacts were to remain in place above Non-Residential SRLs, an engineering control would also need to be implemented. The use of an institutional control can be a cost-effective means of obtaining site closure.

As the source area of the Site is currently zoned Intermediate Commercial (C-2) and is not anticipated to change, the use of an institutional control by the implementation of a DEUR to address VOC impacts within the vicinity of the source area is retained for further consideration, if the Site cannot be remediated to residential standards, but non-residential standards are met. Elevated VOCs in the vadose zone could result in potential vapor intrusion risks within the source area and to sensitive off-site receptors (i.e. Kinderland Pre-School Daycare). Additionally, institutional controls would not mitigate continued source area releases to groundwater, and the propagation of PCE further downgradient.

4.2.3 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is a widely-applied remedial measure when natural processes are expected to reduce COC concentrations over time. Such natural processes

include dilution, dispersion, sorption, volatilization, and chemical and/or biological stabilization or transformation. For chlorinated VOCs, such as PCE, TCE, and 1,1-DCE, natural reductive dechlorination (via biological and/or abiotic degradation processes) is usually the most significant degradation process when conditions are favorable (i.e., anaerobic environment with available organic carbon). Application of MNA requires the identification of the most likely attenuation processes and an estimation of the time required for these processes to meet the remedial objectives. MNA also includes implementation of a plan to observe the progress of the remedy to monitor that natural attenuation proceeds, and that unexpected migration of impacts does not occur.

Groundwater parameters observed prior to the ozone pilot study indicate aerobic, slightly oxidizing conditions with dissolved oxygen values ranging between 0.5 and 6 milligrams per liter (mg/L), which could limit the potential for biologically mediated reductive dechlorination of PCE. Other abiotic MNA processes (e.g., dilution, dispersion, and sorption) may result in PCE concentrations decreasing to less than 5 µg/L over time without the presence of an ongoing source of new VOC impacts to groundwater.

For dilute plumes (e.g., < 100 µg/L PCE), MNA is often the only technically feasible solution. MNA is frequently included as a component in a larger remedial strategy, most commonly coupled with more active remediation at source areas. MNA is retained as a treatment technology for Site groundwater, in conjunction with other remediation strategies.

4.2.4 Soil Vapor Extraction

SVE is an established remedial technology for treatment of VOCs in the vadose zone. SVE involves the installation of SVE wells in impacted vadose zone soil and applying vacuum to extract soil vapors containing VOCs. The extracted soil vapor can then be discharged to the atmosphere following treatment as needed to remove VOCs, depending on the quantity emitted and local regulations. SVE is effective for source mitigation for groundwater impacts but does not directly attenuate existing groundwater impacts. An SVE system has been operated at the Site as an ERA since October 17, 2018. As of May 3, 2019, the SVE system was successful at removing approximately 537 lbs of VOCs (Subsection 2.3). As the SVE system is successful in cost effectively removing VOC mass from the vadose zone, SVE is retained as a treatment technology for remediating impacted vadose zone soil and soil vapor at the Site.

4.2.5 Air Sparging

Air sparge (AS) systems introduce compressed gasses below the water table through injection wells, where the gasses expand and travel upward through the saturated zone to the unsaturated zone. VOCs partition from impacted groundwater into the introduced bubbles or air channels and are removed by advection to the vadose zone. Air sparging can enhance SVE remediation by increasing contaminant mass removal from the saturated zone. As a complimentary system to SVE, air sparging would provide groundwater treatment while the SVE system provides overlying soil vapor mitigation.

AS promotes aerobic biological activity and degradation of some VOCs, but is typically better suited to enhancing the volatilization of high concentration non-chlorinated VOC impacts beneath the water table and would not be effective at degrading VOCs impacts once they reach low concentrations. AS is impractical for the treatment of large dilute plumes. Based on these factors, air sparging has been eliminated from further consideration.

4.2.6 Groundwater Extraction and Treatment

A groundwater extraction and treatment system (GETS) is a technology for groundwater remediation that can be effective for hydraulic containment and/or migration control for sites impacted by VOCs. Extraction and treatment systems, colloquially referred to as "pump and treat," typically utilize submersible pumps in extraction wells to extract groundwater and transfer it via conveyance piping into an aboveground treatment system. The post-treatment water is subsequently discharged to a municipal sewer, a canal or other surface water, an infiltration basin, or re-injected into the subsurface with an injection well. These systems can control the subsurface flow of impacted groundwater, mitigating migration and/or reducing the footprint of the impacts. Liquid-phase granular activated carbon (LGAC) is typically employed for VOC removal via adsorption onto the media surface.

The primary limitation for GETS is typically long cleanup times when used as the primary remedial measure in heterogeneous formations where diffusion from fine-grained layers provides a secondary source. As a dissolved-phase plume treatment alternative, GETS is not typically cost effective for large, dilute plumes. However, GETS is a widely implemented and proven component for source mitigation of localized, high-concentration groundwater impacts. This measure is implementable with respect to both the design and operation of a treatment system and is amenable to the hydrostratigraphy of the Site. Therefore, GETS technology is retained as a remedial measure for additional

evaluation. The design of a GETS system for the Site must consider requirements for discharge of treated water, e.g. into the SRP conveyance system.

4.2.7 Enhanced Reductive Dechlorination

Enhanced reductive dechlorination (ERD) involves stimulation or augmentation of indigenous microbial populations to expedite the anaerobic biodegradation (reductive dechlorination) of chlorinated VOCs through injections of electron donor (e.g., sodium lactate or emulsified vegetable oil). In the presence of sufficient electron donor, natural microbial activity will produce the required anaerobic conditions conducive to reductive dechlorination. If a sufficient population of bacteria capable of completely degrading PCE and its daughter products are not naturally present, the natural bacterial population can be augmented to supplement and enhance naturally-occurring bacteria, and completely degrad PCE and its daughter products.

Successful implementation of ERD requires: spatial distribution of the electron donor to achieve strongly reducing conditions; a microbial community capable of reductive dechlorination; groundwater pH between 5.5 and 9.0; sufficient concentrations of chlorinated VOCs to support the growth of the microbial culture (typically near 100 μg/L); absence of high concentrations of inhibitory constituents; and low concentrations of competing electron acceptors, such as sulfate and nitrate. If these conditions are not initially present in an aquifer, measures must be taken to alter conditions to become conducive to active reductive dechlorination. Although reduction can be ultimately stimulated in most aquifers, the greater the initial deviation from these ideal conditions, the more difficult and costlier ERD will be to implement.

The natural groundwater condition at the Site is generally aerobic and would require significant amounts of electron donor to become sufficiently reducing. Considering the size of the plume and the Site geochemical conditions, significant amounts of bacterial culture would be needed to establish the amount of bacterial population for successful ERD at the Site.

Although ERD is potentially capable of achieving the applicable ROs for the Site, there are challenges posed by the predominantly aerobic groundwater conditions, the low PCE concentrations, the depth to groundwater, and the size of the plume. ERD would be prohibitively costly as a treatment alternative for the overall plume; however, ERD may be effective as a treatment for targeted areas in combination with other treatment methodologies. Therefore, ERD is retained as a potential contingent remedial alternative should conducive future conditions warrant.

4.2.8 *In Situ* Chemical Reduction

In situ chemical reduction (ISCR) can abiotically reduce VOC concentrations by chemically breaking the bonds within the VOC molecules using chemical reductants, such as zero valent iron (ZVI). ZVI can also be combined with an electron donor to promote concurrent biotic and abiotic reduction of VOCs. Because groundwater at the Site is typically aerobic or moderately chemically oxidizing, a large quantity of the injectate would be consumed in reactions associated with ambient groundwater general chemistry as opposed to reduction of target COCs. Given the thickness of the impacted groundwater zone, and the depth to groundwater, installation, and the expected large volume of injectate, ISCR would be both technically and economically infeasible. Based on these limitations, this technology was not retained for further consideration.

4.2.9 *In Situ* Chemical Oxidation

In situ chemical oxidation (ISCO) relies on injection of a powerful oxidizing agent to mineralize VOCs. Several oxidants are available and have been proven effective for chlorinated VOCs, including potassium and sodium permanganate, sodium persulfate, hydrogen peroxide, and ozone. These oxidants are considered effective for oxidizing PCE and its biological degradation products, TCE, cDCE, and VC (Interstate Technology & Research Council [ITRC], 2005). The oxidant is generally delivered to the site in concentrated formulations or as solids, mixed in the field, and then injected through dedicated injection wells or temporary injection points. For the case of ozone, a mobile ozone generator system can be mobilized, and injected as a gas through sparge wells.

These highly reactive amendments oxidize the COCs to produce innocuous byproducts. Catalysts may be included or required to promote reactions for some amendments, such as sodium persulfate, potassium permanganate, or hydrogen peroxide. ISCO, as with other *in situ* methods, typically includes higher capital costs than *ex situ* methods, such as GETS, but may provide significant savings through long-term O&M cost reductions and reduced timeframes for achieving cleanup goals and site closure. It is capable of rapidly reducing high concentrations of VOCs and is well-suited- for targeted remediation of small source areas. However, these strong oxidants require robust safety considerations for safe handling and if applied at too high of concentrations can potentially result in unintended changes to aquifer geochemistry. For example, persulfate may result in an increase in groundwater sulfate concentrations, whereas permanganate may result in increasing manganese dioxide concentrations in groundwater. Additionally, because of the presence of naturally occurring chromium in Site sediments, ISCO remedies such as alkaline activated sodium persulfate and excessive amounts of potassium permanganate have the potential to react with the Site mineralogy and may result in the conversion of

innocuous and stable trivalent chromium into acutely toxic and mobile hexavalent chromium. Unlike other oxidizing agents, the processes involved in ozonation are unlikely to lead to persistent changes in aquifer geochemistry.

SiREM Laboratory (SiREM) was tasked with performing a treatability study to assess the potential for ISCO using permanganate and ozone to oxidize PCE in subsurface samples from the Site (SiREM, 2019). A copy of this report is provided in Appendix C. The results of the ozone bench scale study indicate that ozone was successful in completely removing PCE. Similarly, permanganate was also successful in reducing PCE concentrations. However, permanganate can persist in the aquifer after degradation of organic compounds, resulting in oxidation of the site mineralogy, potentially increasing concentrations of dissolved metals in groundwater. As a result, ozone was selected for a Site pilot study.

Ozone sparge has been performed at the Site as part of a pilot study at the source area (Subsection 2.3 and Appendix A). Groundwater laboratory analytical results and field observations indicate that ozonation is providing a positive regarding degradation of VOCs downgradient of the source area. In the vicinity of the source area, VOC reductions have been modest, likely due to continued source addition attributed to continued dissolution of PCE into the local area groundwater. Large radii of influence (ROI) have also been observed from the ozone injection wells. Further, laboratory results have shown that hexavalent chromium is not being created to a significant degree. Additional pilot study operation and groundwater sampling is necessary to evaluate the full-scale design.

Based on the results of the ozone treatability study (SiREM, 2019) and the pilot study indicating successful oxidation of VOCs, the large ROI observed, and the lack of observed insoluble trivalent chromium conversion to soluble hexavalent chromium, ozone sparge is considered capable of achieving the applicable ROs for the Site. As stated above, ISCO would require an initial large capital costs associated with installation of additional injection wells, trenching, and ozone generators for a full-scale implementation to address the overall plume; however, ozone will be effective as a treatment at the source area and other targeted areas. Additionally, ozone may have the secondary benefit of effective degradation of VOCs in the vadose zone, enhancing remediation of the source area in combination with the SVE vadose zone source treatment. Therefore, ISCO is retained as a potential remedial alternative.

5. DEVELOPMENT OF REFERENCE REMEDY AND ALTERNATIVE REMEDIES

Using the retained remedial technologies, a Reference Remedy has been developed along with two alternative remedies (the More Aggressive and the Less Aggressive Remedies). The Reference Remedy and the alternative remedies consist of remedial strategies and actions (remedial measures) to achieve ROs for the Site.

Remedial strategies may incorporate more than one remediation technology or methodology. As provided in A.A.C. R18-16-407(F), remedial strategies for consideration may include:

- Plume remediation to achieve water quality standards for COCs in waters of the state throughout the Site;
- Physical containment to contain contaminants within definite boundaries;
- Controlled migration to control the direction or rate of migration, but not necessarily to contain migration of contaminants;
- Source control to eliminate or mitigate a continuing source of contamination;
- Monitoring to observe and evaluate the contamination at the Site through the collection of data; and
- No action.

For the vadose zone, potential remedies consider future land use and potential risk exposure through vapor intrusion or impacts to groundwater. For groundwater, the alternative remedies have been identified with consideration of the needs of the water providers (COP and SRP) and their customers, including the quantity and quality of water, water rights, other legal constraints, and operational implications. Where remedial measures are necessary to achieve ROs, the remedial measures will remain in effect as long as required for continued achievement of those objectives.

The Reference Remedy and each alternative remedy may also include contingent remedial measures to address reasonable uncertainties regarding the achievement of ROs, or uncertain timeframes in which ROs will be achieved. Decision points for each contingency will be determined in the Proposed Remedial Action Plan (PRAP), to be prepared following issuance of this FS Report. The Reference Remedy and the alternative remedies are described below.

5.1 Reference Remedy

The remedial strategies for the Reference Remedy are:

- Source control to eliminate or mitigate a continuing source of contamination;
- Plume remediation to achieve water quality standards for COCs in waters of the state throughout the Site;
- Monitoring to observe and evaluate the contamination at the Site through the collection of data; and
- Contingency remedial measures to address potential uncertainties.

5.1.1 Source Control and Plume Remediation

Under the Reference Remedy, source control will be achieved through a combination of SVE (implemented to mitigate VOC impacts to the vadose zone) and ISCO (implemented to mitigate impacts to groundwater). The ISCO implementation will provide plume remediation for high-concentration groundwater impacts; dilute groundwater impacts will be mitigated by natural attenuation.

5.1.1.1 *Reference Remedy SVE*

Implementation of SVE for the Reference Remedy will comprise the following:

- Expansion of ERA SVE blower system from 75 cfm to 300 cfm, assuming the use of the existing eight SVE wells; and
- Continued operational monitoring to assess remedial progress and system performance.

The continued operation of the SVE system will provide source control through the removal of VOC mass in the vadose zone, which will mitigate the potential for vapor intrusion and ongoing groundwater impacts from the residual VOCs within the vadose zone. The SVE ERA performance and capacity will be evaluated, and upgrades will be recommended as part of the PRAP, if warranted. However, for the purpose of this FS, it is assumed that the SVE system for the Reference Remedy will be upgraded to a blower with a 300 cfm capacity, that all eight SVE wells will be actively remediated, and the system will continue to be operated for up to three years, or until asymptotic decreases in soil vapor VOC concentrations are observed. SVE system optimization will be conducted throughout the three-year period, which includes a contingency for expansion of the system (Subsection 5.1.3), and operational schedules may be adjusted to enhance VOC

removal. After SVE system shut-down, VOCs will be monitored for rebound for a period of three months, after which confirmation soil vapor samples will be collected to support achieving the ROs and discontinued SVE operations.

5.1.1.2 *Reference Remedy ISCO*

Implementation of ISCO for the Reference Remedy will comprise the following:

- Continued operation of the pilot study ozone sparge system with eventual upgrade to a full-scale system, consisting of;
    - Installation of two additional injection wells for the existing ozone generator; and
    - Installation of an additional ozone generator and up to five new dual-nested injection wells on the southeast corner of 7th Street and Missouri Avenue; and
- Continued operational monitoring to assess remedial progress and system performance.

An ozone generator installed in the subterranean parking lot of the Missouri Falls building has been operating at the Site as part of the Ozone Pilot Study (Subsection 2.3 and Appendix A), and it will continue to operate and inject ozone at the two existing nested well locations (7M-SW-01 and 7M-SW-02) located at the source area (Figure 4). For the Reference Remedy, the current source area ozone sparge system will be expanded with two additional injection wells, installed on the north side of the Missouri Falls property and tied into the existing system. The two additional wells are proposed to be located within the planter areas south of East Missouri Avenue and west of North 7th Street (Figure 4).

One additional ozone generator with an associated injection well network (Figure 4) is also proposed downgradient of the source area. The ozone generator is proposed to be installed at the southeast corner of the 7th & Missouri intersection, connected to up to five new dual-nested injection wells installed on private property south of East Missouri Avenue.

Based on the results of the ozone pilot study, approximately 5.5 lbs per day of ozone would continue to be injected at the source area, whereas approximately 10 lbs per day of ozone would be injected downgradient of the Site. Ozone sparge operations are expected to last a period of up to 3 years, with 3 additional years of post-ozone injection MNA (6 years of monitoring total were assumed for this FS).

The conceptual injection well configuration would intercept the anticipated path of the plume along the ambient gradient towards the north-northeast. This remedy would treat groundwater at the source area, cut-off the plume near the source, and mitigate migration of PCE further downgradient, ultimately treating the high-concentration impacts near the source, with natural attenuation mitigating the dilute impacts furthest downgradient.

5.1.1.3 *Reference Remedy MNA*

Due to the large area covered by the dilute plume, the application of MNA is appropriate for the peripheral portions of the plume where the COCs may be reasonably anticipated to attenuate by natural processes (e.g., dilution and dispersion) downgradient of the ozone sparge system. As a result, the ozone sparge system does not need to be designed to capture the entire footprint of the plume as it presently exists. Due to the aerobic conditions in the groundwater, MNA processes such as dilution, dispersion, volatilization, and sorption are likely to be the dominant mechanisms for concentration reductions in the VOC plume over time, as opposed to biological reductive dechlorination.

5.1.2 Monitoring

Implementation of monitoring for the Reference Remedy will comprise the following:

- Quarterly soil vapor sampling from on-site soil vapor probes and SVE wells;
- Installation of two new groundwater monitoring wells (MW-301 and 302) cross-gradient from the source area and east of MW-106;
- Continued semiannual sampling of the groundwater monitor well network to evaluate plume stability, VOC concentrations, and natural attenuation parameters; and
- Continued semiannual groundwater elevation measurements to evaluate flow direction and hydraulic gradient.

Semiannual groundwater monitoring of 22 wells will be continued for up to six years for the current monitor well network (three years during active remediation, and three additional years of monitoring post remediation). If the PCE plume appears to be stable, the groundwater monitoring frequency may be reduced to annual and the number of monitor wells may be decreased.

As part of the Reference Remedy, two additional monitoring wells (MW-301 and MW-302) will be installed east of MW-106 (Figure 4) to monitor the upper and middle portion of the UAU in this area. One sentinel monitoring well (MW-210) installed between the toe of the PCE plume and COP Well 57, will provide advanced warning for potential groundwater contamination reaching COP Well 57, so that contingencies (Subsection 5.1.3) may be considered to protect the nearby groundwater supply.

Based on the most recent Site-wide groundwater data collected in September 2017 (Pinyon, 2018), the groundwater monitor well network for the Reference Remedy would include:

- Upgradient: MW-107;
- Source area: MW-201;
- Downgradient: MW-104, MW-105, MW-106, MW-108, MW-202s/m/d, MW-204, MW-205, MW-207, MW-208, MW-209, COP Well 57, and one sentinel monitoring well near COP Well 57 (MW-210); and
- Cross-gradient: existing wells MW-101, MW-102, MW-103, MW-203, and proposed monitoring wells MW-301 and MW-302.

These wells define the current downgradient and cross-gradient PCE impacts exceeding 5 µg/L.

5.1.3 Contingencies

As mentioned in Section 5.1.1.1, the performance and capacity of the SVE system will be evaluated as part of the PRAP. However, the following contingency remedial measures have been identified to address potential uncertainty in the achievement of the ROs:

<u>Source Area Remediation Contingencies</u>

- If during SVE monitoring or post-SVE soil vapor probe confirmation sampling portions of the source area do not appear to be fully affected by the extraction process, one additional SVE well may be installed to extend coverage of the SVE system, along with O&M for one additional year;
- Additional O&M of the SVE system if rebound in soil-gas occurs after the system has been shut-down (assumed one year);
- If remediation of the vadose zone cannot reach residential SRLs, but non-residential SRLs are met, a DEUR may be established for Site; and

- An SVE system consisting of a 2-horsepower (HP) blower and VGAC vessels may be considered to reduce the potential for the accumulation of ozone in the subsurface below Circle K infrastructure (e.g. USTs, conveyance piping, etc.). This contingency assumes that the SVE system will include the blower, conveyance piping, and up to two proposed SVE wells.

Dissolved Plume Remediation Contingencies

- If the PCE concentrations continue to be greater than the AWQS after six years of monitoring, then additional groundwater monitoring will be performed (a contingency of one additional year is assumed for this FS);
- If persistent elevated PCE concentrations are measured further downgradient from the source area, then the source area ozone sparge system will be moved to an area north of the Cinema Park Village Shopping Center located approximately 1,000 ft north of East Missouri Avenue and east of North 7th Street. This ozone sparge system will be connected to five new additional nested injection wells, and it will be operated for an assumed period of one year;
- If PCE concentrations continue to be greater than the AWQS in the areas surrounding either COP Well 57 and/or SRP Well 14.0E-9.6N, additional ozone sparge injection wells and a mobile ozone sparge system may be installed in the vicinity of these extraction wells to restore the surrounding groundwater quality; and
- If either COP or SRP resume pumping from Well 57 and/or Well 14.0E-9.6N before PCE concentrations are below the AWQS, then wellhead treatment using LGAC or modification of the production well (e.g., sleeving) may be performed to allow groundwater usage. Wellhead treatment with LGAC would be installed at a production well if monitoring results indicate PCE concentrations are greater than the AWQS and COP or SRP requires drinking water quality out of the production well. For the Reference Remedy, additional coordination with COP and/or SRP would be required for the design and access location of the wellhead treatment system or modification of the production well.

5.1.4 Permits and Agreements

Multiple permits and/or agreements would be necessary to authorize installation and operation of the Reference Remedy, including:

- Operation of the SVE system will require continued compliance with the Maricopa County Air Quality Department (MCAQD) air discharge permit for the

SVE system operation, along with quarterly SVE performance testing and reporting. O&M measurements will be used to assess system performance;

- Pre-construction notifications (i.e., ADWR Notice of Intent to Drill) and post-construction reporting (Driller's Reports) would be prepared for new groundwater injection/monitor wells that are installed;
- Well construction and/or modification work must be conducted by an ADWR-licensed driller. New wells must comply with ADWR standards found in A.R.S. §45-594, 45-595, 45-596 and 45-600 of the Groundwater Code;
- General construction permits and right-of-way construction permits would be required from the COP for the installation of a new injection system and associated conveyance piping. This would require preparation and submittal of design plans and specifications (i.e., civil, plumbing, mechanical, electrical) to COP; and
- Access agreements with private land owners and SRP would be required if the injection system components and/or associated conveyance piping needs to be located on private property.

5.2 More Aggressive Alternative Remedy

The following subsections present the More Aggressive Alternative Remedy that has been developed for the Site. The remedial strategies for the More Aggressive Alternative Remedy are:

- Source control to eliminate or mitigate a continuing source of contamination;
- Plume remediation to achieve water quality standards for COCs in waters of the state throughout the Site;
- Controlled migration to control the direction or rate of migration, but not necessarily to contain migration of contaminants;
- Monitoring to observe and evaluate the contamination at the Site through the collection of data; and
- Contingency remedial measures to address potential uncertainties.

The More Aggressive Alternative Remedy includes the measures listed in the Reference Remedy, plus additional remedial strategies and contingencies.

5.2.1 Source Control, Plume Remediation, and Controlled Migration

Vadose zone remedial measures (SVE system operation) for the More Aggressive Alternative Remedy include:

- Upgrade of the current SVE system from 75 cfm to 500 cfm; and
- Installation of five SVE wells, in addition to the eight existing SVE wells.

As part of this remedy, the SVE well network will be expanded to 13 wells: including eight existing wells and five additional wells. The SVE blower will be upgraded from a 75 cfm unit to a 500 cfm capacity unit. This upgraded SVE system is assumed to expand the footprint of the remediation area and remediate the vadose zone within a shorter period of time than the Reference or Less Aggressive remedies.

The dissolved plume remedial measures for the More Aggressive Alternative Remedy include:

- Continued operation of the source area ozone sparge system comprising of injection at the two existing source area injection wells (7M-SW-01 and 7M-SW-02) for a period of 3 years;
- Installation and operation of a GETS consisting of two groundwater extraction wells and an LGAC treatment system; and
- MNA for dilute portions of the dissolved plume.

The GETS would include two groundwater extraction wells (south of Missouri Avenue with one well east and west of 7th Street) and the installation of subsurface groundwater conveyance piping north to a designated treatment plant area in proximity to the existing SRP Well 14E-9.6N compound (Figure 7). The anticipated flow rate of groundwater extraction is 100 gallons per minute (gpm) from each well. The wells are sited to capture the highest-concentration portion of the plume, given the physical and logistical limitations for placement of wells in a developed area

The treatment system receiving extracted water would include two bag filtration units and two LGAC vessels operating in series to accommodate an average combined extraction flow rate of 200 gpm. Treated water would tie into the existing SRP distribution system.

By controlling the migration of the highest-concentration portion of the plume, the More Aggressive Remedy would reduce the mass of COCs within the regional groundwater, which would contribute to the closure of the Site by implementation of MNA for the

remainder of the plume. The operational period of the GETS is assumed to be 10 years based on the nature of the laterally dispersed (greater than approximately 0.5 square miles) and dilute plume of PCE, as observed in September 2017 (Pinyon, 2018).

5.2.2 Monitoring

Monitoring measures for the More Aggressive Alternative Remedy would be the same as stated for the Reference Remedy (Subsection 5.1.2).

5.2.3 Contingencies

Contingencies for the More Aggressive Alternative Remedy include following:

Source Area Remediation Contingencies

- One additional SVE well may be installed to extend coverage of the SVE system if portions of the source area do not appear to be fully affected by the extraction process during SVE monitoring or post-SVE soil vapor probe confirmation sampling;
- Additional O&M of the SVE system may be performed if rebound in soil-gas occurs after the system has been shut-down (assumed one year);
- If remediation of the vadose zone cannot reach residential SRLs, but non-residential SRLs are met, a DEUR may be established for the Site; and
- An SVE system consisting of a 2-HP blower and VGAC vessels may be considered to reduce the potential for the accumulation of ozone in the subsurface Circle K infrastructure (e.g. USTs, conveyance piping, etc.). This contingency assumes that the SVE system will include a blower, conveyance piping, and up to two proposed SVE wells.

Dissolved Plume Remediation Contingencies

- One additional groundwater extraction well may be installed to supplement the GETS;
- If PCE concentrations continue to be greater than the AWQS in the areas surrounding either COP Well 57 and/or SRP Well 14.0E-9.6N, additional ozone sparge injection wells and a mobile ozone sparge generator may be installed in the vicinity of these extraction wells to restore the surrounding groundwater quality;

- If either COP or SRP resume pumping from Well 57 and/or Well 14.0E-9.6N before PCE concentrations are below AWQS, then wellhead treatment using LGAC or modification of the production well (e.g., sleeving) may be performed to allow groundwater usage; and
- Semiannual groundwater monitoring will be continued for up to 10 additional years if operation of the GETS does not reduce PCE concentrations below the AWQS of 5 µg/L. If the PCE plume appears to be stable, the groundwater monitoring frequency may be reduced to annual and the number of monitor wells may be decreased.

5.2.4 Permits and Agreements

The same permit requirements as those specified in for the Reference Remedy (Subsection 5.1.4) would be required for the More Aggressive Alternative Remedy. In addition, a Poor-Quality Groundwater Withdrawal Permit (PQGWP) from ADWR may be required for the GETS system, along with a sanitary sewer waste discharge permit from COP and/or a discharge agreement with SRP.

5.3 Less Aggressive Alternative Remedy

The following subsections present the Less Aggressive Alternative Remedy that has been developed for the source vadose zone and groundwater plume. The remedial strategies for the Less Aggressive Alternative Remedy are:

- Source control to eliminate or mitigate a continuing source of contamination;
-
- Monitoring to observe and evaluate the contamination at the Site through the collection of data; and
- Contingency remedial measures to address potential uncertainties.

The Less Aggressive Alternative Remedy includes a subset of the measures listed in the Reference Remedy.

5.3.1 Source Control and Plume Remediation

Vadose zone remedial measures (SVE system operation) for the Less Aggressive Alternative Remedy are the same as for the Reference Remedy (Subsection 5.1.1.1) and are changed to operate for a period of two years instead of three years, or until the vadose zone is either remediated or reaches a non-residential SRLs. Source area groundwater

treatment will consist of the current pilot ozone system only with the two current injection wells for a period of two years. The dissolved plume remedial measures for the Less Aggressive Alternative Remedy are limited to MNA with the contingency of wellhead treatment.

5.3.2 Monitoring

Monitoring measures for the Less Aggressive Alternative Remedy are the same as for the Reference Remedy (Subsection 5.1.1.2) and are not changed. For cost evaluation purposes, it was assumed that monitoring would be on a semiannual basis for 30 years. However, as part of this remedy, a groundwater flow and transport model and a natural attenuation model would be completed to estimate the extent of PCE over time. The groundwater model will be updated on a 5-year basis to monitor the timeline for PCE to naturally attenuate to concentrations below AWQS.

5.3.3 Contingencies

Contingencies for the Less Aggressive Alternative Remedy are limited to the following:

<u>Source Area Remediation Contingencies</u>

- If during SVE monitoring or post-SVE soil vapor probe confirmation sampling portions of the source area do not appear to be fully affected by the extraction process, one additional SVE well may be installed to extend coverage of the SVE system;
- Additional O&M of the SVE system (assumed one year) may be performed if rebound in soil-gas occurs after the system has been shut-down;
- If remediation of the vadose zone cannot reach residential SRLs, but non-residential SRLs are met, a DEUR may be established for Site; and
- A soil vapor extraction system consisting of a 2-HP blower and VGAC vessels may be considered to reduce the potential for accumulation of ozone in the Circle K subsurface infrastructure (e.g. USTs, conveyance piping, etc.). This contingency assumes that the SVE system will include a blower, conveyance piping, and up to two proposed SVE wells.

<u>Dissolved Plume Remediation Contingencies</u>

- If the PCE concentrations in groundwater continue to be greater than the AWQS, for the 30 years period assumed, then an additional 10 years, or until concentrations are less than the AWQS, of groundwater monitoring will be

performed. The groundwater model will continue to be updated on a 5-year basis to monitor the timeline for PCE concentrations to naturally attenuate to below the AWQS.

- If PCE concentrations continue to be greater than the AWQS in the areas surrounding either COP Well 57 and/or SRP Well 14.0E-9.6N, additional ozone sparge injection wells and a mobile ozone sparge generator can be installed in the vicinity of these extraction wells to restore the surrounding groundwater quality.
- Similar to the Reference Remedy, if either COP or SRP resume pumping from Well 57 and/or Well 14.0E-9.6N before PCE concentrations are below the AWQS, then wellhead treatment using LGAC or modification of the production well (e.g., sleeving) may be performed to allow groundwater usage. Additional coordination with COP and/or SRP would be required for the design and access location of the wellhead treatment system.
- Two additional groundwater monitoring wells may be considered for complete delineation (lateral and vertical) of the impacted groundwater due to a shift in groundwater flow direction, and/or to replace wells that may become unusable due to changing groundwater elevation, fouling, or other conditions.

5.3.4 Permits and Agreements

Permits and agreements for the Less Aggressive Alternative Remedy would be the same as for the Reference Remedy (Subsection 5.1.4) and are not changed as they relate to installation of additional monitoring wells.

6. COMPARISON OF REMEDIES

The following section compares the Reference Remedy and alternative remedies to criteria described in A.A.C R18-16-407H.3.

6.1 Comparison Criteria

In accordance with A.A.C. R18-16-407E.3, this FS has been completed to identify a Reference Remedy and alternative remedies that are potentially capable of achieving ROs, and to evaluate the remedies based on the comparison criteria in order to select a remedy that complies with A.R.S. §49-282.06. A.A.C. R18-16-407H specifies that practicability, risks, costs, and benefits are the primary remedy evaluation criteria.

Practicability includes the assessment of feasibility, short- and long-term effectiveness, and the reliability of the remedial alternative. The risk criteria include assessment of the overall protectiveness of public health and the environment in terms of fate and transport of the COCs, current and future land and water uses, exposure pathways and durations of potential exposure, changes in risk during remediation, and residual risk at the end of remediation. The cost analysis includes capital, operating, maintenance, and life cycle costs. Evaluation of benefits includes the assessment of lowered risk, reduced COC concentration or volume, decrease in liability, and preservation of existing and future uses.

Table 2 presents an evaluation of the remedies for VOCs impacts in the vadose zone and groundwater with respect to the comparison criteria. The following subsections describe how the remedies perform against these criteria.

For cost analyses, the estimates are conceptual and assumed to have similar margins of error between –30% and +50% (i.e., the actual costs are expected to be between 30% less than and 50% more than the estimated costs).

6.1.1 Reference Remedy

The practicability, risk, cost, and benefits for both the vadose zone and groundwater Reference Remedies are discussed in the following subsections.

6.1.1.1 *Practicability*

The vadose zone and groundwater Reference Remedies involve technologies that are already operating at the Site (SVE and ozone sparge), and are known and proven reliable remediation technologies. For vadose zone VOC impacts, the current SVE system

infrastructure will be reevaluated and likely upgraded to a 300 cfm system for continued operation, and as such it is considered highly practicable. SVE is a known effective and reliable remedy for VOC impacts in the vadose zone.

For the groundwater Reference Remedy, ozone injection is a well-established technology that can be highly effective in the short-term. Ozone generators are generally compact equipment, requiring minimal storage requirements. Although initial capital improvements may be high in order to install injection wells and the associated piping, the effectiveness of ozone at remediating groundwater VOC plumes results in a significant decrease in costs and risk associated with MNA over a long period of time.

6.1.1.2 *Protectiveness (Risk)*

The vadose zone Reference Remedy is protective, as it will increase and continue to provide source control through removal of VOC mass in the vadose zone. The Reference Remedy will mitigate the risk that residual PCE in the vadose zone could be a long-term source of groundwater contamination. The vadose zone remedy reduces the potential exposure pathways and is consistent with current and future industrial land use.

The groundwater Reference Remedy is protective in that it provides active remediation of PCE impacts at and near the source area, and it will detach the source area from the dilute downgradient plume, which will ultimately naturally attenuate further downgradient. Additionally, the Reference Remedy provides continued monitoring of the dissolved-phase contaminant plume and nearby SRP production wells with the contingency of wellhead treatment.

6.1.1.3 *Cost*

The cost summary for the Reference Remedy is presented in Table 3, and detailed costs are presented in Appendix D. The Reference Remedy cost estimates include O&M and monitoring of the SVE system in the source area vadose zone. Additionally, this remedy will include the ozone sparge system at the source area and two downgradient segments. The following assumptions were used for costing purposes:

- The SVE system will be upgraded to a 300 cfm system and operated for a period of up to three years;
- A total of two additional injection wells will be added to the source area ozone sparge system. The two wells will be installed west of North 7th Street and south of East Missouri Avenues, and tied into the existing ozone sparge system installed

at the Missouri Falls property. The source area ozone system would be operated for a period of 3 years;

- A total of five additional injection wells will be installed along East Missouri Avenue. These wells will be located east of North 7th Street and south of East Missouri Avenue, and tied into an ozone sparge system contained in a Conex box (or similar) in the parking lot at the southeast corner of the 7th Street & Missouri intersection, which will be operated for a period of 3 years; and
- A total of 22 groundwater wells will be used for monitoring of the plume.

From Table 3, there are estimated capital costs of $25K for SVE system upgrades. Approximately $0.9 million would be required for ozone sparge system installation capital costs. Total estimated O&M costs (excluding contingencies) are approximately $0.9 million (accounting for a net present value discounted at 5%), based on the estimation that SVE O&M would be conducted for 3 years and groundwater monitoring activities would be conducted for 6 years after the capital improvements are installed (3 years during ozone sparging and up to 3 years post-injection). Total estimated contingency costs are approximately $4.4 million based on the assumptions included in Appendix D. Contingency costs conservatively assume the following:

- One additional year of SVE operation;
- A DEUR for the source area vadose zone if a residential SRLs cannot be reached, but soil-gas results indicate soils are below non-residential SRLs;
- Installation of an off-site SVE system at Circle K and O&M for one year;
- O&M of the ozone sparge system and groundwater monitoring for one additional year;
- Installation of up to five additional downgradient ozone-sparge injection wells and ozone injection for up to one year;
- Installation of two additional ozone sparge injection wells near COP Well 57 and SRP well 14.0E-9.6N; and
- Wellhead treatment at SRP well 14.0E-9.6N in lieu of extraction well modification (e.g. sleeves) with 20 years of O&M costs.

The total estimated cost for the Reference Remedy including contingency is approximately $6.2 million, with a margin of error between $4.3 million (-30%) and $9.3 million (+50%).

6.1.1.4 *Benefits*

The continued operation of an SVE system with a larger blower unit in the Reference Remedy is beneficial since it will improve the system capacity and continue to remove VOC mass in the vadose zone, it will mitigate the potential for residual PCE to pose a vapor intrusion risk to site occupants and as a long-term source of groundwater contamination, and it will reduce the time to complete remediation and ultimately achieve the ROs.

The groundwater Reference Remedy is considered beneficial by providing an immediate decrease of PCE concentrations at the source area and the dilute downgradient plume, and continued monitoring of the PCE plume as a means of evaluating the effectiveness of remediation.

6.1.2 More Aggressive Alternative Remedy

The practicability, risk, cost, and benefits for implementation of the More Aggressive Alternative Remedy are discussed in the following subsections.

6.1.2.1 *Practicability*

The More Aggressive Alternative Remedy in the vadose zone involves the upgrade and continued operation of the SVE system. The SVE system will be upgraded with a 500 cfm unit and 5 additional SVE wells, greatly expanding its capacity to remove VOCs from the vadose zone. The SVE system is highly practicable, and since the start of operations, has proven to be effective at source area VOC mass removal. SVE is an effective and reliable remedy for remediation of VOC impacts in the vadose zone.

For the groundwater More Aggressive Alternative Remedy, continuation of the existing source area ozone sparge system as implemented in the pilot study for a period of three years, groundwater extraction and treatment, and MNA monitoring are well-established technologies that can be effective in the short- and long-term. The technologies are feasible, although the installation of two GETS extraction wells and a treatment system may present challenges to implementation. For example, if the ideal locations of the extraction wells and the treatment system are on private property, the property owners may be averse to allowing construction of these items on their property and the long-term access that would be required for their monitoring and maintenance. Because the system would be designed to pump water to a GETS system located within the SRP compound, street closures in a high-traffic urban setting will be necessary for trenching of the conveyance system. Both private and public utilities and infrastructure would need to be

avoided during siting and installation of the groundwater extraction wells and the associated conveyance piping. Additionally, the practicability of pumping into the SRP system during potential active pumping from SRP Well 14E-9.6N needs to be evaluated.

6.1.2.2 *Protectiveness (Risk)*

The vadose zone More Aggressive Alternative Remedy is highly protective, as the remedy increases the capacity of the SVE system, it will shorten the amount of time needed to remove VOC mass from the subsurface, and it will mitigate the potential for residual PCE in the vadose zone to act as a long-term source of groundwater contamination. The remedy reduces exposure pathways and is consistent with current and future land use.

The groundwater More Aggressive Alternative Remedy is highly protective by directly treating contaminated groundwater. Continued groundwater monitoring of portions of the plume not addressed by groundwater treatment is protective in that it provides continued monitoring of the dissolved-phase contaminant plume and the nearby SRP and COP production wells with the contingency of wellhead treatment.

6.1.2.3 *Cost*

The cost summary of the More Aggressive Alternative Remedy is presented in Table 3, and itemized costs are presented in Appendix D. The More Aggressive Alternative Remedy costs include the upgrade and operation of the SVE system; installation, O&M and monitoring of a GETS; and continued operation of the existing source area ozone sparge system installed as part of a pilot test. The following assumptions were used for costing purposes:

- The SVE system would be upgraded to 500 cfm capacity, five additional SVE wells will be added to the system, and the SVE will be operated for a period of up to 3 years;
- The existing source area ozone sparge system would be operated for a period of 3 years;
- Two extraction wells will be installed downgradient of the source area;
- Permitting and utility clearance would be required for installation of the two extraction GETS wells and conveyance pipeline;
- The groundwater conveyance piping for the GETS would be single-walled high density polyethylene installed via trenching;

- Trench spoils (native soil) would be used to backfill above the pipes;
- The new treatment system would include a target extraction rate of approximately 200 gpm and include a concrete pad with a secondary containment berm, one sump pump, filtration, two 6,000-pound LGAC vessels, and a chain-link fence for security purposes; and
- A total of 22 groundwater wells would be used for MNA.

The estimated capital costs for the vadose zone remedy are $75K (excluding contingencies). Approximately $1.1 million are estimated for the GETS installation. Total estimated O&M costs (excluding contingencies) are approximately $2.1 million (accounting for a net present value discounted at 5%), based on the estimation that SVE O&M would be conducted 3 years, source area ozone sparge for up to 3 years, GETS with up to 10 years of O&M, and groundwater monitoring activities would conducted for 10 years after the capital improvements are installed. The costs for the More Aggressive Alternative Remedy are significantly higher due to the installation and operation of a GETs.

Total estimated contingency costs are approximately $4.9 million based on the assumptions included in Appendix D. Contingency costs conservatively assume, installation of one additional SVE well with capital improvements, one additional year of SVE operation, a DEUR for source area vadose zone if residential screening levels cannot be achieved, installation of an off-site SVE system at Circle K and O&M for one year, 10 additional years of MNA for groundwater, installation of one additional extraction well with necessary GETS upgrades, installation of two additional ozone sparge injection wells near COP Well 57 and SRP well 14.0E-9.6N, and wellhead treatment in lieu of extraction well modification (e.g. sleeves) with 20 years of O&M costs. The total cost for the More Aggressive Remedy including contingency is approximately $8.2 million, with a margin of error between $5.7 million (-30%) and $12.3 million (+50%).

6.1.2.4 *Benefits*

Operation of the SVE system is beneficial since it will remove VOC mass in the vadose zone at a faster rate than the Reference and Less Aggressive Remedies and mitigate the continued migration of VOC mass into and within groundwater. The GETS, ozone sparge system, and groundwater monitoring are considered beneficial by providing treatment of the dissolved-phase plume and monitoring as a means for evaluating the effectiveness of remediation. Continued ozone injection at the two source area nested injection wells will further decrease dissolved VOC concentrations at the source area. Semiannual

groundwater monitoring would also provide a means for evaluating the effectiveness of the remediation.

6.1.3 Less Aggressive Alternative Remedy

The practicability, risk, cost, and benefits for both the vadose zone and groundwater Less Aggressive Alternative Remedies are discussed in the following subsections.

6.1.3.1 *Practicability (Risk)*

Similar to the Reference Remedy, the vadose zone Less Aggressive Alternative Remedy involves the operation of the SVE system with an upgraded 300 cfm unit, which would be very feasible to implement. However, the system is assumed to be operated for a period of two years, instead of three in the Reference Remedy. SVE is an effective and reliable remedy for remediation of VOC impacts in the vadose zone.

The groundwater Less Aggressive Alternative Remedy consists of continuation of the existing source area ozone sparge system, as implemented in the pilot study. Ozone sparge for this remedy is reduced to a period of two years instead of three years in the Reference Remedy. This remedy also includes MNA of the existing groundwater well network on a semiannual basis. Continuation of the ozone sparge system is feasible as it would not require any additional capital improvements. MNA is a well-established technology that can be highly effective in the long-term. While the groundwater conditions are not conducive to reductive dechlorination, monitoring for abiotic MNA processes is feasible. Although MNA including groundwater monitoring at the frequency specified is considered moderately reliable, additional groundwater well monitoring, and/or monitoring wells, may be required if the extent of the plume exceeding AWQS increases beyond its present footprint.

6.1.3.2 *Protectiveness (Risk)*

The vadose zone Less Aggressive Alternative Remedy is protective, as the remedy removes VOC mass from the subsurface and will mitigate the potential for residual PCE in the vadose zone to act as a long-term source of groundwater contamination. The reduced time of SVE operation from that of the Reference Remedy, increases the risk of only remediating the Site to non-residential SRLs, resulting in the need for a DEUR. However, the remedy is expected to reduce exposure pathways and is consistent with current and future land use.

The groundwater Less Aggressive Alternative Remedy is protective in that it provides for continued operation of the limited source area ozone sparge system as designed as part of the pilot study, and continued monitoring of the dissolved-phase contaminant plume and nearby SRP production wells. The semiannual sampling frequency and the well network consisting of the source area and downgradient plume would cost effectively allow for the continued monitoring of the PCE plume. The monitoring network would continue to delineate the portion of the PCE plume exceeding the AWQSs of 5 µg/L. However, because only limited source area ozone sparge would be implemented, the transport (advection, dispersion, and diffusion) of the dilute plume would likely continue, and potentially result in the expansion of the PCE plume. Additionally, future expansion to the monitor well network may be needed should an exceedance of the AWQS be measured in downgradient and/or cross-gradient wells due to continued dispersion of the dilute plume downgradient from the source area, along with implementation of the wellhead treatment contingency for the SRP production well 14.0E-9.6N.

6.1.3.3 *Cost*

The cost summary of the Less Aggressive Alternative Remedy is presented in Table 3, and itemized costs are presented in Appendix D. The Less Aggressive Alternative Remedy costs include the upgrade and continued operation of the SVE system, the limited source area ozone sparge system and groundwater MNA. The following assumptions were used for costing purposes:

- The SVE system would be upgraded to 300 cfm capacity and continued operation for a period of up to 2 years;
- Source area ozone sparge system injection for two years; and
- A total of 22 groundwater wells would be used for MNA for a period of 30 years.

The estimated capital costs for the vadose zone remedy are $25K (excluding contingencies).. Approximately $0.1 million are estimated for installation of a sentinel groundwater monitoring well. Total estimated O&M costs (excluding contingencies) are approximately $1.7 million (accounting for a net present value discounted at 5%), based on the estimation that SVE O&M would be conducted for 3 years and activities associated with MNA for groundwater would be conducted for 30 years. Total estimated contingency costs are approximately $4.8 million based on the assumptions included in Appendix D.

Contingency costs conservatively assume installation of one additional SVE well, one additional year of SVE operation, installation of an off-site SVE system and O&M for

one year, a DEUR for source area vadose zone if residential screening levels cannot be achieved, installation of two ozone sparge injection wells near COP Well 57 and SRP well 14.0E-9.6N, 10 additional years of MNA for groundwater, installation of two additional monitoring wells in the event of a shift of the groundwater plume, and wellhead treatment in lieu of extraction well modification (e.g. sleeves) with 20 years of O&M costs. The total cost for the Less Aggressive Remedy including contingency is approximately $6.8 million, with a margin of error between $4.8 million (-30%) and $10.2 million (+50%).

6.1.3.4 *Benefits*

Operation of the SVE system is beneficial since it will remove VOC mass in the vadose zone at a higher rate than that designed as part of the ERA, and it will mitigate the continued migration of VOC mass into and within groundwater. However, the SVE system reduced years of operation may only be able to achieve non-residential screening levels, resulting in a DEUR for the site source area. The groundwater Less Aggressive Alternative Remedy is considered beneficial by providing continued limited remediation of groundwater at the source area by ozone sparging, and monitoring of the dissolved-phase plume as a means for evaluating the effectiveness of remediation of the monitor well network. Additionally, MNA of groundwater would not affect neighboring properties with the installation of the injection well networks proposed in the Reference Remedy and the More Aggressive Alternate Remedy.

6.2 Comparison of Remedies

Comparison of the remedies is required under the A.A.C. R18-16-407(H). Table 4 presents a ranking of the comparison criteria for the remedies. The remedies were ranked with scores ranging from zero to five, with five indicating the most relative benefit and zero indicating the least relative or no benefit. The following subsections describe the practicability, risk, cost, and benefits comparison for remedies.

6.2.1 Practicability

There are four considerations for practicability as follows:

- Feasibility involves the ability to put the remedy in place;
- Short-term effectiveness represents how much the remedy removes the COCs and limits the potential for exposure in the short-term;

- Long-term effectiveness represents how much the remedy removes the COCs and limits the potential for exposure in the long-term; and
- Reliability involves whether the technologies comprising the alternative are expected to perform reliably.

For the vadose zone, the three remedies are proposed as follows:

- Reference Remedy – Upgrade of the existing SVE system with a 300 cfm unit, maintaining the existing eight SVE wells, and up to three years of operation;
- More Aggressive Alternative Remedy – Upgrade of the existing SVE system with a 500 cfm unit, five additional SVE wells, and up to three years of operation; and
- Les Aggressive Alternative Remedy – Upgrade of the existing SVE system with a 300 cfm unit, maintaining the existing eight SVE wells, and up to two years of operation;

The remedies are considered to be technically and operationally feasible, as it relies primarily on an SVE system using existing infrastructure. The Less Aggressive Alternative Remedy scored slightly lower as the reduced years of remediation may only achieve a non-residential screening levels for the source area vadose zone, resulting in a DEUR.

For groundwater, the Reference Remedy consists of an expanded source-area ozone sparging system (with two additional wells), and expansion of the ozone sparge well network downgradient of the source area with an additional segment dissecting the plume along East Missouri Avenue. The More Aggressive Alternative Remedy consists of continued source-area ozone sparging with no additional injection wells, and installation of a separate GETS. Both the Reference Remedy and More Aggressive Alternative Remedy scored high in practicability (50 and 46, respectively), however the feasibility of the More Aggressive Alternative Remedy is considered challenging, since it would require installation and monitoring of a separate GETS system, and it would likely result in substantial impact to the public right-of-way. Both remedies are considered effective and reliable in the short and long term. The Less Aggressive Alternative Remedy ranked lowest (total score of 4042 It is moderately reliable, as an expansion to the monitor well network may be needed should an exceedance of the AWQS be measured further downgradient from wells with current concentrations below AWQS standards. Additionally, the Less Aggressive Alternative Remedy scored low in short to long term effectiveness, since MNA of the plume with limited active remediation using only the

ozone sparge system at the two injection wells installed as part of the pilot study may not be effective at reducing PCE concentration in the entire source area, and would result in a significantly extended monitoring period.

6.2.2 Risk

The VOC vadose zone remedies are protective in the three proposed remedies, since the three remedies propose continued operation of an expanded SVE system. However, the reduced years of remediation in the Less Aggressive Alternative Remedy may only achieve non-residential SRLs for the source area vadose zone, resulting in a DEUR.

The groundwater More Aggressive Alternative Remedy is slightly more protective than the Reference Remedy due to the installation and operation of a GETS, though each of the groundwater remedies includes the contingency of SRP wellhead treatment of contaminated groundwater. The groundwater Less Aggressive Alternative Remedy ranked lowest for protectiveness since it involves no active groundwater remediation.

6.2.3 Cost

The three remedies have varying capital and O&M costs. Including the capital, O&M, and contingency costs, it is estimated that the Less Aggressive Alternative Remedy would have a moderate cost ($6.8 million), while the Reference Remedy cost would be the least ($6.2 million), and the More Aggressive Alternative Remedy would cost the most ($8.2 million).

6.2.4 Benefits

The More Aggressive Alternative Remedy for the vadose zone scored slightly higher than the Reference Remedy as it is expected to remediate the source area in a shorter amount of time, but both remedies for the vadose zone are considered equally protective. The Less Aggressive Alternative Remedy for the vadose zone scored lowest, since the shortest remediation duration may only result in a non-residential cleanup scenario, resulting in a DEUR.

The groundwater Reference Remedy and More Aggressive Alternative Remedy had similar benefits since they both include active groundwater remediation systems; however, the More Aggressive Alternative Remedy scored moderate, since it may be impractical to install, operate and maintain two separate groundwater remediation systems (e.g. ozone sparge and GETS). The Less Aggressive Alternative Remedy, implementing limited ozone sparging as designed during the pilot study at only two

source area wells, and MNA with the existing monitor well network, scored lowest since it would result in the potential spread of the plume further downgradient as more PCE mass dissolves into groundwater and further degrades the aquifer, and because the period of MNA monitoring would be expected to last up to 30 years or longer.

7. PROPOSED REMEDY

The following presents the proposed remedy for both the vadose zone and groundwater, as well as the bases for selecting the proposed remedy. Cost information for the remedial alternatives is included in Appendix D.

7.1 Process and Reason for Selection

The Reference Remedy is recommended as the proposed remedies at the Site for both the vadose zone and groundwater. This recommendation is considered to be the recommended combination of remedial effectiveness, practicably, cost, and benefit for restoration and use of land and groundwater resources. Since the proposed vadose zone remedy is the same for the three alternatives, the recommended remedy is driven by the ranking of the groundwater alternatives. The Reference Remedy for VOCs groundwater scored the highest (Table 4) when ranking in accordance with the comparison criteria specified in A.A.C R18-16-407H.3.e (Section 6).

7.2 Achievement of Remedial Objectives

The Reference Remedy for PCE in the vadose zone and in groundwater achieve the ROs for the Site (Subsection 3.3.). Continued operation of the SVE system will provide source control for the vadose zone and will mitigate potential ongoing migration to groundwater. The groundwater Reference Remedy will provide active source area and dilute plume remediation by ozone sparging, which will result in a decreased number of years recommended for MNA of the PCE plume concentrations.

7.3 Achievement of Remedial Action Criteria Pursuant to A.R.S. §49-282.06

To meet the remedial action criteria listed in A.R.S. §49-282.06, it is recommended that the Reference Remedy for the vadose zone and groundwater be selected as the Final Remedy for the Site. Based on a comparison with the More Aggressive and Less Aggressive Alternative Remedies, the Reference Remedy will:

- Provide for protection of public health and welfare and the environment;
- Provide source area soil-gas remediation, decreased risk to site occupants, and mitigate further contribution of PCE from the vadose zone source area to groundwater;

- Provide a thorough and timely means for continued remediation and monitoring of the existing groundwater impacts, including evaluation of the progress of remediation over time;
- To the extent practicable, provide for the control, management, and cleanup of the COCs in the groundwater;
- Provide for the beneficial use of the groundwater resource by COP and SRP; and
- Be reasonable, cost-effective, and technically feasible.

7.4 Consistency with Water Management and Land Use Plans

The Reference Remedy for vadose zone and groundwater are consistent with water management plans and general land use plans.

7.5 Contingencies

For the vadose zone Reference Remedy, O&M measurements will be used to assess the SVE system performance and to provide feedback on optimization activities. If results from soil vapor confirmation sampling indicate that VOC concentrations are greater than Residential SRLs, minimum GPLs, or Site-specific soil vapor screening levels, the SVE system may be expanded (as described in the in Subsection 5.1.3) and/or operated for an additional time (one year assumed for FS costing). Additionally, if residential screening levels cannot be achieved, but non-residential SRLs are met, a DEUR may be filed for the Site source area.

For the groundwater Reference Remedy, the current ozone sparge system will be expanded and additional ozone sparge wells and additional ozone sparge system will be installed downgradient from the source area. Additionally, semiannual groundwater monitoring will be performed to assess the PCE plume stability and monitor decreasing VOC concentrations at the Site. After ozone sparging is completed, and if groundwater VOC concentrations are stable, the monitoring frequency may be reduced to annual for VOCs and/or the number of wells that are monitored may be decreased.

If SRP determines that the inactive water production well impacted by the PCE plume is to be recommissioned prior to completion of the PCE remediation, then wellhead treatment using LGAC or modification of the production well may be performed to allow for groundwater usage. The COP extraction well, currently near the toe and outside of the PCE plume, will continue to be monitored during Site remediation, and the proposed

contingencies will be applied to this well if current conditions change in the future. The hypothetical need for and cost of wellhead treatment or modification of a production well would be well-specific and may vary significantly depending on the well location and the timing of when well treatment or modifications may be needed. Although a cost estimate for wellhead treatment is provided in Appendix D, the actual cost for wellhead treatment would be further evaluated on a well specific basis, if the need arises. If PCE concentrations continue to be greater than the AWQS in the areas surrounding either COP Well 57 and/or SRP Well 14.0E-9.6N, additional ozone sparge injection wells and a mobile ozone sparge system can be installed in the vicinity of these extraction wells, in addition to wellhead treatment, to restore the surrounding groundwater quality.

For both the vadose zone and groundwater Reference Remedy, contingencies will be presented in further detail in the Proposed Remedial Action Plan (PRAP).

8. COMMUNITY INVOLVEMENT

ADEQ will issue a Notice to the Public announcing availability of FS Report on ADEQ's website at www.azdeq.gov. The notice may be mailed to the Public Mailing List for the site, water providers, the Community Advisory Board, and other interested parties.

9. REFERENCES

HGC, 2015. *Remedial Investigation Report, Cooper and Commerce WQARF Site, Gilbert, Arizona*. June 12

ITRC, 2005. *Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater, Second Edition.* Interstate Technology and Regulatory Cooperation Work Group, In Situ Chemical Oxidation Work Team. January.

Pinyon, 2018. *Remedial Investigation Report, North 7th Street and Missouri Avenue, Phoenix, Arizona*. November 21.

Pinyon, 2019a. *Field Investigation Summary for Groundwater Monitoring Well Installation, 7th Street and Missouri Avenue, Phoenix, Arizona.* February 8.

Pinyon, 2019b. *Field Investigation Summary for Site-wide Groundwater Sampling, 7th Street and Missouri Avenue, Phoenix, Arizona*. June 28

Pinyon, 2019c. *Fiscal Year 2019 Early Response Action Report, North 7th Street and East Missouri Avenue Phoenix, Arizona*. June 27

SiREM, 2019. *Laboratory Treatability Study to Assess Potential for In-Situ Chemical Oxidation of Chlorinated Volatile Organic Compounds, 7th and Missouri Site, Phoenix, Arizona*, 7 June.

TABLES

Table 1
Remediation Technology Screening Summary
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Technology	Retained	Reason for Retention or Elimination
No Action	No	The vadose zone soil would not be remediated, resulting in potential risk to site occupants, a continued source of chlorinated solvents to groundwater, and the dilute groundwater plume could potentially propagate further downgradient. As a result, the ROs for the Site would not be met and the alternative is not retained
Institutional Controls	Yes	Although institutional controls have been cost-effective means of managing impacts in place, they would not prevent continued source area releases to groundwater and protection of site occupants from potential vapor intrusion risks. However, in the event residential standards cannot be achieved for the Site vadose zone, a DEUR could to be implemented if non-residential standards are met.
Monitored Natural Attenuation (MNA)	Yes	Retained remedial technology (primarily for abiotic processes).
Soil Vapor Extraction (SVE)	Yes	Retained remedial technology that was implemented as part of the ESA; has been cost-effective at removing VOC mass from vadose zone.
Air Sparging	No	Not likely to be cost-effective or improve treatment due to low groundwater concentrations immediately downgradient of the plume, the large extent of the dilute plume, and residual VOC mass in fine grained intervals.
Groundwater Extraction & Treatment System (GETS)	Yes	Effectiveness for disperse dilute plume reduced but retained as effective for control of VOCs in groundwater and as potential wellhead treatment for contingency.

Abbreviations:
VOC – Volatile Organic Compounds

Table 1
Remediation Technology Screening Summary
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Enhanced Reductive Dechlorination (ERD)	Yes	Cost prohibitive for overall plume due to predominantly aerobic groundwater conditions, low VOC concentrations, and the size and depth of the plume; retained for potentially targeted treatment areas.
In Situ Chemical Reduction (ISCR)	No	Technically and economically infeasible due to thickness of impacted groundwater zone and the size and depth of the plume.
In Situ Chemical Oxidation (ISCO)	Yes	Cost prohibitive for overall plume due to relatively small radius of influences, low VOC concentrations, and size and depth of plume; retained for potentially targeted treatment areas, including the VOCs source and areas immediately downgradient of the source using ozone.

Abbreviations:
VOC – Volatile Organic Compounds

Table 2
Remedy Evaluation
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Remedial Alternative	Vadose Zone / Groundwater	Will Alternative Meet Remedial Objectives?	Practicability			Protectiveness (Risk)	Costs	Benefits	Regulatory/Public Acceptance
			Feasibility	Short/Long Term Effectiveness	Reliability				
Reference Remedy	**Vadose Zone VOCs Expanded SVE System**	Yes, the expanded SVE system will likely achieve residential SRLs and GPLs by increasing the capacity of the system, which will reduce VOC concentrations in the vadose zone, decrease risks to site occupants, and stop contribution of VOC to groundwater.	Very feasible, SVE piping and wells are already constructed and the remedy would only require an increase in capacity to 300 cfm.	SVE is a known effective remedy for VOC contamination in the vadose zone; the current system has been successful in removing VOCs mass. An upgrade in SVE system capacity will increase performance. Effectiveness will be assessed as part of the system monitoring.	SVE is a known and reliable remediation technology.	The reference remedy is protective, as it removes VOCs from vadose zone and reduces possibility of residual VOCs acting as long-term source of groundwater contamination. It mitigates exposure pathways and is consistent with current and future land use.	Capital costs would be incurred for the increase in system capacity, and O&M costs would be similar to current SVE system operating costs.	The reference remedy would provide continued reduction of VOC concentrations and mass in the vadose zone, which would result in lower risk to site occupants.	Highly Likely
	ISCO Using Ozone, Semiannual MNA Monitoring Existing Groundwater Well Network	Yes, the remedy will likely achieve AWQS by treating the source area, and cutting off the source area from the dilute plume, greatly decreasing natural attenuation time of PCE	Ozone injection is an established groundwater remediation measure, successful VOC cleanup in groundwater is well documented, an results from a site pilot study show VOC reduction. MNA is very feasible as groundwater monitoring is currently conducted at the site.	Ozone injection and MNA are known and effective remedies; Ozone will quickly reduce VOC concentrations, and ultimately reduce the number of years for monitoring; continued semiannual groundwater monitoring of existing monitoring well network will assess effectiveness.	Ozone injection and MNA are known and reliable remediation technology.	The reference remedy is protective, in that it will reduce VOC concentrations at the source and immediately downgradient, and it continues to monitor and evaluate Site contamination through the collection of data.	Although ozone injection would result in initially high capital costs associated with installation of injection wells, associated piping, and purchase of ozone generators, its effectiveness will result in a significant decrease in the number of years required for MNA; monitoring costs would be similar to current semiannual groundwater monitoring costs.	Ozone injection would result in achieving the groundwater RO within a relatively short period of time, and it would mitigate further dilution of VOC in groundwater, and the potential expansion of the plume. MNA monitoring would provide data to evaluate VOC concentrations throughout the VOC plume and monitor for the potential need of implementing wellhead treatment as a contingency for the SRP well, if pumping at this well is resumed.	Likely
More Aggressive Remedy	**Vadose Zone VOCs Expanded SVE System**	Yes, the expanded SVE system will likely achieve residential SRLs and GPLs by increasing the capacity of the system, which will reduce VOC concentrations in the vadose zone, decrease risks to site occupants, and stop contribution of VOC to groundwater.	Addition of a new SVE extraction points and increase in SVE capacity at the Site is feasible, coordination with Missouri Falls is required.	SVE is a known effective remedy for VOC contamination in the vadose zone; the current system has been successful in removing VOCs mass. An upgrade in SVE system capacity will increase performance. Effectiveness will be assessed as part of the system monitoring.	SVE is a known and reliable remediation technology.	The more aggressive remedy is protective, as it removes VOC from the vadose zone and reduces possibility of residual VOC acting as long-term source of groundwater contamination. It mitigates exposure pathways and is consistent with current and future land use.	Capital costs would include installation of additional SVE extraction wells, and upgrade in SVE capacity.	The more aggressive remedy would provide continued reduction of VOC concentrations and mass in the vadose zone, which would result in lower risk to site occupants.	Highly Likely
	Source Area ISCO Using Ozone, GETS, and Monitoring of Existing Groundwater Well Network	Yes, AWQS will likely be achieved as the source area ozone sparge system installed as part of the pilot study will continue PCE reduction, groundwater extraction will treat the dilute plume, and MNA will provide data for continued evaluation of the plume.	This remedy is moderately feasible. Ozone injection is an established groundwater remediation measure, successful VOC cleanup in groundwater is well documented, an results from a site pilot study show VOC reduction. Siting the location of groundwater extraction wells and a treatment system would have potential challenges and require property acquisition and/or access agreements. Installation would require linear improvements potentially impacting the community during construction activities. MNA monitoring would be completed as part of the groundwater extraction system monitoring, but additional operational efforts would be associated with running the ozone generator	Ozone injection, groundwater extraction, and MNA are known and effective remedies; Ozone will quickly reduce VOC concentrations at the source, while groundwater extraction would remediate the dilute plume downgradient from the source; The two combined remedies would help reduce source area VOCs, and control expansion of the dilute plume; Continued semiannual groundwater monitoring of existing monitoring well network will assess effectiveness.	Ozone injection, GETS and MNA are known and reliable remediation technologies.	The More Aggressive Remedy is protective, in that it will reduce VOC concentrations at the source, it reduces mass by groundwater extraction and treatment in the areas with the relatively higher VOC concentrations, and it continues to monitor and evaluate Site contamination through the collection of data.	Source area ozone injection would not result in additional capital costs, because the system was installed as part of a pilot study and has been actively running since November 2018; Capital costs are high and include the installation of two groundwater extraction wells, a treatment system, associated trenching and piping, either purchase or leasing of land for the treatment system, permitting and construction oversight costs. Combined with groundwater extraction it will result in significant decrease in the number of years required for MNA. MNA costs would be similar to current semiannual groundwater monitoring costs and those assumed in the reference remedy.	Ozone injection would result in achieving the groundwater RO within a relatively short period of time, and it would mitigate further dilution of VOC in groundwater, while the groundwater extraction system mitigates further downgradient PCE migration; MNA monitoring would provide data to evaluate VOC concentrations throughout the VOC plume and monitor for the potential need of implementing wellhead treatment as a contingency for the SRP well, if pumping at this well is resumed.	Likely

Table 2
Remedy Evaluation
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Remedial Alternative	Vadose Zone / Groundwater	Will Alternative Meet Remedial Objectives?	Practicability			Protectiveness (Risk)	Costs	Benefits	Regulatory/Public Acceptance
			Feasibility	Short/Long Term Effectiveness	Reliability				
Less Aggressive Remedy	**Vadose Zone VOCs Expanded SVE System**	Yes, the expanded SVE system will likely achieve non-residential SRLs and GPLs by increasing the capacity of the system, which will reduce VOC concentrations in the vadose zone, decrease risks to site occupants, and stop contribution of VOC to groundwater.	Very feasible, SVE piping and wells are already constructed and the remedy would only require an increase in capacity to 300 cfm.	SVE is a known effective remedy for VOC contamination in the vadose zone; the current system has been successful in removing VOCs mass. An upgrade in SVE system capacity will increase performance. Effectiveness will be assessed as part of the system monitoring.	Since the SVE system would no longer be operating under this remedy, reliability is very high.	No further active remediation would be performed, therefore the protectiveness of this remedy is unknown, and it could result in potential vapor intrusion risks, and continued dilution of PCE from the source area into groundwater. The need for continued SVE operation would be determined based on laboratory results collected during rebound monitoring after the system has been shutdown. If residential screening levels are not achievable, but non-residential screening levels are met, a DEUR may be established for the site.	Capital costs would be incurred for the increase in system capacity, and O&M costs would be similar to current SVE system operating costs.	The reference remedy would provide continued reduction of VOC concentrations and mass in the vadose zone, which would result in lower risk to site occupants. However, if only non-residential screening levels are met because of the reduced number of years of operation, this remedy could result in a DEUR and therefore be less beneficial than the Reference and More Aggressive Alternative Remedy.	Moderately Unlikely
	Source Area ISCO Using Ozone and Semiannual MNA Monitoring of Existing Groundwater Well Network	Yes, AWQS will likely be achieved as the source area ozone sparge system installed as part of the pilot will continue PCE reduction and MNA will provide data for continued evaluation of the plume. However, this remedy may result in at least 30 years of MNA and implementation of contingencies for groundwater.	MNA monitoring is very feasible as groundwater monitoring is currently conducted at the site. Untreated portions of the plume may result in expansion of the dilute plume beyond its current footprint. Additional monitoring wells may be required.	MNA is a known and effective remedy given the condition of the plume; semiannual monitoring will assess effectiveness.	MNA is a known and reliable remediation technology.	The less aggressive remedy is protective, in that it continues to monitor and evaluate Site contamination through the collection of data. However, it will not remediate groundwater conditions in the vicinity of the SRP well. If either SRP or COP reactivate wells within or near the VOC plume, impacted water may be drawn into the wells, which would require implementation of the wellhead treatment contingencies.	MNA costs for this remedy would be similar to the current groundwater monitoring costs. Additional capital costs may be required if either SRP or COP reactivates production wells located within or near the VOC plume, resulting in the need for wellhead treatment, and potentially new monitoring wells if the plume expands.	MNA monitoring would provide data to evaluate VOC concentrations throughout the PCE plume and monitor for the potential need of implementing wellhead treatment as a contingency for either SRP of COP wells.	Moderately Unlikely

Abbreviations:
LGAC - liquid-phase granular activated carbon
MNA - Monitored Natural Attenuation
O&M - Operation and Maintenance
PCE = Tetrachloroethene
SRP - Salt River Project
SVE - Soil Vapor Extraction
TOG - Town of Gilbert
VOC - Volatile Organic Compound

Table 3
Remedial Alternatives Cost Summary
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Remedial Alternative	Vadose Zone / Groundwater		Estimated Capital Costs	Estimated O&M and Monitoring Costs	Total Estimated Cost (Not Including Contingency)	Contingency	Total Remedy Estimated Cost (Including Contingency)	Potential Range	
								(-30%)	(+50%)
Reference Remedy	Reference Remedy	Vadose Zone VOCs - SVE System Upgrade & O&M	$25,000	$204,000 (Total 3 years)	$1,806,000	$375,000 (One Additional Year O&M)	**$6,200,000**	**4,300,000**	**9,300,000**
		Ozone Sparge - Source Area and Expanded Downgradient Injection; and Semiannual Monitoring	$911,000	$666,000 (Total 3 years)		$4,031,000 (Wellhead Treatment+ 10 Years Monitoring)			
More Aggressive Alternative Remedy	More Aggressive Remedy	Vadose Zone VOCs - SVE System Upgrade & O&M	$75,000	$87,000 (Total 3 years)	$3,322,000	$400,000 (One Additional Year O&M)	**$8,200,000**	**5,700,000**	**12,300,000**
		Source Area Ozone Sparge; GETS; and Semiannual Monitoring;	$1,100,000	$2,060,000 (Total 10 years O&M)		$4,500,000 (Wellhead Treatment+ 10 Years Monitoring)			
Less Aggressive Alternative Remedy	Less Aggressive Remedy	Vadose Zone VOCs - SVE System Upgrade & O&M	$25,000	$140,000 (Total 3 years)	$1,810,000	$380,000 (One Additional Year O&M)	**$6,800,000**	**4,800,000**	**10,200,000**
		Ozone Sparge - Source Area and Semiannual Monitoring	$125,000	$1,520,000 (Total 30 years)		$4,400,000 (Wellhead Treatment+ 10 Years Monitoring)			

Abbreviations:
WQARF = Water Quality Assurance Revolving Fund
O&M = operations and maintenance
% = percent
$ = United States dollars
GETS = Groundwater Extraction & Treatment System
VOCs = volatile organic compounds
SVE = soil vapor extraction
MNA = monitored natural attenuation

Notes:
Costs are based on 2019 dollar values
Costs for O&M and contingencies include an assumed Net Present Value of 5%

Table 4

Remedial Alternative Scoring
North 7th Street and East Missouri Avenue WQARF Site
Phoenix, Arizona

Remedial Alternative	Vadose Zone / Groundwater	Will Alternative Meet Remedial Objectives?	Practicability			Protectiveness (Risk)	Cost	Benefits	*Total Score*	*Total Estimated Cost (Not Including Contingency)*	*Total Remedy Estimated Cost (Including Contingency)*
			Feasibility	Short/Long Term Effectiveness	Reliability						
Reference Remedy	**Source Area SVE Remediation**	Yes, remedy will likely achieve residential SRLs and GPLs	5	4	4	5	4	4	***50***	**$1.88M**	**$6.31M**
	Source Area and Dissolved Plume Ozone Sparge	Yes, remedy will likely achieve AWQS	4	4	4	4	4	4			
More Aggressive Remedy	**Source Area SVE Remediation**	Yes, remedy will likely achieve residential SRLs and GPLs	5	5	4	5	3	5	***46***	**$3.46M**	**$8.30M**
	Source Area Ozone Sparge and Installation of GETS	Yes, remedy will likely achieve AWQS	2	4	4	4	2	3			
Less Aggressive Remedy	**Source Area SVE Remediation**	Yes, remedy will likely achieve non-residential SRLs and GPLs	5	3	4	2	5	3	***42***	**$1.72M**	**$6.50M**
	Semiannual MNA Monitoring of the Plume	Yes, remedy will likely achieve AWQS	5	2	3	3	4	3			

Abbreviations:
SVE - soil vapor extraction
MNA - monitored natural attenuation
VOCs - volatile organic compounds
GETS - Groundwater Extraction and Treatment System

Scoring:
Scores ranged from zero to five, with five indicating the most relative benefit and zero indicating the least relative or no benefit.

FIGURES

KEY MAP

NOT TO SCALE

AERIAL IMAGE FROM BING

100' 50' 0 100 Feet

SITE LOCATION

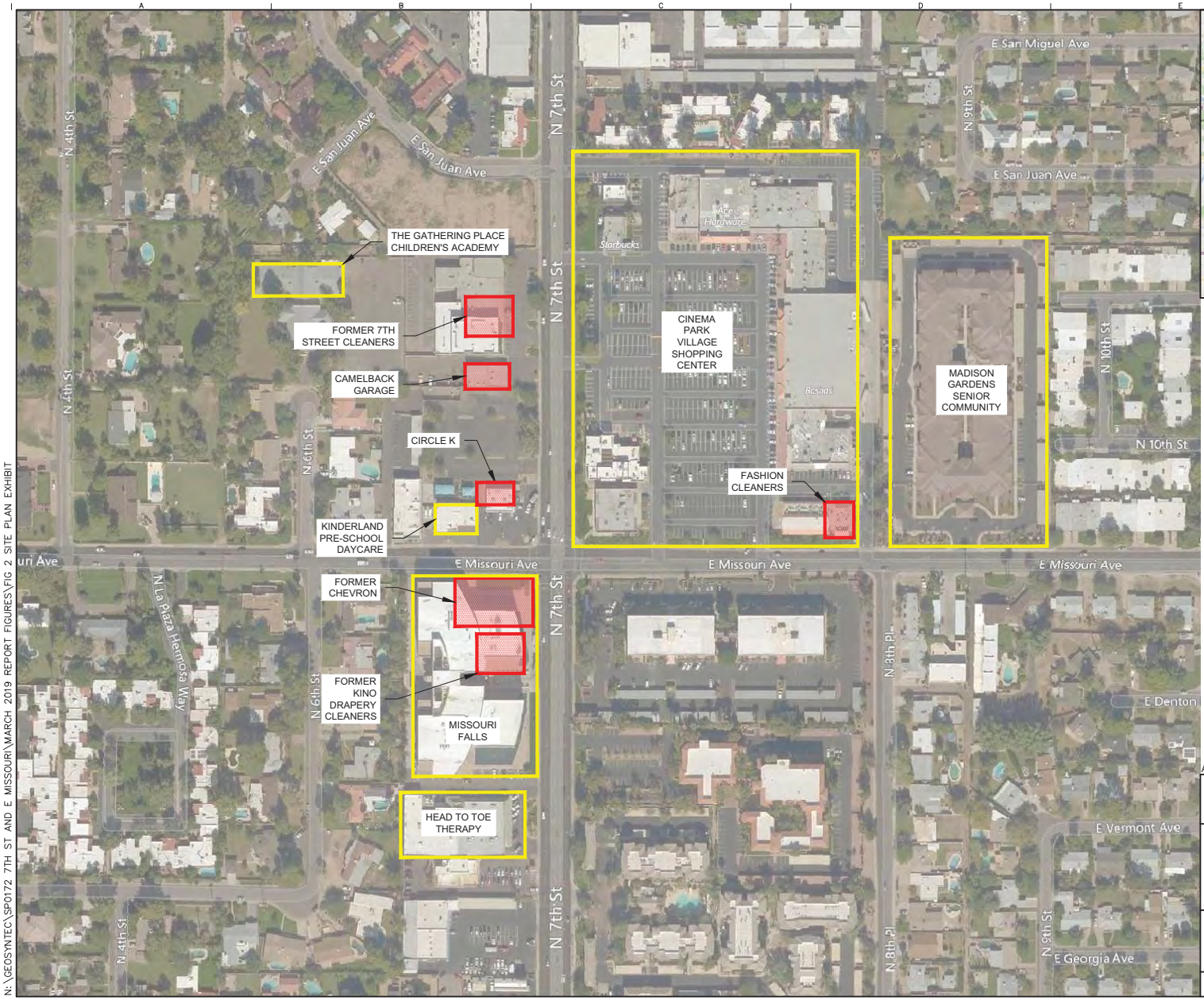
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 1

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\MARCH 2019 REPORT FIGURES\FIG 1 SITE LOCATION EXHIBIT



KEY MAP

NOT TO SCALE

LEGEND

KEY OFF-SITE PROPERTIES

ENVIRONMENTAL FACILITIES

AERIAL IMAGE FROM BING

200' 100' 0 200 Feet

SITE LAYOUT

North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 2

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\MARCH 2019 REPORT FIGURES\FIG 2 SITE PLAN EXHIBIT

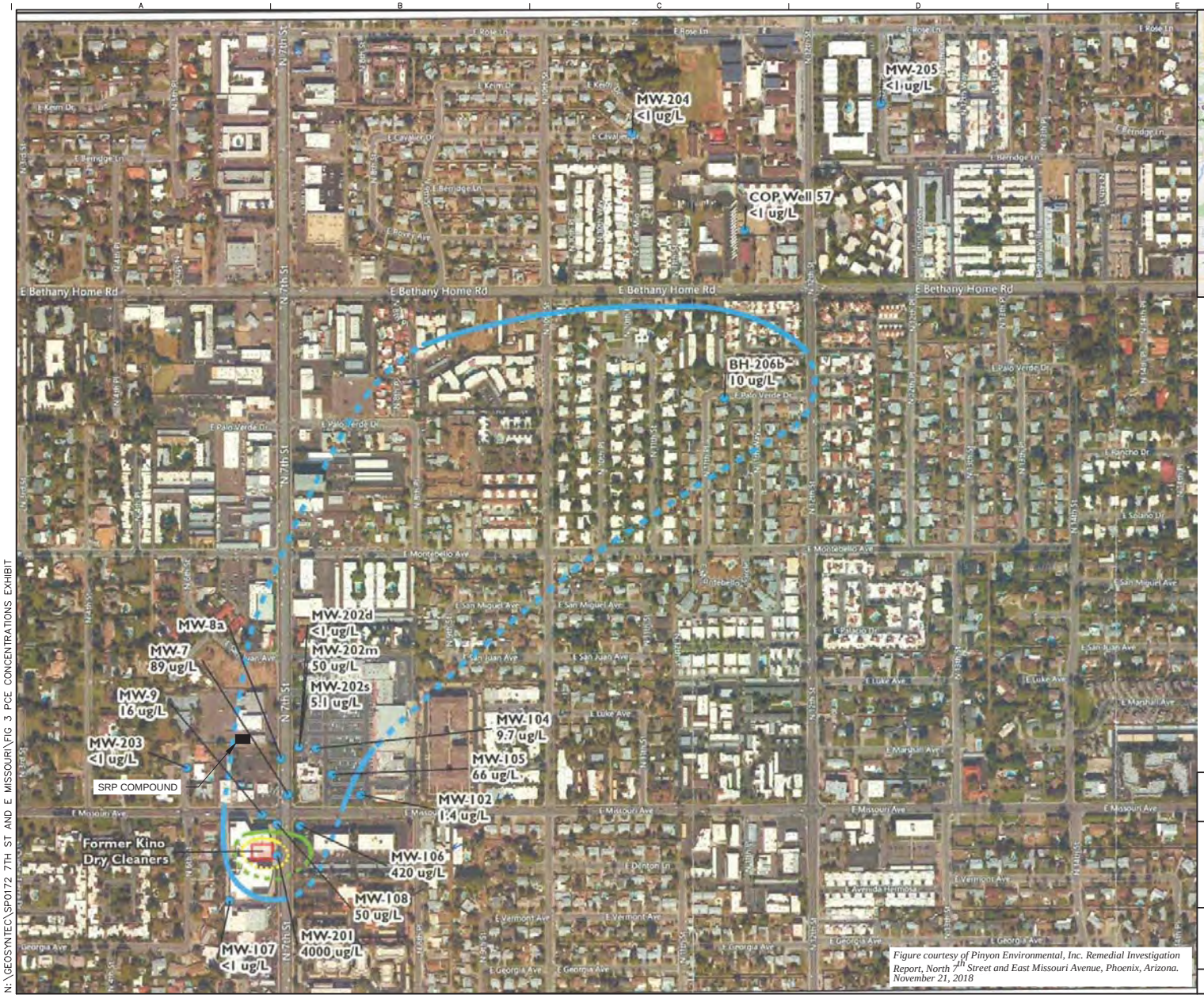


Figure courtesy of Pinyon Environmental, Inc. Remedial Investigation Report, North 7th Street and East Missouri Avenue, Phoenix, Arizona. November 21, 2018

Legend

- Monitoring Well
- Source Area

PCE Concentration (ug/L)

- 5
- 500
- 1000

Notes:
Tetrachloroethene (PCE) concentration used for interpolation is highest reported in each well during sampling event.
The reporting limit was used for interpolation where results were not detected above the reporting limit.
Only groundwater wells sampled during this sampling event are shown.
a - Due to the shallower depth of screen, PCE results from MW-8 were not included in the interpolation.
b - BH-206 was sampled during drilling in April 2017. No well was installed.
ug/L - micrograms per liter

500' 250' 0 500 Feet

PCE CONCENTRATION ISOPLETHS
SEPTEMBER 2017

North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 3

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\FIG 3 PCE CONCENTRATIONS EXHIBIT

SITE LOCATION

NOT TO SCALE

LEGEND

- MONITORING WELL
- EXISTING OZONE SPARGING WELL
- PROPOSED MONITORING WELL
- PROPOSED OZONE SPARGING WELL
- CURRENT OZONE GENERATOR
- FUTURE OZONE GENERATOR
- CONVEYANCE PIPELINE

60' 30' 0 60 Feet

OZONE SPARGE PILOT STUDY SYSTEM AND PROPOSED REFERENCE REMEDY UPGRADES

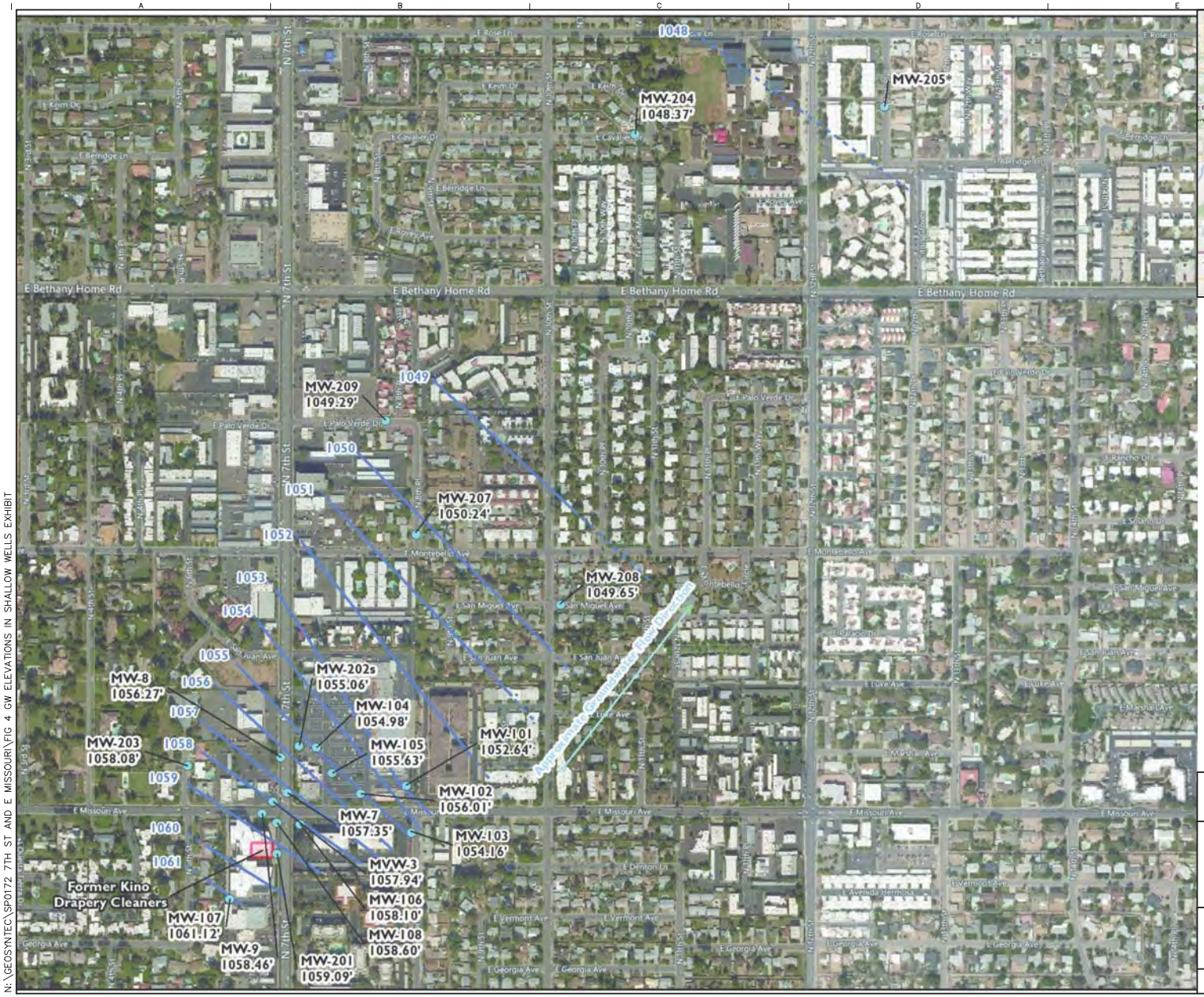
7th Street and East Missouri Avenue Ozone Sparging for PCE Removal

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 4

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\PILOT MEMO\PILOT MEMO EXHIBIT



KEY MAP

NOT TO SCALE

Legend

- Monitoring Well
- Groundwater Elevation (')
- Source Area

Notes:
' = feet
* Point not used in groundwater contours.

Figure courtesy of Pinyon Environmental, Inc. Remedial Investigation Report, North 7th Street and East Missouri Avenue, Phoenix, Arizona. November 21, 2018, and March 4, 2019 email communication

500' 250' 0 500 Feet

GROUNDWATER ELEVATIONS AND CONTOURS IN SHALLOW WELLS
DECEMBER 2018

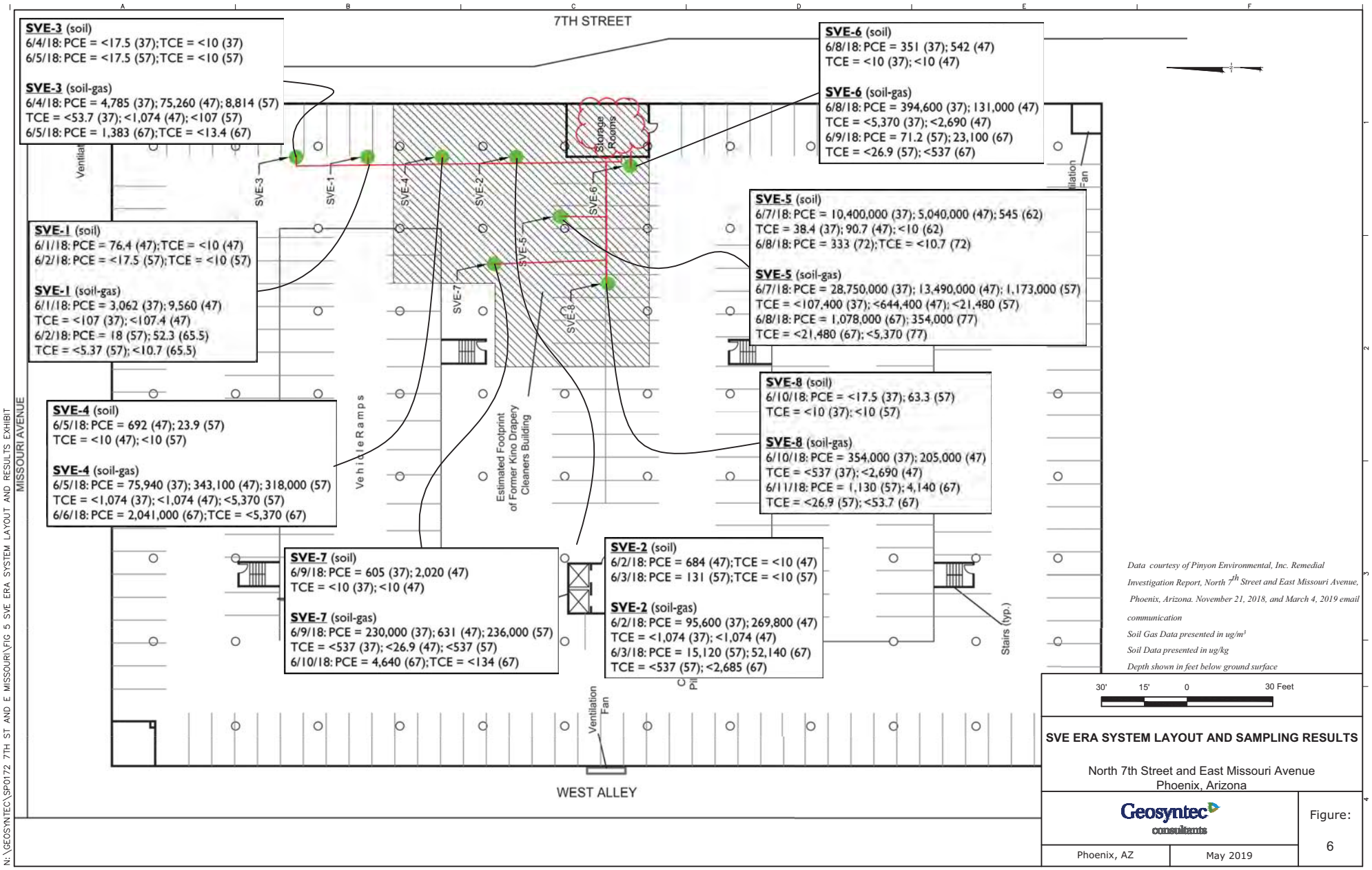
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 5

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\FIG 4 GW ELEVATIONS IN SHALLOW WELLS EXHIBIT



Data courtesy of Pinyon Environmental, Inc. Remedial Investigation Report, North 7th Street and East Missouri Avenue, Phoenix, Arizona. November 21, 2018, and March 4, 2019 email communication

Soil Gas Data presented in ug/m³

Soil Data presented in ug/kg

Depth shown in feet below ground surface

SVE ERA SYSTEM LAYOUT AND SAMPLING RESULTS

North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 6

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\FIG 5 SVE ERA SYSTEM LAYOUT AND RESULTS EXHIBIT

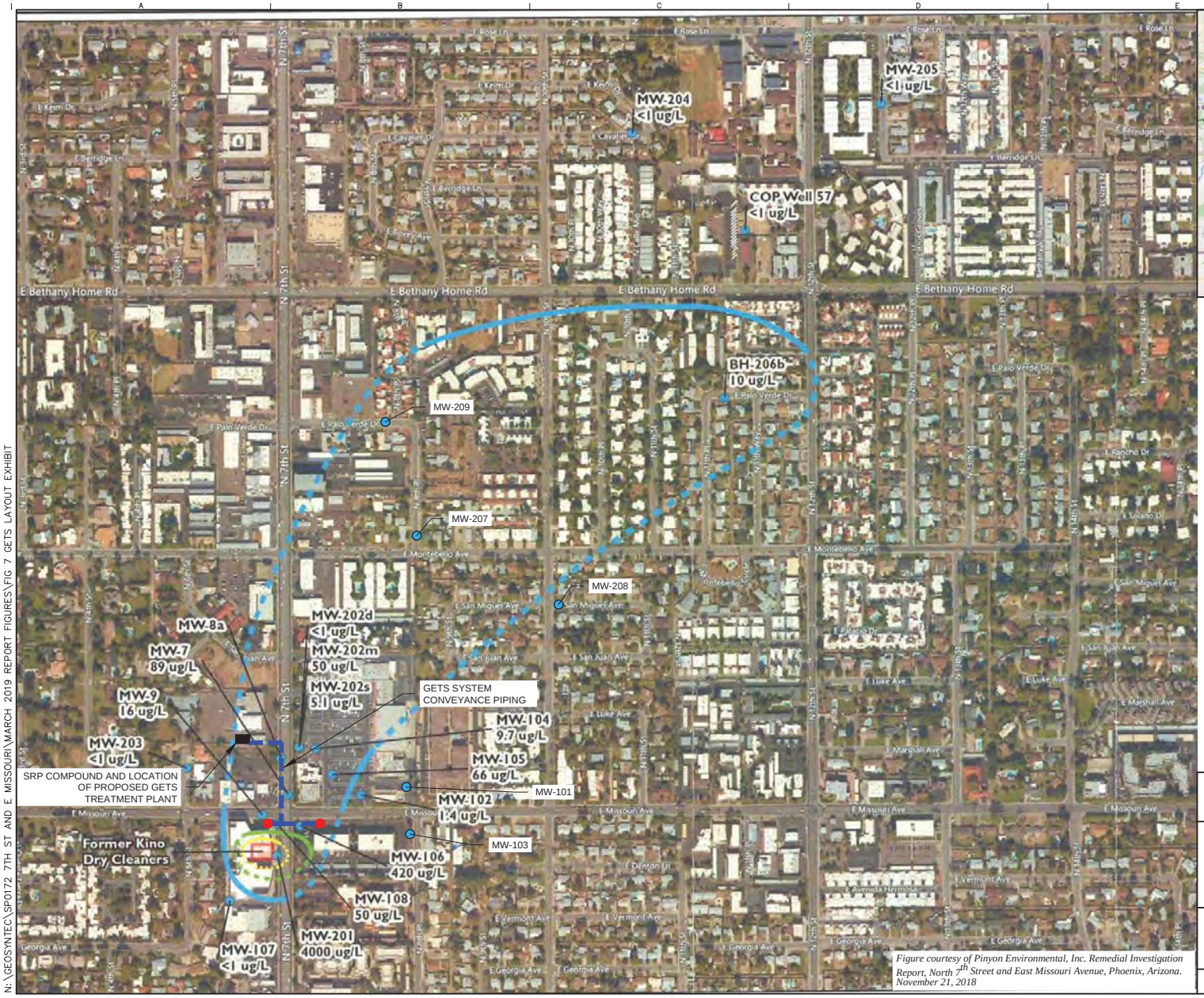


Figure courtesy of Pinyon Environmental, Inc. Remedial Investigation Report, North 7th Street and East Missouri Avenue, Phoenix, Arizona. November 21, 2018

Legend

- Monitoring Well
- Proposed Extraction Well
- Source Area

PCE Concentration (ug/L)

- 5
- 500
- 1000

- GETS System Conveyance Piping

Notes:
Tetrachloroethene (PCE) concentration used for interpolation is highest reported in each well during sampling event.
The reporting limit was used for interpolation where results were not detected above the reporting limit.
Only groundwater wells sampled during this sampling event are shown.
a - Due to the shallower depth of screen, PCE results from MW-8 were not included in the interpolation.
b - BH-206 was sampled during drilling in April 2017. No well was installed.
ug/L - micrograms per liter

500' 250' 0 500 Feet

PROPOSED MORE AGGRESSIVE REMEDY

North 7th Street and East Missouri Avenue
Phoenix, Arizona

Geosyntec consultants

Phoenix, AZ | May 2019

Figure: 7

N:\GEOSYNTEC\SP0172 7TH ST AND E MISSOURI\MARCH 2019 REPORT FIGURES\FIG 7 GETS LAYOUT EXHIBIT

APPENDIX A
Ozone Sparge Pilot Study Results

Pilot Study Summary

The pilot-scale ozone sparging system is comprised of an ozone sparge unit (H2O Engineering, OSUXX-104) and two dual-nested ozone injection wells (7M-SW-01 and 7M-SW-02). The system was installed on the Missouri Falls property in October 2018 and commissioned in November 2018. The ozone sparge unit contains two ozone generators (A and B) and can produce up to 104 grams/hour of ozone with air as the feed gas per generator, for a total of approximately 5 lbs/day of ozone for both combined units. Each dual-nested injection well was connected to the ozone unit via nylon ozone-compatible conveyance tubing connected to an ozone diffuser. The piping and well connections are pressure sealed allowing for ozone to be injected under pressure into the water column for efficient transfer of ozone into the saturated zone. During drilling of the injection wells, soil vapor samples were collected approximately every 10 ft to profile the vadose zone. Laboratory data results are presented in Appendix B. Soil gas results ranged from non-detected to 2,480 ug/m^3 in 7M-SW-02 at 70 ft bgs. The nested ozone injection wells have shallow well screens from 119 to124 ft bgs and deep well screens from 144 to 149 ft bgs. An ozone sparge system layout is shown on Figure 4.

The system started operating on November 26, 2018. Due to a leak of ozone detected in 7M-SW-02 on the same day, the ozone was directed to 7M-SW-01 with gas flow alternating between the two nested screens on 5-minute intervals. The system was temporarily shut off between January 4 and 11, 2019 during the construction of a replacement well installed 5 feet to the north of the previously installed 7M-SW-02. Six rounds of groundwater sampling were conducted between November 7, 2018 and April 4, 2019 to monitor the effect of ozone sparging; the VOC results suggest positive remedial effect associated with the ozone treatment in areas downgradient of the source area. In the vicinity of the source area, VOC reductions have been modest, likely due to continued source addition from ongoing dissolution of PCE from the vadose zone into the local area groundwater.

Results from the groundwater sampling events are presented in Appendix B in both summary table format and time-series plots. The main observations from these results are:

- Results from MW-201, located within the source area, indicate that PCE decreased slightly during the initial few weeks of ozone sparging, but slightly increased in concentrations, likely due to continued dissolution of PCE into groundwater at the source area;
- PCE concentrations at MVW-103 and MW-108, located immediately downgradient of the source area, slightly increased during the initial stage of ozone sparging. The increase in PCE concentrations could be due to the circulation effect created by ozone sparging into groundwater, which likely mobilized PCE further downgradient and accelerated PCE dissolution at the source. The subsequent concentration decrease starting in December 2018 is likely attributable to the ozonation effect overcoming the circulation effect;

- PCE concentrations increased at downgradient well MW-106, likely due mobilization of PCE from the circulation effect created by ozone sparging. However, PCE oxidation is expected to occur at MW-106 because of the following:
    - Ozone was detected in ambient readings near the top of the well at MW-106, suggesting that it has migrated to this well through groundwater, the vadose zone, or both; and,
    - Elevated carbon dioxide concentrations (up to 2,000 parts per million by volume), and the lack of hydrocarbons, indicating that the mineralization of organic compounds by ozone is occurring at MW-106.

Petroleum hydrocarbon related VOCs concentrations detected at downgradient monitoring well MVW-3 (Figure 5), near the Circle K facility, decreased since the start of ozone sparging. VOC compounds such as benzene, ethylbenzene, toluene and xylenes (BTEX), decreased at MVW-3 by one to two orders of magnitude. For example, benzene decreased from 350 μg/L in November 2018 to 60 μg/L in February 2019, and total xylenes decreased from 480 μg/L to non-detect during the same time period. Time-series plots of these concentrations are presented in Appendix B. These data indicate that petroleum hydrocarbon related VOCs are being reduced in concentration by the ozone injection, and possibly competing for ozone with chlorinated hydrocarbon.

Sampling Date		11/7/2018		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	52	120	51	48
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	10	1.5	9.5	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	1.7	ND	ND
EPA 200.8	Copper	0.50	ug/L	0.87	0.85	0.55	ND
EPA 200.8	Manganese	0.50	ug/L	3.7	1100	1.7	190
EPA 200.8	Molybdenum	0.50	ug/L	20	4.7	22	6.4
EPA 200.8	Nickel	0.50	ug/L	0.53	1.6	ND	1.5
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	58	65	52	8.8
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	140
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	38
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	350
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	98
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	108	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	270
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	15
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	390
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	74
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	33
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	87
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	71	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	760	107	2500	17
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	210
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	21
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	45
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	480

Sampling Date		2/20/2019		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	47	70	54	47
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	9.4	ND	11	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Copper	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Manganese	0.50	ug/L	2.2	5.1	ND	15
EPA 200.8	Molybdenum	0.50	ug/L	22	5.7	19	11
EPA 200.8	Nickel	0.50	ug/L	ND	ND	ND	1.1
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	54	63	45	22
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	5.2
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	60
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	42
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	63
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	15
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	8.7
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	7.1
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	6.5
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	1200	62	2000	11
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	17
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	96
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	ND

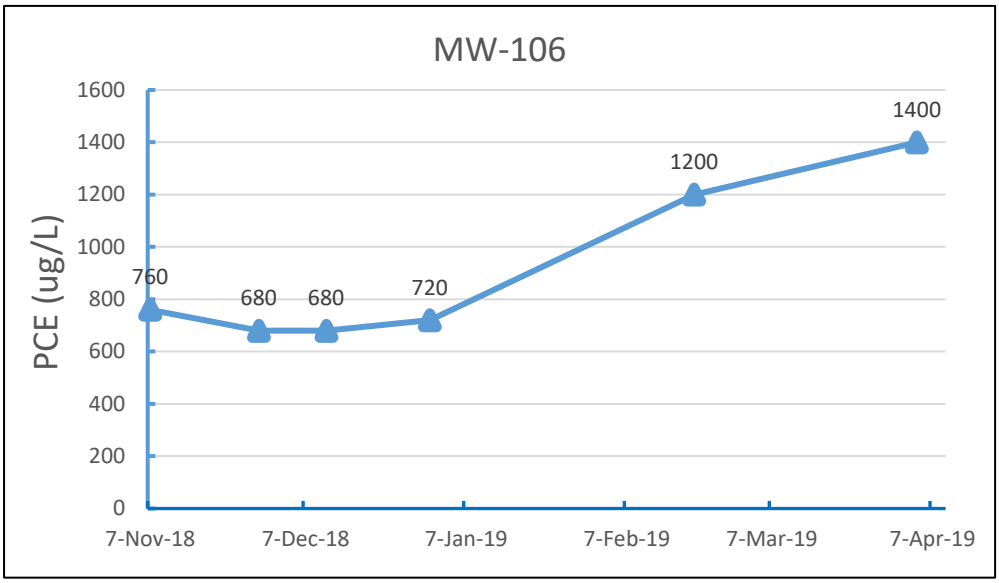
Sampling Date		11/28/2018		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	47	75	46	46
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	10	1.7	11	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Copper	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Manganese	0.50	ug/L	0.56	ND	ND	170
EPA 200.8	Molybdenum	0.50	ug/L	20	6.0	19	14
EPA 200.8	Nickel	0.50	ug/L	13	ND	ND	0.63
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	54	56	43	23
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	220
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	62
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	190
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	54
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	25
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	680	100	1700	47
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	33
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	13
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	77
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	ND

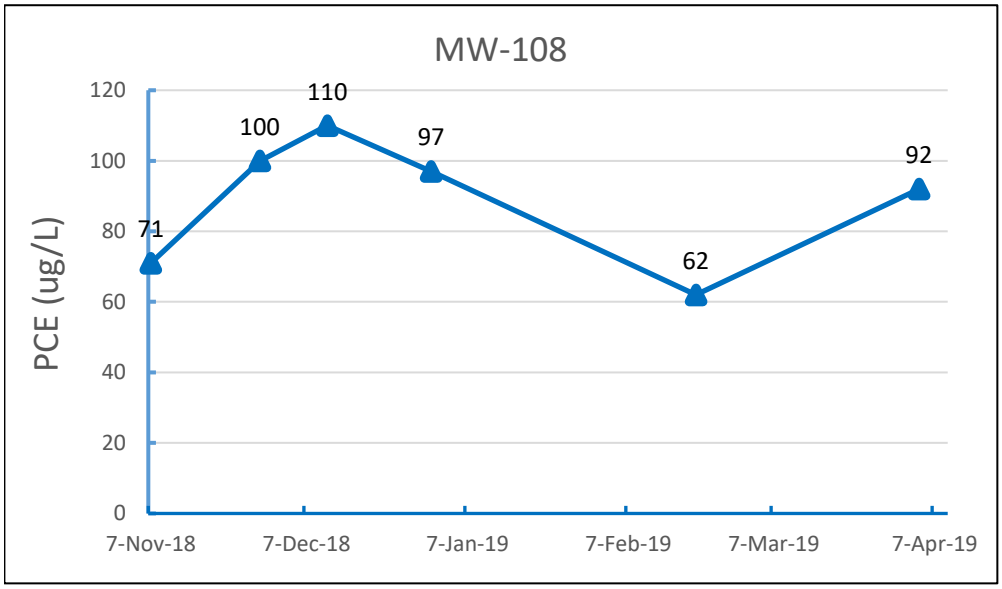
Sampling Date		4/5/2019		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	47	73	59	51
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	9.6	ND	12	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Copper	0.50	ug/L	4.5	ND	ND	ND
EPA 200.8	Manganese	0.50	ug/L	ND	28	28	200
EPA 200.8	Molybdenum	0.50	ug/L	22	6.7	19	4.8
EPA 200.8	Nickel	0.50	ug/L	ND	ND	ND	1.1
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	57	68	46	20
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	2.9
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	77
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	67
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	120
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	7.6
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	8.7
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	7.1
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	14
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	1400	92	2200	**ND**
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	16
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	49
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	ND

Sampling Date		12/11/2018		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	52	88	55	48
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	9.8	ND	11	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Copper	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Manganese	0.50	ug/L	ND	ND	ND	130
EPA 200.8	Molybdenum	0.50	ug/L	21	5.4	21	17
EPA 200.8	Nickel	0.50	ug/L	ND	ND	ND	0.67
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	56	57	46	27
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	35
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	7.4
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	170
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	59
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	130
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	110
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	53
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	21
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	50
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	680	110	1900	74
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	130
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	9.2
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	64
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	160

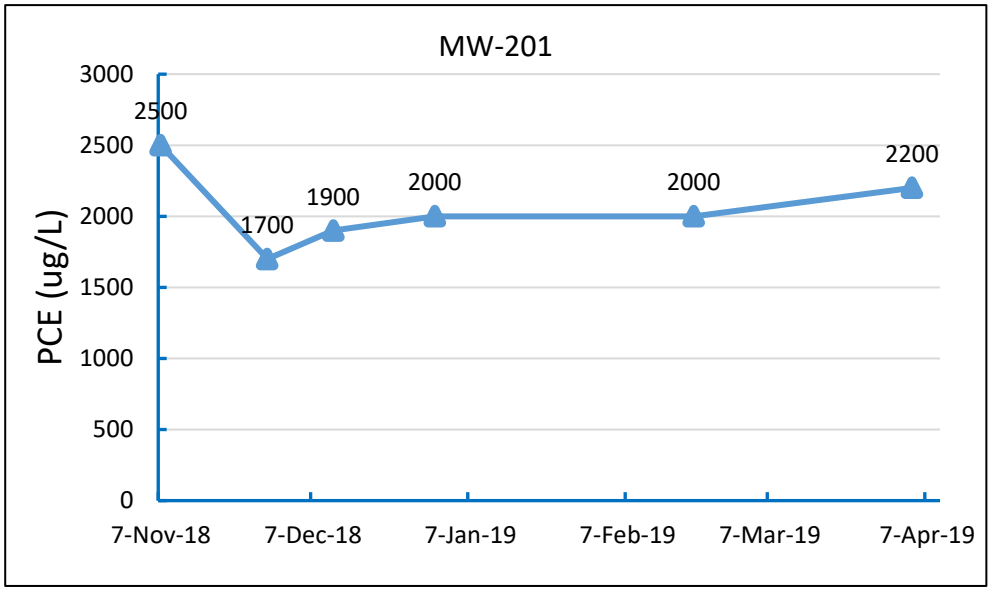
Sampling Date		12/31/2018		Sampling Depth 110 ft bgs			
				MW-106	MW-108	MW-201	MVW-03
Method	Analyte	RL	RL Units	Results			
EPA 200.8	Antimony	1.0	ug/L	ND	ND	ND	ND
EPA 200.8	Barium	0.50	ug/L	50	79	54	52
EPA 200.8	Cadmium	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Chromium	1.0	ug/L	9.6	ND	11	ND
EPA 200.8	Cobalt	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Copper	0.50	ug/L	ND	ND	ND	ND
EPA 200.8	Manganese	0.50	ug/L	2.1	ND	1.2	200
EPA 200.8	Molybdenum	0.50	ug/L	22	5.4	19	13
EPA 200.8	Nickel	0.50	ug/L	ND	ND	ND	1.5
EPA 200.8	Silver	0.10	ug/L	ND	ND	ND	ND
EPA 200.8	Vanadium	0.50	ug/L	55	59	46	29
EPA 200.8	Zinc	13	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1,2-Tetrachloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,1-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2,2-Tetrachloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1,2-Trichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloroethene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,1-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,3-Trichloropropane	10	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trichlorobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2,4-Trimethylbenzene	2.0	ug/L	ND	ND	ND	68
EPA 8260B	1,2-Dibromo-3-Chloropropane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dibromoethane (EDB)	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloroethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3,5-Trimethylbenzene	2.0	ug/L	ND	ND	ND	8.5
EPA 8260B	1,3-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,3-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	1,4-Dichlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2,2-Dichloropropane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	2-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	2-Hexanone	10	ug/L	ND	ND	ND	ND
EPA 8260B	4-Chlorotoluene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	4-Methyl-2-pentanone (MIBK)	10	ug/L	ND	ND	ND	ND
EPA 8260B	Acetone	20	ug/L	ND	ND	ND	ND
EPA 8260B	Benzene	2.0	ug/L	ND	ND	ND	180
EPA 8260B	Bromobenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromochloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromodichloromethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromoform	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Bromomethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon disulfide	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Carbon tetrachloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorobenzene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chlorodibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloroform	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Chloromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	cis-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	48
EPA 8260B	cis-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dibromomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Dichlorodifluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Ethylbenzene	2.0	ug/L	ND	ND	ND	160
EPA 8260B	Hexachlorobutadiene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Iodomethane	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Isopropylbenzene	2.0	ug/L	ND	ND	ND	12
EPA 8260B	m,p-Xylenes	5.0	ug/L	ND	ND	ND	110
EPA 8260B	Methyl tert-butyl ether	1.0	ug/L	ND	ND	ND	ND
EPA 8260B	Methylene Chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Naphthalene	5.0	ug/L	ND	ND	ND	35
EPA 8260B	n-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	n-Propylbenzene	2.0	ug/L	ND	ND	ND	24
EPA 8260B	o-Xylene	5.0	ug/L	ND	ND	ND	74
EPA 8260B	p-Isopropyltoluene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	sec-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Styrene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	tert-Butylbenzene	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Tetrachloroethene	2.0	ug/L	720	97	2000	60
EPA 8260B	Toluene	2.0	ug/L	ND	ND	ND	400
EPA 8260B	trans-1,2-Dichloroethene	2.0	ug/L	ND	ND	ND	7.2
EPA 8260B	trans-1,3-Dichloropropene	2.0	ug/L	ND	ND	ND	ND
EPA 8260B	Trichloroethene	2.0	ug/L	ND	ND	ND	64
EPA 8260B	Trichlorofluoromethane	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl acetate	25	ug/L	ND	ND	ND	ND
EPA 8260B	Vinyl chloride	5.0	ug/L	ND	ND	ND	ND
EPA 8260B	Xylenes, Total	10	ug/L	ND	ND	ND	180

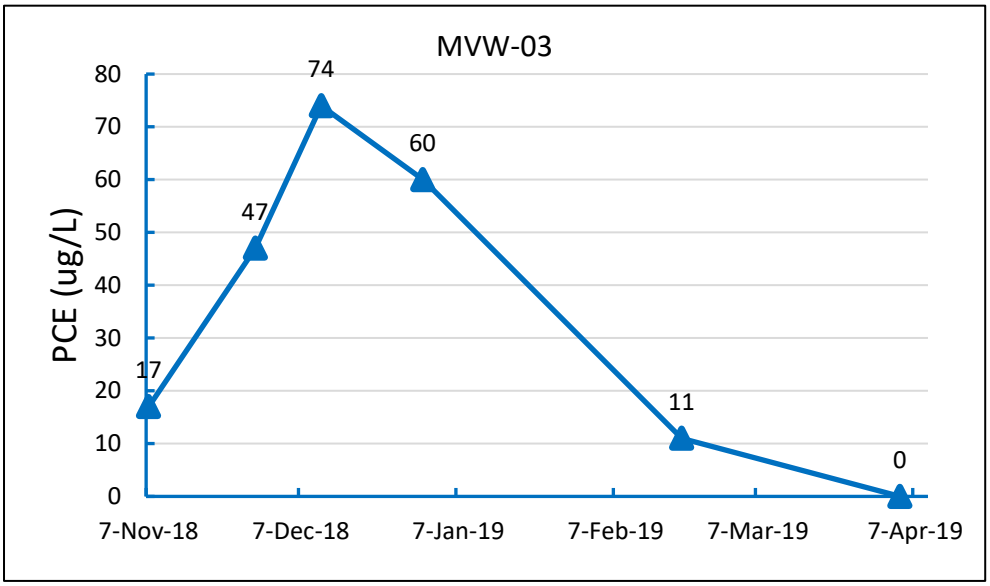
Sampling Date	PCE ug/l	PCE ug/l	PCE ug/l	PCE ug/l
	MW-106	MW-108	MW-201	MVW-03
7-Nov-18	760	71	2500	17
28-Nov-18	680	100	1700	47
11-Dec-18	680	110	1900	74
31-Dec-18	720	97	2000	60
20-Feb-19	1200	62	2000	11
4/4/2019	1400	92	2200	0



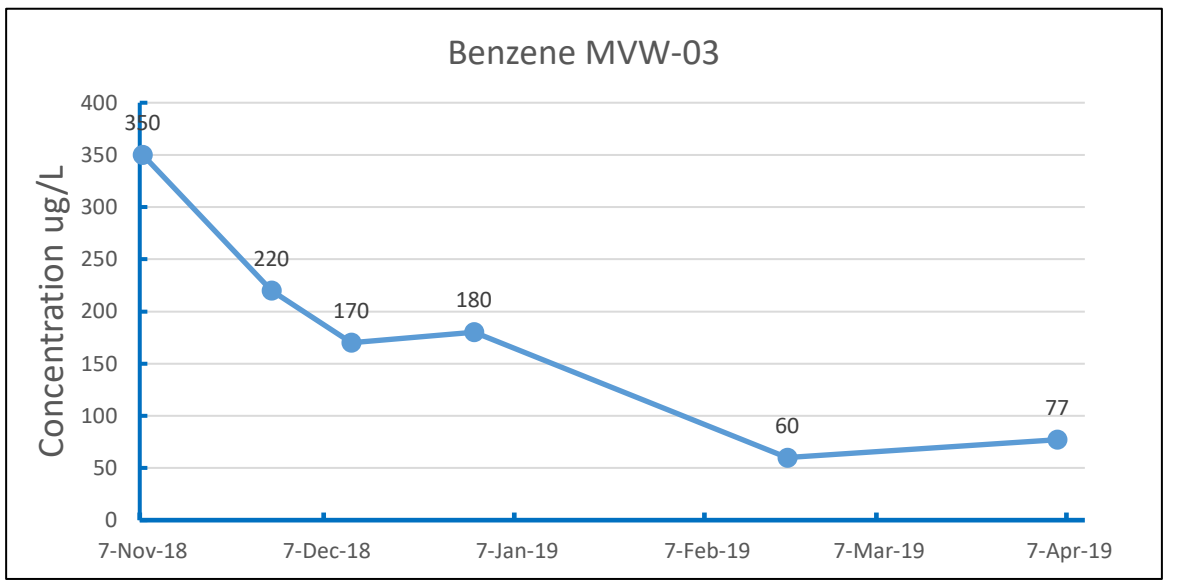


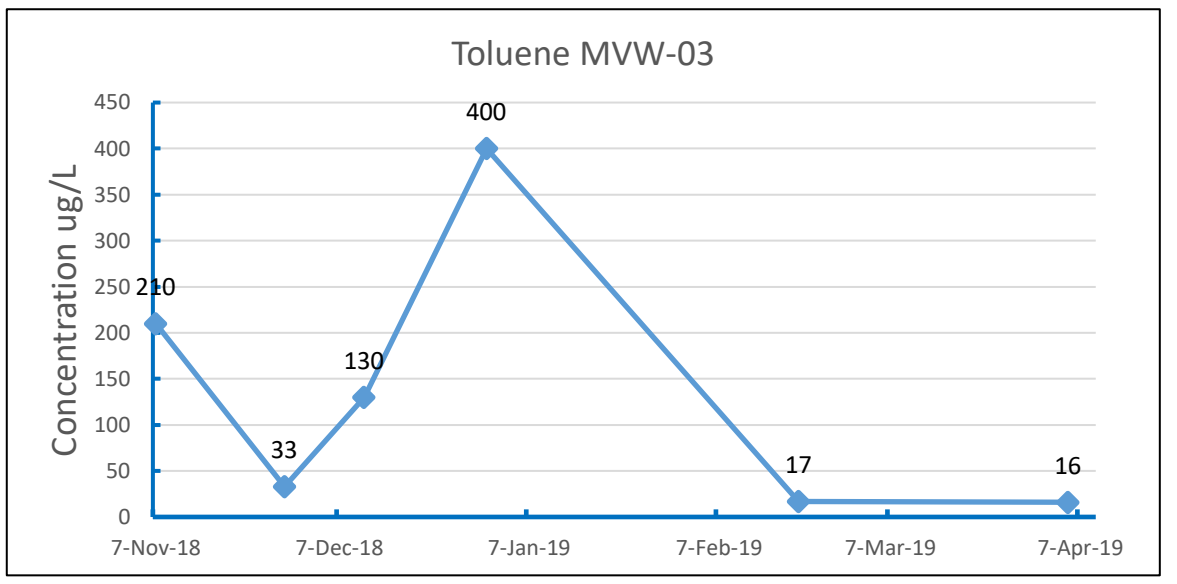
Sampling Date	PCE ug/l	PCE ug/l	PCE ug/l	PCE ug/l
	MW-106	MW-108	MW-201	MVW-03
7-Nov-18	760	71	2500	17
28-Nov-18	680	100	1700	47
11-Dec-18	680	110	1900	74
31-Dec-18	720	97	2000	60
20-Feb-19	1200	62	2000	11
4/4/2019	1400	92	2200	0

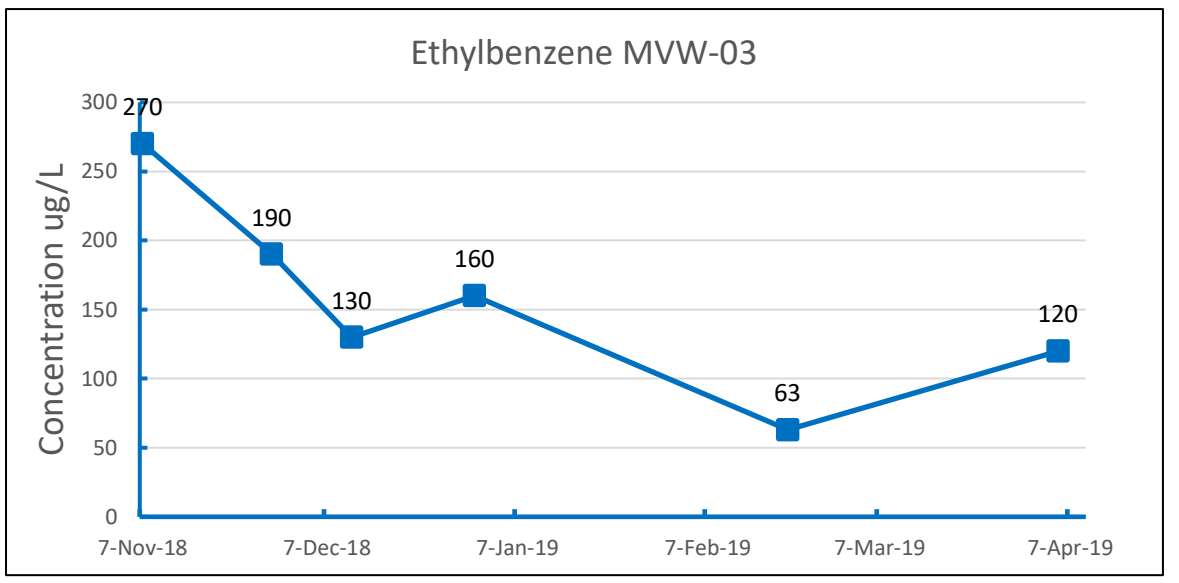




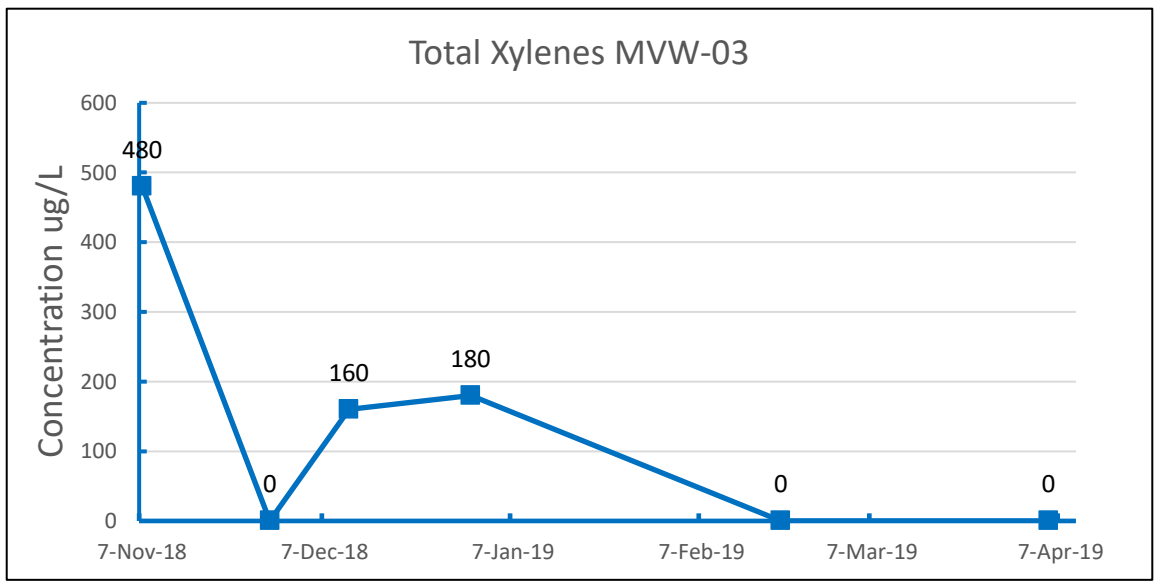
	Benzene MVW -03	Ethylbenzene MVW-03	Toluene MVW-03	Total Xylenes MVW-03	Napthalene MVW-03
7-Nov-18	350	270	210	480	74
28-Nov-18	220	190	33	0	54
11-Dec-18	170	130	130	160	53
31-Dec-18	180	160	400	180	35
20-Feb-19	60	63	17	0	7.1
5-Apr-19	77	120	16	0	7.1

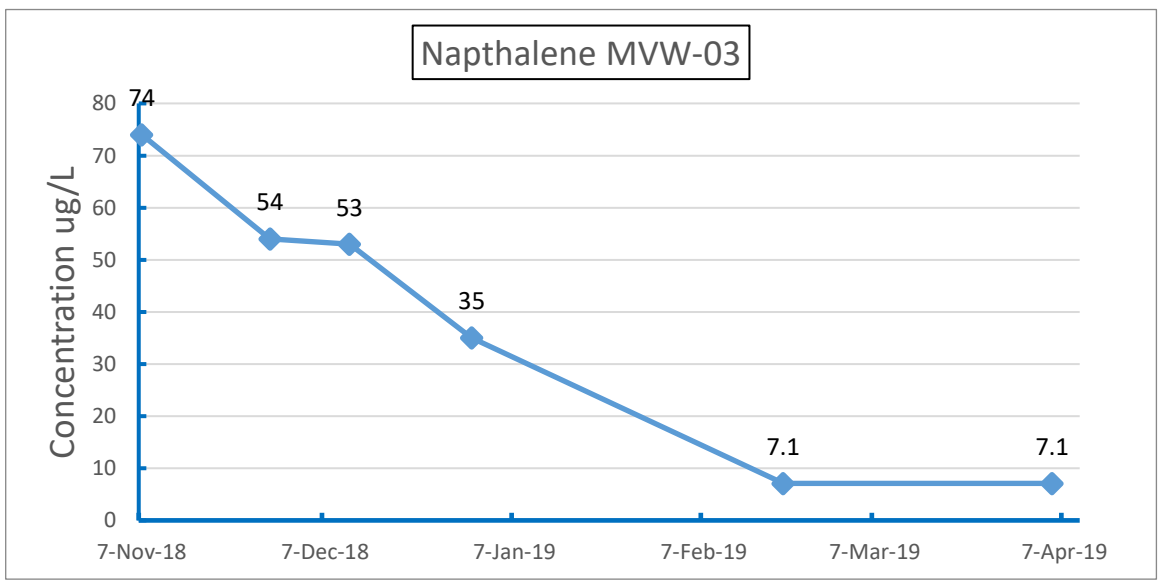






	Benzene MVW -03	Ethylbenzene MVW-03	Toluene MVW-03	Total Xylenes MVW-03	Napthalene MVW-03
7-Nov-18	350	270	210	480	74
28-Nov-18	220	190	33	0	54
11-Dec-18	170	130	130	160	53
31-Dec-18	180	160	400	180	35
20-Feb-19	60	63	17	0	7.1
5-Apr-19	77	120	16	0	7.1





Airtech Environmental Laboratories (AEL)

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Date: November 8, 2018

Client:	Lee Anna Walker	Work Order #:	18J022
Company:	Geosyntec	Project Name:	7th St & Missouri
Address:	11811 N Tatum Blvd, Suite P186	Project Number:	SP0172
	Phoenix, AZ 85028	Received Date:	10/17/2018

Dear Client:

Airtech Environmental Laboratories received twenty (20) samples for analysis.

All analyses met laboratory QA/QC with any exceptions addressed in the Case Narrative.

If you have any questions or concerns regarding your samples analysis, please contact the laboratory at 480-968-5888

Sincerely,

Yu Min Shi
Technical Director
Airtech Environmental Labs

Arizona ADHS License No. AZ0740

Airtech Environmental Laboratories (AEL)
4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Date: November 8, 2018

Client:	Lee Anna Walker	Work Order #:	18J022
Company:	Geosyntec	Project Name:	7th St & Missouri
Address:	11811 N Tatum Blvd, Suite P186	Project Number:	SP0172
	Phoenix, AZ 85028	Received Date:	10/17/2018

SAMPLE SUMMARY

LAB ID	CLIENT ID	METHOD	SAMPLE DATE	SAMPLE TIME
18J022-01	SP2-20'	TO-15	10/12/2018	12:02
18J022-02	SP2-28'	TO-15	10/12/2018	12:59
18J022-03	SP2-38'	TO-15	10/12/2018	14:05
18J022-04	SP2-42'-Dup	TO-15	10/13/2018	07:48
18J022-05	SP2-42'	TO-15	10/13/2018	07:43
18J022-06	SP2-50'	TO-15	10/13/2018	08:30
18J022-07	SP2-60'	TO-15	10/13/2018	09:23
18J022-08	SP2-68'	TO-15	10/13/2018	10:08
18J022-09	SP2-80'	TO-15	10/13/2018	11:27
18J022-10	Background Ambient	TO-15	10/13/2018	11:03
18J022-11	SP1-SV-20	TO-15	10/12/2018	11:57
18J022-12	SP1-SV-28	TO-15	10/12/2018	12:44
18J022-13	SP1-SV-38	TO-15	10/12/2018	12:50
18J022-14	SP1-SV-42	TO-15	10/13/2018	7:20
18J022-15	SP1-SV-42-Dup	TO-15	10/13/2018	7:20
18J022-16	SP1-SV-50	TO-15	10/13/2018	8:09
18J022-17	SP1-SV-60	TO-15	10/13/2018	9:01
18J022-18	SP1-SV-70	TO-15	10/13/2018	10:01
18J022-19	SP1-SV-80	TO-15	10/13/2018	11:02
18J022-20	SP-EB	TO-15	10/17/2018	17:03

Airtech Environmental Laboratories (AEL)
4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Date: November 8, 2018

Client:	Lee Anna Walker	Work Order #:	18J022
Company:	Geosyntec	Project Name:	7th St & Missouri
Address:	11811 N Tatum Blvd, Suite P186	Project Number:	SP0172
	Phoenix, AZ 85028	Received Date:	10/17/18

Case Narrative

All samples and QC associated with your samples met the quality control objectives. Data qualifiers in this report are in accordance with ADEQ Data Qualifiers.

L5: The associated blank spike recovery was above the laboratory/method acceptance limits. The analyte was not detected in the sample.

T4: Tentatively identified compound. Concentration is estimated and based on the closest internal standard.

Airtech Environmental Laboratories (AEL) - AZ 0740
4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Kits QC	**Matrix:**	Air

		Canister				Grab Sampler	
		Type		Vacuum	Vacuum	Type	
	Client	1.0 liter		before sampled	after sampled	5 minute-fill 1.0L canister	
AEL#	ID	SN#	Clean Batch#	Hg inch	psia	SN#	Clean Batch#
18J022-01	SP2-20'	E2392	1810-02	29.0	12.90	113	1809-07
18J022-02	SP2-28'	E2352	1810-03	29.0	12.74	004	1809-07
18J022-03	SP2-38'	E2290	1810-02	29.0	10.80	145	1809-07
18J022-04	SP2-42'-Dup	1849	1810-03	29.0	9.74	017	1809-07
18J022-05	SP2-42'	1832	1810-03	29.0	12.96	076	1809-07
18J022-06	SP2-50'	E2359	1810-03	29.0	14.20	118	1809-07
18J022-07	SP2-60'	E2371	1810-03	29.0	14.12	008	1809-07
18J022-08	SP2-68'	1313	1810-02	29.0	9.00	077	1809-07
18J022-09	SP2-80'	E2097	1809-13	29.0	11.32	177	1809-07
18J022-10	Background Ambient	E2412	1810-01	29.0	11.88	073	1809-07
18J022-11	SP1-SV-20	1825	1810-02	29.0	11.60	108	1809-07
18J022-12	SP1-SV-28	E2297	1810-03	29.0	13.58	146	1809-07
18J022-13	SP1-SV-38	1860	1810-02	29.0	11.80	157	1809-07
18J022-14	SP1-SV-42	1816	1810-01	29.0	11.74	186	1809-07
18J022-15	SP1-SV-42-Dup	E2372	1810-01	29.0	12.90	132	1809-07
18J022-16	SP1-SV-50	1847	1810-02	29.0	11.02	182	1809-07
18J022-17	SP1-SV-60	E2375	1810-02	29.0	12.90	036	1809-07
18J022-18	SP1-SV-70	E2295	1810-01	29.0	12.04	155	1809-07
18J022-19	SP1-SV-80	E2099	1810-01	29.0	12.90	010	1809-07
18J022-20	SP-EB	E2284	1810-01	29.0	19.70	119	1809-07

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-20'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	01	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/26/2018	540-84-1
2-Butanone (MEK)	**67**	**40**	**199**	**118**		20	10/25/2018	78-93-3
2-Hexanone	**14**	**10**	**56.3**	**41.0**		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**100**	**10**	**238**	**23.8**		2	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**4.6**	**1.0**	**14.6**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	**1.2**	**1.0**	**5.76**	**4.88**		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-20'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	01	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**4.3**	**1.0**	**17.8**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**7.2**	**2.0**	**25.4**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/26/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/26/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**6.4**	**2.0**	**43.1**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**30**	**20**	**89.1**	**59.0**		20	10/25/2018	109-99-9
Toluene	**6.5**	**1.0**	**24.4**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	110	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-28'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	02	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	**2.1**	**1.0**	**10.2**	**4.92**		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	**122**	**40**	**361**	**118**		20	10/26/2018	78-93-3
2-Hexanone	**29**	**10**	**117**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**56**	**10**	**133**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**2.0**	**1.0**	**6.32**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**70**	**10**	**132**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	**1.4**	**1.0**	**6.08**	**4.34**		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-28'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	02	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**1.9**	**1.0**	**7.63**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**2.9**	**2.0**	**10.1**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	**5.9**	**2.0**	**25.4**	**8.68**		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	< 2.0	2.0	< 5.90	5.90		2	10/25/2018	109-99-9
Toluene	**8.9**	**1.0**	**33.6**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	101	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-38'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	03	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	**1.4**	**1.0**	**6.69**	**4.92**		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	**318**	**40**	**937**	**118**		20	10/26/2018	78-93-3
2-Hexanone	**72**	**10**	**293**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**166**	**100**	**395**	**238**		20	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**6.2**	**1.0**	**19.7**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	**1.1**	**1.0**	**5.56**	**4.88**		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**98**	**10**	**185**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	**1.8**	**1.0**	**7.64**	**4.34**		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-38'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	03	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**11**	**1.0**	**45.8**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**21**	**2.0**	**74.3**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	**6.0**	**2.0**	**26.2**	**8.68**		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	**2.4**	**2.0**	**9.57**	**8.04**		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	**3.7**	**2.0**	**25.0**	**13.6**		2	10/25/2018	127-18-4
Tetrahydrofuran	**30**	**2.0**	**89.1**	**5.90**		2	10/25/2018	109-99-9
Toluene	**11**	**1.0**	**40.4**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	98.4	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-42'-Dup
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	04	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**1.5**	**1.0**	**6.99**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**143**	**20**	**422**	**59.0**		10	10/26/2018	78-93-3
2-Hexanone	**33**	**10**	**133**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**53**	**10**	**127**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**1.1**	**1.0**	**3.57**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**61**	**10**	**114**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-42'-Dup
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	04	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	< 1.0	1.0	< 4.10	4.10		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	< 2.0	2.0	< 7.04	7.04		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	**23**	**2.0**	**67.2**	**5.90**		2	10/25/2018	109-99-9
Toluene	**3.4**	**1.0**	**12.7**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018	

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-42'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	05	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**1.7**	**1.0**	**8.11**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**186**	**20**	**548**	**59.0**		10	10/26/2018	78-93-3
2-Hexanone	**40**	**10**	**162**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**61**	**10**	**144**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	< 1.0	1.0	< 3.19	3.19		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**67**	**10**	**126**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-42'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	05	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	< 1.0	1.0	< 4.10	4.10		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	< 2.0	2.0	< 7.04	7.04		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	**28**	**2.0**	**82.0**	**5.90**		2	10/25/2018	109-99-9
Toluene	**3.9**	**1.0**	**14.7**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-50'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	06	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	**48**	**4.0**	**141**	**11.8**		2	10/25/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**26**	**10**	**61.4**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	< 1.0	1.0	< 3.19	3.19		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**78**	**10**	**147**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-50'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	06	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	**1.0**	**1.0**	**4.26**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	< 2.0	2.0	< 7.04	7.04		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	< 2.0	2.0	< 5.90	5.90		2	10/25/2018	109-99-9
Toluene	**2.1**	**1.0**	**7.92**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	102	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv	T4	2	10/25/2018	

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-60'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	07	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	**311**	**40**	**918**	**118**		20	10/26/2018	78-93-3
2-Hexanone	**23**	**10**	**94.4**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**343**	**100**	**817**	**238**		20	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**2.7**	**1.0**	**8.55**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-60'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	07	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	< 1.0	1.0	< 4.10	4.10		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**9.1**	**2.0**	**32.0**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	**11**	**2.0**	**32.5**	**5.90**		2	10/25/2018	109-99-9
Toluene	**13**	**1.0**	**48.0**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	**1.1**	**1.0**	**4.28**	**3.96**		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	101.3	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-68'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	08	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	**2.8**	**1.0**	**13.8**	**4.92**		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	**1.0**	**1.0**	**4.92**	**4.92**		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	**77**	**4.0**	**227**	**11.8**		2	10/25/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**77**	**10**	**184**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**10**	**1.0**	**32.3**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**41**	**10**	**77.9**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-68'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	08	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**3.9**	**1.0**	**16.1**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**10**	**2.0**	**36.5**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	**9.1**	**2.0**	**61.7**	**13.6**		2	10/25/2018	127-18-4
Tetrahydrofuran	**6.2**	**2.0**	**18.2**	**5.90**		2	10/25/2018	109-99-9
Toluene	**3.9**	**1.0**	**14.6**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	760	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-80'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	09	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**1.4**	**1.0**	**6.43**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**94**	**20**	**278**	**59.0**		10	10/30/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	**20**	**10**	**48.1**	**24.5**		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**90**	**10**	**213**	**23.8**		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	< 1.0	1.0	< 3.19	3.19		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**86**	**50**	**162**	**94.0**	L5, T4	10	10/30/2018	64-17-5
Ethyl Acetate	**3.3**	**1.0**	**11.8**	**3.60**		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP2-80'
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	09	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**1.0**	**1.0**	**4.18**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**2.5**	**2.0**	**8.87**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	**2.2**	**2.0**	**6.61**	**5.90**		2	10/25/2018	109-99-9
Toluene	**4.6**	**1.0**	**17.3**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	108	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	Background Ambient
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	10	**Matrix:**	Ambient air

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	< 4.0	4.0	< 11.8	11.8		2	10/25/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	< 10	10	< 23.8	23.8		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	< 1.0	1.0	< 3.19	3.19		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**32**	**10**	**60.7**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	Background Ambient
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	10	**Matrix:**	Ambient air

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	< 1.0	1.0	< 4.10	4.10		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	< 2.0	2.0	< 7.04	7.04		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	< 2.0	2.0	< 5.90	5.90		2	10/25/2018	109-99-9
Toluene	< 1.0	1.0	< 3.77	3.77		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	102	70-130	%REC					

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-20
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	11	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**1.0**	**1.0**	**4.66**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**86**	**40**	**254**	**118**		20	10/30/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**135**	**100**	**321**	**238**		20	10/30/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**2.4**	**1.0**	**7.72**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	**3.5**	**1.0**	**13.7**	**3.96**		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	**5.6**	**1.0**	**19.4**	**3.44**		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**37**	**10**	**69.7**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	**1.2**	**1.0**	**5.03**	**4.34**		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-20
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	11	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**4.9**	**1.0**	**20.2**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**5.9**	**2.0**	**20.7**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	**3.8**	**2.0**	**16.7**	**8.68**		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	**12**	**2.0**	**79.1**	**13.6**		2	10/25/2018	127-18-4
Tetrahydrofuran	**228**	**20**	**673**	**59.0**		20	10/30/2018	109-99-9
Toluene	**24**	**1.0**	**89.7**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	**6.9**	**1.0**	**37.1**	**5.37**		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-28
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	12	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	**1.1**	**1.0**	**5.61**	**4.92**		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**1.6**	**1.0**	**7.64**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**88**	**4.0**	**259**	**11.8**		2	10/25/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**301**	**50**	**716**	**119**		10	10/30/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**3.2**	**1.0**	**10.3**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	**7.2**	**1.0**	**24.7**	**3.44**		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**45**	**10**	**84.4**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	**2.2**	**1.0**	**9.72**	**4.34**		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-28
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	12	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**6.5**	**1.0**	**26.5**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**6.8**	**2.0**	**24.0**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	**7.6**	**2.0**	**32.9**	**8.68**		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	**2.1**	**2.0**	**8.28**	**8.04**		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 10	10	< 52.4	52.4		10	10/30/2018	111-84-2
Octane	< 10	10	< 46.7	46.7		10	10/30/2018	111-65-9
o-Xylene	**1.3**	**1.0**	**5.56**	**4.34**		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	**4.2**	**2.0**	**28.2**	**13.6**		2	10/25/2018	127-18-4
Tetrahydrofuran	**96**	**2.0**	**285**	**5.90**		2	10/25/2018	109-99-9
Toluene	**45**	**1.0**	**171**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	**1.5**	**1.0**	**8.16**	**5.37**		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	60	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-38
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	13	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	**1.1**	**1.0**	**5.41**	**4.92**		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	**2.3**	**1.0**	**10.5**	**4.66**		2	10/25/2018	540-84-1
2-Butanone (MEK)	**50**	**40**	**146**	**118**		20	10/30/2018	78-93-3
2-Hexanone	**12**	**10**	**48.4**	**41.0**		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	**293**	**100**	**697**	**238**		20	10/30/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	**3.7**	**1.0**	**11.7**	**3.19**		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	**9.9**	**1.0**	**34.1**	**3.44**		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	**63**	**10**	**118**	**18.8**	L5, T4	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	**2.4**	**1.0**	**10.4**	**4.34**		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-38
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/12/2018
Lab ID:	13	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**10**	**1.0**	**41.2**	**4.10**		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	**9.8**	**2.0**	**34.4**	**7.04**		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	**7.2**	**2.0**	**31.2**	**8.68**		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	**3.3**	**2.0**	**13.1**	**8.04**		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 20	20	< 105	105		20	10/30/2018	111-84-2
Octane	< 20	20	< 93.4	93.4		20	10/30/2018	111-65-9
o-Xylene	**1.0**	**1.0**	**4.43**	**4.34**		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	**7.8**	**2.0**	**52.9**	**13.6**		2	10/25/2018	127-18-4
Tetrahydrofuran	**83**	**20**	**245**	**59.0**		20	10/30/2018	109-99-9
Toluene	**47**	**1.0**	**178**	**3.77**		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	**1.5**	**1.0**	**8.27**	**5.37**		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	105	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-42
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	14	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**1.3**	**1.0**	**6.24**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**42**	**4.0**	**125**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**127**	**50**	**302**	**119**		10	10/30/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**1.1**	**1.0**	**3.57**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	**21**	**10**	**38.8**	**18.8**	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**1.2**	**1.0**	**5.29**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-42
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	14	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**3.7**	**1.0**	**15.1**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**3.2**	**2.0**	**11.3**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**4.2**	**2.0**	**18.2**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/26/2018	111-84-2
Octane	< 10	10	< 46.7	46.7		10	10/30/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**9.9**	**2.0**	**67.4**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**38**	**2.0**	**111**	**5.90**		2	10/26/2018	109-99-9
Toluene	**13**	**1.0**	**48.3**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	**1.3**	**1.0**	**6.98**	**5.37**		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	109	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-42-Dup
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	15	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**1.4**	**1.0**	**6.34**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**41**	**4.0**	**121**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**142**	**50**	**337**	**119**		10	10/30/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**1.1**	**1.0**	**3.38**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	**4.2**	**1.0**	**14.3**	**3.44**		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	**32**	**10**	**60.0**	**18.8**	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**1.3**	**1.0**	**5.64**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-42-Dup
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	15	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**3.8**	**1.0**	**15.7**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**3.0**	**2.0**	**10.7**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**4.0**	**2.0**	**17.4**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/26/2018	111-84-2
Octane	< 10	10	< 46.7	46.7		10	10/30/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**4.0**	**2.0**	**27.3**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**37**	**2.0**	**109**	**5.90**		2	10/26/2018	109-99-9
Toluene	**13**	**1.0**	**49.2**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	**1.3**	**1.0**	**6.87**	**5.37**		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	110	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-50
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	16	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**1.9**	**1.0**	**8.85**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**28**	**4.0**	**83.5**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**128**	**50**	**304**	**119**		10	10/31/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**1.6**	**1.0**	**4.98**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	**6.4**	**1.0**	**21.9**	**3.44**		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**1.5**	**1.0**	**6.60**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-50
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	16	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	**5.8**	**1.0**	**23.9**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**4.2**	**2.0**	**14.6**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**4.3**	**2.0**	**18.8**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	**2.2**	**2.0**	**8.84**	**8.04**		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/26/2018	111-84-2
Octane	< 10	10	< 46.7	46.7		10	10/31/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**8.0**	**2.0**	**54.1**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**10**	**2.0**	**30.6**	**5.90**		2	10/26/2018	109-99-9
Toluene	**19**	**1.0**	**72.9**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	110	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-60
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	17	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**2.1**	**1.0**	**9.69**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**46**	**4.0**	**137**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**56**	**10**	**134**	**23.8**		2	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**2.1**	**1.0**	**6.70**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	**7.7**	**1.0**	**26.6**	**3.44**		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**1.8**	**1.0**	**7.73**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-60
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	17	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**6.6**	**1.0**	**26.9**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**5.4**	**2.0**	**19.1**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**5.4**	**2.0**	**23.3**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	**2.6**	**2.0**	**10.3**	**8.04**		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5		2	11/6/2018	111-84-2
Octane	**3.0**	**2.0**	**14.2**	**9.34**		2	11/6/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**15**	**2.0**	**104**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**19**	**2.0**	**55.9**	**5.90**		2	10/26/2018	109-99-9
Toluene	**20**	**1.0**	**73.5**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	108	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv	T4	2	10/26/2018	

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-70
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	18	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**2.4**	**1.0**	**11.4**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**54**	**4.0**	**159**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**89**	**10**	**211**	**23.8**		2	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**7.6**	**1.0**	**24.2**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	**4.3**	**1.0**	**21.1**	**4.88**		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	**11**	**1.0**	**37.5**	**3.44**		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**2.1**	**1.0**	**8.94**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-70
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	18	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR	**TO-15**						Analyst: JJ	
Heptane	**10**	**1.0**	**42.4**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**13**	**2.0**	**46.2**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**5.9**	**2.0**	**25.7**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	**3.4**	**2.0**	**13.7**	**8.04**		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 20	20	< 105	105		20	10/31/2018	111-84-2
Octane	< 20	20	< 93.4	93.4		20	10/31/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**365**	**20**	**2,480**	**136**		20	10/31/2018	127-18-4
Tetrahydrofuran	**41**	**2.0**	**122**	**5.90**		2	10/26/2018	109-99-9
Toluene	**21**	**1.0**	**80.2**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	**8.3**	**1.0**	**44.5**	**5.37**		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	109	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-80
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	19	**Matrix:**	Soil Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/26/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/26/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/26/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/26/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/26/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/26/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/26/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/26/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/26/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/26/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	123-91-1
2,2,4-Trimethylpentane	**2.1**	**1.0**	**9.60**	**4.66**		2	10/26/2018	540-84-1
2-Butanone (MEK)	**41**	**4.0**	**121**	**11.8**		2	10/26/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/26/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/26/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/26/2018	108-10-1
Acetone	**76**	**10**	**181**	**23.8**		2	10/26/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/26/2018	107-05-1
Benzene	**2.0**	**1.0**	**6.32**	**3.19**		2	10/26/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/26/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/26/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/26/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/26/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/26/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/26/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/26/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/26/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/26/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/26/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/26/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Cyclohexane	**8.3**	**1.0**	**28.5**	**3.44**		2	10/26/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/26/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/26/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/26/2018	76-14-2
Ethanol	**31**	**10**	**57.8**	**18.8**	L5, T4	2	10/26/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/26/2018	141-78-6
Ethylbenzene	**1.4**	**1.0**	**6.16**	**4.34**		2	10/26/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP1-SV-80
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/13/2018
Lab ID:	19	**Matrix:**	Soil Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	**6.8**	**1.0**	**27.8**	**4.10**		2	10/26/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/26/2018	87-68-3
Hexane	**4.8**	**2.0**	**16.8**	**7.04**		2	10/26/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	98-82-8
m&p-Xylene	**3.7**	**2.0**	**16.0**	**8.68**		2	10/26/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/26/2018	1634-04-4
Methylcyclohexane	**2.6**	**2.0**	**10.5**	**8.04**		2	10/26/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/26/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/26/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5		2	11/6/2018	111-84-2
Octane	**4.0**	**2.0**	**18.8**	**9.34**		2	11/6/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/26/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/26/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/26/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/26/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/26/2018	98-06-6
Tetrachloroethene	**26**	**2.0**	**178**	**13.6**		2	10/26/2018	127-18-4
Tetrahydrofuran	**18**	**2.0**	**54.0**	**5.90**		2	10/26/2018	109-99-9
Toluene	**20**	**1.0**	**74.6**	**3.77**		2	10/26/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/26/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/26/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/26/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/26/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/26/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/26/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/26/2018	75-01-4
Surr: 4-Bromofluorobenzene	111	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	90	20	ppbv		T4	2	10/26/2018

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP-EB
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/17/2018
Lab ID:	20	**Matrix:**	Vapor

	ppbv		ug/M^3				Date	
Analyses	**Result**	**Limit**	**Result**	**Limit**	**Qual**	**DF**	**Analyzed**	**CAS#**
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 1.0	1.0	< 6.87	6.87		2	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 1.0	1.0	< 5.46	5.46		2	10/25/2018	79-00-5
1,1-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	75-34-3
1,1-Dichloroethene	< 1.0	1.0	< 3.97	3.97		2	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 4.0	4.0	< 29.7	29.7		2	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	95-63-6
1,2-Dibromoethane	< 1.0	1.0	< 7.68	7.68		2	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	95-50-1
1,2-Dichloroethane	< 1.0	1.0	< 4.05	4.05		2	10/25/2018	107-06-2
1,2-Dichloropropane	< 1.0	1.0	< 4.62	4.62		2	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 1.0	1.0	< 4.92	4.92		2	10/25/2018	108-67-8
1,3-Butadiene	< 1.0	1.0	< 2.21	2.21	L5	2	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 1.0	1.0	< 6.01	6.01		2	10/25/2018	106-46-7
1,4-Dioxane	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 1.0	1.0	< 4.66	4.66		2	10/25/2018	540-84-1
2-Butanone (MEK)	< 4.0	4.0	< 11.8	11.8		2	10/25/2018	78-93-3
2-Hexanone	< 10	10	< 41.0	41.0		2	10/25/2018	591-78-6
2-Propanol (IPA)	< 10	10	< 24.5	24.5		2	10/25/2018	67-63-0
4-Ethyltoluene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 10	10	< 41.0	41.0		2	10/25/2018	108-10-1
Acetone	< 10	10	< 23.8	23.8		2	10/25/2018	67-64-1
Allyl chloride	< 2.0	2.0	< 6.26	6.26		2	10/25/2018	107-05-1
Benzene	< 1.0	1.0	< 3.19	3.19		2	10/25/2018	71-43-2
Benzyl chloride	< 4.0	4.0	< 20.7	20.7		2	10/25/2018	100-44-7
Bromodichloromethane	< 1.0	1.0	< 6.70	6.70		2	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 1.0	1.0	< 4.37	4.37		2	10/25/2018	593-60-2
Bromoform	< 1.0	1.0	< 10.3	10.3		2	10/25/2018	75-25-2
Bromomethane	< 1.0	1.0	< 3.88	3.88		2	10/25/2018	74-83-9
Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	104-51-8
Carbon disulfide	< 4.0	4.0	< 12.4	12.4		2	10/25/2018	75-15-0
Carbon tetrachloride	< 1.0	1.0	< 6.29	6.29		2	10/25/2018	56-23-5
Chlorobenzene	< 1.0	1.0	< 4.60	4.60		2	10/25/2018	108-90-7
Chloroethane	< 1.0	1.0	< 2.64	2.64		2	10/25/2018	75-00-3
Chloroform	< 1.0	1.0	< 4.88	4.88		2	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		2	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Cyclohexane	< 1.0	1.0	< 3.44	3.44		2	10/25/2018	110-82-7
Dibromochloromethane	< 1.0	1.0	< 8.52	8.52		2	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 2.0	2.0	< 9.90	9.90		2	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 1.0	1.0	< 6.99	6.99		2	10/25/2018	76-14-2
Ethanol	< 10	10	< 18.8	18.8	L5	2	10/25/2018	64-17-5
Ethyl Acetate	< 1.0	1.0	< 3.60	3.60		2	10/25/2018	141-78-6
Ethylbenzene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	SP-EB
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	10/17/2018
Lab ID:	20	**Matrix:**	Vapor

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst:	JJ
Heptane	< 1.0	1.0	< 4.10	4.10		2	10/25/2018	142-82-5
Hexachlorobutadiene	< 2.0	2.0	< 21.3	21.3	L5	2	10/25/2018	87-68-3
Hexane	< 2.0	2.0	< 7.04	7.04		2	10/25/2018	110-54-3
Isopropylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	98-82-8
m&p-Xylene	< 2.0	2.0	< 8.68	8.68		2	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 4.0	4.0	< 14.4	14.4		2	10/25/2018	1634-04-4
Methylcyclohexane	< 2.0	2.0	< 8.04	8.04		2	10/25/2018	108-87-2
Methylene chloride	< 4.0	4.0	< 13.9	13.9		2	10/25/2018	75-09-2
Naphthalene	< 10	10	< 52.4	52.4		2	10/25/2018	91-20-3
Nonane	< 2.0	2.0	< 10.5	10.5	L5	2	10/25/2018	111-84-2
Octane	< 2.0	2.0	< 9.34	9.34	L5	2	10/25/2018	111-65-9
o-Xylene	< 1.0	1.0	< 4.34	4.34		2	10/25/2018	95-47-6
Propene (Propylene)	< 2.0	2.0	< 3.44	3.44		2	10/25/2018	115-07-1
Propylbenzene	< 2.0	2.0	< 9.84	9.84		2	10/25/2018	103-65-1
Sec-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	135-98-8
Styrene	< 1.0	1.0	< 4.26	4.26		2	10/25/2018	100-42-5
Tert-Butyl benzene	< 2.0	2.0	< 11.0	11.0		2	10/25/2018	98-06-6
Tetrachloroethene	< 2.0	2.0	< 13.6	13.6		2	10/25/2018	127-18-4
Tetrahydrofuran	< 2.0	2.0	< 5.90	5.90		2	10/25/2018	109-99-9
Toluene	< 1.0	1.0	< 3.77	3.77		2	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 1.0	1.0	< 3.96	3.96		2	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 1.0	1.0	< 4.54	4.54		2	10/25/2018	542-75-6
Trichloroethene	< 1.0	1.0	< 5.37	5.37		2	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 1.0	1.0	< 5.62	5.62		2	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 1.0	1.0	< 7.66	7.66		2	10/25/2018	76-13-1
Vinyl acetate	< 1.0	1.0	< 3.52	3.52		2	10/25/2018	108-05-4
Vinyl chloride	< 1.0	1.0	< 2.56	2.56		2	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	100	70-130	%REC					

Tentatively Identified Compounds (TIC's)

Difluoroethane	< 20	20	ppbv		T4	2	10/25/2018	

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011025 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	10/25/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 0.5	0.5	< 3.44	3.44		1	10/25/2018	79-34-5
1,1,2-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	10/25/2018	79-00-5
1,1-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	10/25/2018	75-34-3
1,1-Dichloroethene	< 0.5	0.5	< 1.99	1.99		1	10/25/2018	75-35-4
1,2,4-Trichlorobenzene	< 2.0	2.0	< 14.8	14.8		1	10/25/2018	120-82-1
1,2,4-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	10/25/2018	95-63-6
1,2-Dibromoethane	< 0.5	0.5	< 3.84	3.84		1	10/25/2018	106-93-4
1,2-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/25/2018	95-50-1
1,2-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	10/25/2018	107-06-2
1,2-Dichloropropane	< 0.5	0.5	< 2.31	2.31		1	10/25/2018	78-87-5
1,3,5-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	10/25/2018	108-67-8
1,3-Butadiene	< 0.5	0.5	< 1.11	1.11		1	10/25/2018	106-99-0
1,3-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/25/2018	541-73-1
1,4-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/25/2018	106-46-7
1,4-Dioxane	< 2.0	2.0	< 7.20	7.20		1	10/25/2018	123-91-1
2,2,4-Trimethylpentane	< 0.5	0.5	< 2.33	2.33		1	10/25/2018	540-84-1
2-Butanone (MEK)	< 2.0	2.0	< 5.90	5.90		1	10/25/2018	78-93-3
2-Hexanone	< 5.0	5.0	< 20.5	20.5		1	10/25/2018	591-78-6
2-Propanol (IPA)	< 5.0	5.0	< 12.3	12.3		1	10/25/2018	67-63-0
4-Ethyltoluene	< 1.0	1.0	< 4.92	4.92		1	10/25/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 5.0	5.0	< 20.5	20.5		1	10/25/2018	108-10-1
Acetone	< 5.0	5.0	< 11.9	11.9		1	10/25/2018	67-64-1
Allyl chloride	< 1.0	1.0	< 3.13	3.13		1	10/25/2018	107-05-1
Benzene	< 0.5	0.5	< 1.60	1.60		1	10/25/2018	71-43-2
Benzyl chloride	< 2.0	2.0	< 10.4	10.4		1	10/25/2018	100-44-7
Bromodichloromethane	< 0.5	0.5	< 3.35	3.35		1	10/25/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 0.5	0.5	< 2.19	2.19		1	10/25/2018	593-60-2
Bromoform	< 0.5	0.5	< 5.17	5.17		1	10/25/2018	75-25-2
Bromomethane	< 0.5	0.5	< 1.94	1.94		1	10/25/2018	74-83-9
Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/25/2018	104-51-8
Carbon disulfide	< 2.0	2.0	< 6.22	6.22		1	10/25/2018	75-15-0
Carbon tetrachloride	< 0.5	0.5	< 3.15	3.15		1	10/25/2018	56-23-5
Chlorobenzene	< 0.5	0.5	< 2.30	2.30		1	10/25/2018	108-90-7
Chloroethane	< 0.5	0.5	< 1.32	1.32		1	10/25/2018	75-00-3
Chloroform	< 0.5	0.5	< 2.44	2.44		1	10/25/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		1	10/25/2018	74-87-3
cis-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	10/25/2018	156-59-2
cis-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	10/25/2018	542-75-6
Cyclohexane	< 0.5	0.5	< 1.72	1.72		1	10/25/2018	110-82-7
Dibromochloromethane	< 0.5	0.5	< 4.26	4.26		1	10/25/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 1.0	1.0	< 4.95	4.95		1	10/25/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 0.5	0.5	< 3.50	3.50		1	10/25/2018	76-14-2
Ethanol	< 5.0	5.0	< 9.40	9.40		1	10/25/2018	64-17-5
Ethyl Acetate	< 0.5	0.5	< 1.80	1.80		1	10/25/2018	141-78-6
Ethylbenzene	< 0.5	0.5	< 2.17	2.17		1	10/25/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011025 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	< 0.5	0.5	< 2.05	2.05		1	10/25/2018	142-82-5
Hexachlorobutadiene	< 1.0	1.0	< 10.7	10.7		1	10/25/2018	87-68-3
Hexane	< 1.0	1.0	< 3.52	3.52		1	10/25/2018	110-54-3
Isopropylbenzene	< 1.0	1.0	< 4.92	4.92		1	10/25/2018	98-82-8
m&p-Xylene	< 1.0	1.0	< 4.34	4.34		1	10/25/2018	179601-23-1
Methyl tert-butyl ether	< 2.0	2.0	< 7.22	7.22		1	10/25/2018	1634-04-4
Methylcyclohexane	< 1.0	1.0	< 4.02	4.02		1	10/25/2018	108-87-2
Methylene chloride	< 2.0	2.0	< 6.94	6.94		1	10/25/2018	75-09-2
Naphthalene	< 2.0	2.0	< 10.5	10.5		1	10/25/2018	91-20-3
Nonane	< 1.0	1.0	< 5.24	5.24		1	10/25/2018	111-84-2
Octane	< 1.0	1.0	< 4.67	4.67		1	10/25/2018	111-65-9
o-Xylene	< 0.5	0.5	< 2.17	2.17		1	10/25/2018	95-47-6
Propene (Propylene)	< 1.0	1.0	< 1.72	1.72		1	10/25/2018	115-07-1
Propylbenzene	< 1.0	1.0	< 4.92	4.92		1	10/25/2018	103-65-1
Sec-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/25/2018	135-98-8
Styrene	< 0.5	0.5	< 2.13	2.13		1	10/25/2018	100-42-5
Tert-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/25/2018	98-06-6
Tetrachloroethene	< 1.0	1.0	< 6.78	6.78		1	10/25/2018	127-18-4
Tetrahydrofuran	< 1.0	1.0	< 2.95	2.95		1	10/25/2018	109-99-9
Toluene	< 0.5	0.5	< 1.89	1.89		1	10/25/2018	108-88-3
trans-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	10/25/2018	156-60-5
trans-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	10/25/2018	542-75-6
Trichloroethene	< 0.5	0.5	< 2.69	2.69		1	10/25/2018	79-01-6
Trichlorofluoromethane(F-11)	< 0.5	0.5	< 2.81	2.81		1	10/25/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 0.5	0.5	< 3.83	3.83		1	10/25/2018	76-13-1
Vinyl acetate	< 0.5	0.5	< 1.76	1.76		1	10/25/2018	108-05-4
Vinyl chloride	< 0.5	0.5	< 1.28	1.28		1	10/25/2018	75-01-4
Surr: 4-Bromofluorobenzene	96.3	70-130	%REC					

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 10/25/2018 Batch: MS011025 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
Propene (Propylene)	12.5	125	12.3	123	10.0	1.8	ppbv			
Dichlorodifluoromethane(F-12)	10.3	103	10.2	102	10.0	1.0	ppbv			
Chloromethane	11.6	116	11.4	114	10.0	2.0	ppbv			
Dichlorotetrafluoroethane(F-114)	9.8	98.4	10.1	101	10.0	2.9	ppbv			
Vinyl Chloride	12.0	120	11.8	118	10.0	1.8	ppbv			
1,3-Butadiene	13.4	134	13.2	132	10.0	1.8	ppbv	L5	L5	
Bromomethane	10.2	102	10.4	104	10.0	2.0	ppbv			
Chloroethane	10.7	107	11.3	113	10.0	4.8	ppbv			
Ethanol	15.2	152	15.1	151	10.0	0.6	ppbv	L5	L5	
Bromoethene(Vinyl Bromide)	10.5	105	10.8	108	10.0	3.1	ppbv			
Trichlorofluoromethane (F-11)	10.4	104	10.8	108	10.0	4.5	ppbv			
Acetone	10.4	104	10.7	107	10.0	3.4	ppbv			
Isopropyl Alcohol (2-Propanol)	10.0	100	10.8	108	10.0	7.6	ppbv			
1,1-Dichloroethene	10.0	100	10.3	103	10.0	2.5	ppbv			
Trichlorotrifluoroethane (F-113)	9.1	90.7	9.4	94.1	10.0	3.7	ppbv			
Methylene Chloride	11.9	119	11.9	119	10.0	0.5	ppbv			
Allyl Chloride	8.8	87.8	9.5	95.3	10.0	8.2	ppbv			
Carbon disulfide	9.7	96.9	10.0	99.9	10.0	3.0	ppbv			
trans-1,2-Dichloroethene	8.5	84.9	8.9	89.1	10.0	4.8	ppbv			
Methyl tert-butyl ether	7.2	72.4	8.0	80.3	10.0	10.3	ppbv			
1,1-Dichloroethane	10.1	101	10.3	103	10.0	1.7	ppbv			
Vinyl acetate	10.4	104	11.0	110	10.0	5.6	ppbv			
2-Butanone (MEK)	8.2	82.0	8.9	88.7	10.0	7.9	ppbv			
Hexane	10.0	99.5	10.3	103	10.0	3.2	ppbv			
cis-1,2-Dichloroethene	8.4	84.0	8.6	86.3	10.0	2.7	ppbv			
Ethyl Acetate	10.1	101	11.0	110	10.0	8.6	ppbv			
Chloroform	9.0	89.5	9.2	92.3	10.0	3.1	ppbv			
Tetrahydrofuran	10.6	106	11.3	113	10.0	5.9	ppbv			
1,1,1-Trichloroethane	8.8	87.7	9.1	91.3	10.0	4.0	ppbv			
1,2-Dichloroethane	10.6	106	10.8	108	10.0	2.6	ppbv			
Benzene	8.5	84.8	8.8	88.2	10.0	3.9	ppbv			
Carbon tetrachloride	9.9	99.4	10.3	103	10.0	3.6	ppbv			
Cyclohexane	10.3	103	10.6	106	10.0	2.8	ppbv			
2,2,4-Trimethylpentane	10.5	105	10.6	106	10.0	1.8	ppbv			
Heptane	11.9	119	11.8	118	10.0	0.4	ppbv			
1,2-Dichloropropane	9.7	96.9	9.9	99.2	10.0	2.3	ppbv			
Trichloroethene	8.9	88.7	9.3	93.0	10.0	4.7	ppbv			
Bromodichloromethane	9.7	97.3	10.0	100	10.0	2.8	ppbv			
1,4-Dioxane	7.3	72.6	7.6	76.3	10.0	5.0	ppbv			
Methylcyclohexane	9.6	95.5	9.8	97.7	10.0	2.3	ppbv			
cis-1,3-Dichloropropene	9.4	93.5	9.8	97.6	10.0	4.3	ppbv			
4-methyl-2-pentanone	10.5	105	10.7	107	10.0	2.1	ppbv			
trans-1,3-Dichloropropene	8.7	86.6	9.1	90.6	10.0	4.5	ppbv			
Toluene	8.6	86.3	9.0	89.6	10.0	3.8	ppbv			

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 10/25/2018 Batch: MS011025 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
1,1,2-Trichloroethane	8.5	85.1	8.9	88.6	10.0	4.0	ppbv			
2-Hexanone	10.8	108	11.5	115	10.0	5.8	ppbv			
n-Octane	13.9	139	13.8	138	10.0	0.5	ppbv	L5	L5	
Dibromochloromethane	10.0	99.6	10.3	103	10.0	3.1	ppbv			
1,2-Dibromoethane	9.0	89.8	9.4	93.6	10.0	4.1	ppbv			
Tetrachloroethene	10.2	102	10.4	104	10.0	2.5	ppbv			
Chlorobenzene	8.3	83.1	8.5	84.9	10.0	2.1	ppbv			
Ethylbenzene	8.2	82.4	8.6	86.4	10.0	4.7	ppbv			
m&p-Xylene	17.1	85.6	17.8	89.1	20.0	4.0	ppbv			
Bromoform	11.8	118	12.2	122	10.0	3.4	ppbv			
Styrene	8.3	83.1	8.8	87.7	10.0	5.4	ppbv			
Nonane	14.0	140	14.1	141	10.0	0.5	ppbv	L5	L5	
o-Xylene	10.6	106	10.9	109	10.0	2.9	ppbv			
1,1,2,2-Tetrachloroethane	8.9	88.9	9.0	89.7	10.0	0.9	ppbv			
Isopropylbenzene	9.5	95.2	10.1	101	10.0	5.5	ppbv			
n-Propylbenzene	9.6	95.7	10.0	99.9	10.0	4.3	ppbv			
4-Ethyltoluene	9.0	89.7	9.4	94.2	10.0	4.9	ppbv			
1,3,5-Trimethylbenzene	9.1	90.8	9.4	94.2	10.0	3.7	ppbv			
Tert-Butyl Benzene	10.5	105	11.0	110	10.0	4.9	ppbv			
1,2,4-Trimethylbenzene	9.3	93.3	9.6	96.1	10.0	3.0	ppbv			
Sec-Butyl Benzene	10.2	102	10.6	106	10.0	4.0	ppbv			
1,3-Dichlorobenzene	9.4	93.6	9.8	97.9	10.0	4.5	ppbv			
Benzyl chloride	8.1	81.2	8.8	87.7	10.0	7.7	ppbv			
1,4-Dichlorobenzene	9.3	93.4	9.8	97.6	10.0	4.4	ppbv			
1,2-Dichlorobenzene	9.3	93.4	9.7	96.5	10.0	3.3	ppbv			
n-Butyl Benzene	9.6	95.8	10.1	101	10.0	4.8	ppbv			
1,2,4-Trichlorobenzene	11.9	119	12.9	129	10.0	8.6	ppbv			
Naphthalene	8.7	86.6	9.5	94.5	10.0	8.7	ppbv			
Hexachlorobutadiene	17.0	170	18.0	180	10.0	5.6	ppbv	L5	L5	
Surr: 4-Bromofluorobenzene	11.1	111	10.9	109			%REC			
		70-130%		70-130%						

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011030 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	10/30/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 0.5	0.5	< 3.44	3.44		1	10/30/2018	79-34-5
1,1,2-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	10/30/2018	79-00-5
1,1-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	10/30/2018	75-34-3
1,1-Dichloroethene	< 0.5	0.5	< 1.99	1.99		1	10/30/2018	75-35-4
1,2,4-Trichlorobenzene	< 2.0	2.0	< 14.8	14.8		1	10/30/2018	120-82-1
1,2,4-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	10/30/2018	95-63-6
1,2-Dibromoethane	< 0.5	0.5	< 3.84	3.84		1	10/30/2018	106-93-4
1,2-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/30/2018	95-50-1
1,2-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	10/30/2018	107-06-2
1,2-Dichloropropane	< 0.5	0.5	< 2.31	2.31		1	10/30/2018	78-87-5
1,3,5-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	10/30/2018	108-67-8
1,3-Butadiene	< 0.5	0.5	< 1.11	1.11		1	10/30/2018	106-99-0
1,3-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/30/2018	541-73-1
1,4-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	10/30/2018	106-46-7
1,4-Dioxane	< 2.0	2.0	< 7.20	7.20		1	10/30/2018	123-91-1
2,2,4-Trimethylpentane	< 0.5	0.5	< 2.33	2.33		1	10/30/2018	540-84-1
2-Butanone (MEK)	< 2.0	2.0	< 5.9	5.9		1	10/30/2018	78-93-3
2-Hexanone	< 5.0	5.0	< 20.5	20.5		1	10/30/2018	591-78-6
2-Propanol (IPA)	< 5.0	5.0	< 12.3	12.3		1	10/30/2018	67-63-0
4-Ethyltoluene	< 1.0	1.0	< 4.92	4.92		1	10/30/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 5.0	5.0	< 20.5	20.5		1	10/30/2018	108-10-1
Acetone	< 5.0	5.0	< 11.9	11.9		1	10/30/2018	67-64-1
Allyl chloride	< 1.0	1.0	< 3.13	3.13		1	10/30/2018	107-05-1
Benzene	< 0.5	0.5	< 1.60	1.60		1	10/30/2018	71-43-2
Benzyl chloride	< 2.0	2.0	< 10.4	10.4		1	10/30/2018	100-44-7
Bromodichloromethane	< 0.5	0.5	< 3.35	3.35		1	10/30/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 0.5	0.5	< 2.19	2.19		1	10/30/2018	593-60-2
Bromoform	< 0.5	0.5	< 5.17	5.17		1	10/30/2018	75-25-2
Bromomethane	< 0.5	0.5	< 1.94	1.94		1	10/30/2018	74-83-9
Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/30/2018	104-51-8
Carbon disulfide	< 2.0	2.0	< 6.22	6.22		1	10/30/2018	75-15-0
Carbon tetrachloride	< 0.5	0.5	< 3.15	3.15		1	10/30/2018	56-23-5
Chlorobenzene	< 0.5	0.5	< 2.30	2.30		1	10/30/2018	108-90-7
Chloroethane	< 0.5	0.5	< 1.32	1.32		1	10/30/2018	75-00-3
Chloroform	< 0.5	0.5	< 2.44	2.44		1	10/30/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		1	10/30/2018	74-87-3
cis-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	10/30/2018	156-59-2
cis-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	10/30/2018	542-75-6
Cyclohexane	< 0.5	0.5	< 1.72	1.72		1	10/30/2018	110-82-7
Dibromochloromethane	< 0.5	0.5	< 4.26	4.26		1	10/30/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 1.0	1.0	< 4.95	4.95		1	10/30/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 0.5	0.5	< 3.50	3.50		1	10/30/2018	76-14-2
Ethanol	< 5.0	5.0	< 9.40	9.40		1	10/30/2018	64-17-5
Ethyl Acetate	< 0.5	0.5	< 1.80	1.80		1	10/30/2018	141-78-6
Ethylbenzene	< 0.5	0.5	< 2.17	2.17		1	10/30/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011030 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	< 0.5	0.5	< 2.05	2.05		1	10/30/2018	142-82-5
Hexachlorobutadiene	< 1.0	1.0	< 10.7	10.7		1	10/30/2018	87-68-3
Hexane	< 1.0	1.0	< 3.52	3.52		1	10/30/2018	110-54-3
Isopropylbenzene	< 1.0	1.0	< 4.92	4.92		1	10/30/2018	98-82-8
m&p-Xylene	< 1.0	1.0	< 4.34	4.34		1	10/30/2018	179601-23-1
Methyl tert-butyl ether	< 2.0	2.0	< 7.22	7.22		1	10/30/2018	1634-04-4
Methylcyclohexane	< 1.0	1.0	< 4.02	4.02		1	10/30/2018	108-87-2
Methylene chloride	< 2.0	2.0	< 6.94	6.94		1	10/30/2018	75-09-2
Naphthalene	< 2.0	2.0	< 10.5	10.5		1	10/30/2018	91-20-3
Nonane	< 1.0	1.0	< 5.24	5.24		1	10/30/2018	111-84-2
Octane	< 1.0	1.0	< 4.67	4.67		1	10/30/2018	111-65-9
o-Xylene	< 0.5	0.5	< 2.17	2.17		1	10/30/2018	95-47-6
Propene (Propylene)	< 1.0	1.0	< 1.72	1.72		1	10/30/2018	115-07-1
Propylbenzene	< 1.0	1.0	< 4.92	4.92		1	10/30/2018	103-65-1
Sec-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/30/2018	135-98-8
Styrene	< 0.5	0.5	< 2.13	2.13		1	10/30/2018	100-42-5
Tert-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	10/30/2018	98-06-6
Tetrachloroethene	< 1.0	1.0	< 6.78	6.78		1	10/30/2018	127-18-4
Tetrahydrofuran	< 1.0	1.0	< 2.95	2.95		1	10/30/2018	109-99-9
Toluene	< 0.5	0.5	< 1.89	1.89		1	10/30/2018	108-88-3
trans-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	10/30/2018	156-60-5
trans-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	10/30/2018	542-75-6
Trichloroethene	< 0.5	0.5	< 2.69	2.69		1	10/30/2018	79-01-6
Trichlorofluoromethane(F-11)	< 0.5	0.5	< 2.81	2.81		1	10/30/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 0.5	0.5	< 3.83	3.83		1	10/30/2018	76-13-1
Vinyl acetate	< 0.5	0.5	< 1.76	1.76		1	10/30/2018	108-05-4
Vinyl chloride	< 0.5	0.5	< 1.28	1.28		1	10/30/2018	75-01-4
Surr: 4-Bromofluorobenzene	98.6	70-130	%REC					

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 10/30/2018 Batch: MS011030 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
Propene (Propylene)	12.3	123	12.2	122	10.0	1.1	ppbv			
Dichlorodifluoromethane(F-12)	12.4	124	12.5	125	10.0	1.0	ppbv			
Chloromethane	14.7	147	14.6	146	10.0	1.2	ppbv	L5	L5	
Dichlorotetrafluoroethane(F-114)	12.1	121	11.9	119	10.0	1.6	ppbv			
Vinyl Chloride	12.3	123	12.3	123	10.0	0.2	ppbv			
1,3-Butadiene	14.8	148	15.0	150	10.0	1.1	ppbv	L5	L5	
Bromomethane	10.9	109	10.8	108	10.0	0.7	ppbv			
Chloroethane	11.4	114	11.0	110	10.0	3.3	ppbv			
Ethanol	14.2	142	13.7	137	10.0	3.9	ppbv	L5	L5	
Bromoethene(Vinyl Bromide)	11.0	110	10.9	109	10.0	0.6	ppbv			
Trichlorofluoromethane (F-11)	12.7	127	12.4	124	10.0	2.0	ppbv			
Acetone	8.7	86.9	9.1	90.5	10.0	4.1	ppbv			
Isopropyl Alcohol (2-Propanol)	9.8	98.2	9.8	98.2	10.0	0.0	ppbv			
1,1-Dichloroethene	10.4	104	10.2	102	10.0	1.5	ppbv			
Trichlorotrifluoroethane (F-113)	9.0	89.5	9.2	92.1	10.0	2.9	ppbv			
Methylene Chloride	11.1	111	11.4	114	10.0	2.7	ppbv			
Allyl Chloride	8.1	80.8	8.4	83.9	10.0	3.8	ppbv			
Carbon disulfide	9.3	93.2	9.3	93.3	10.0	0.1	ppbv			
trans-1,2-Dichloroethene	7.9	78.9	8.1	80.6	10.0	2.1	ppbv			
Methyl tert-butyl ether	8.4	83.8	8.4	83.9	10.0	0.1	ppbv			
1,1-Dichloroethane	8.9	89.0	9.4	93.5	10.0	4.9	ppbv			
Vinyl acetate	10.1	101	10.1	101	10.0	0.1	ppbv			
2-Butanone (MEK)	7.8	78.3	7.9	79.1	10.0	1.0	ppbv			
Hexane	8.9	88.8	9.2	92.4	10.0	4.0	ppbv			
cis-1,2-Dichloroethene	7.6	76.2	7.7	77.1	10.0	1.2	ppbv			
Ethyl Acetate	10.2	102	10.1	101	10.0	1.2	ppbv			
Chloroform	9.3	93.3	9.3	92.9	10.0	0.4	ppbv			
Tetrahydrofuran	10.1	101	10.5	105	10.0	3.7	ppbv			
1,1,1-Trichloroethane	9.9	99.0	10.2	102	10.0	2.7	ppbv			
1,2-Dichloroethane	11.1	111	11.1	111	10.0	0.1	ppbv			
Benzene	7.4	74.4	7.6	75.5	10.0	1.5	ppbv			
Carbon tetrachloride	11.4	114	11.8	118	10.0	3.8	ppbv			
Cyclohexane	9.4	93.7	9.7	97.3	10.0	3.8	ppbv			
2,2,4-Trimethylpentane	9.3	93.4	9.3	92.9	10.0	0.5	ppbv			
Heptane	11.7	117	11.3	113	10.0	3.2	ppbv			
1,2-Dichloropropane	8.5	85.4	8.4	83.6	10.0	2.1	ppbv			
Trichloroethene	8.1	80.7	8.0	80.0	10.0	0.9	ppbv			
Bromodichloromethane	9.5	95.4	9.5	94.7	10.0	0.7	ppbv			
1,4-Dioxane	7.3	73.2	7.3	73.3	10.0	0.1	ppbv			
Methylcyclohexane	8.7	86.9	8.8	88.0	10.0	1.3	ppbv			
cis-1,3-Dichloropropene	8.5	84.5	8.3	82.8	10.0	2.0	ppbv			
4-methyl-2-pentanone	9.7	96.6	9.6	95.5	10.0	1.1	ppbv			
trans-1,3-Dichloropropene	8.4	83.6	8.4	84.4	10.0	1.0	ppbv			
Toluene	7.7	77.1	7.7	77.2	10.0	0.1	ppbv			

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 10/30/2018 Batch: MS011030 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
1,1,2-Trichloroethane	7.7	77.4	7.6	75.7	10.0	2.2	ppbv			
2-Hexanone	10.6	106	10.3	103	10.0	2.7	ppbv			
n-Octane	12.5	125	12.0	120	10.0	4.3	ppbv			
Dibromochloromethane	9.6	96.3	9.5	95.4	10.0	0.9	ppbv			
1,2-Dibromoethane	8.1	80.5	8.0	80.3	10.0	0.2	ppbv			
Tetrachloroethene	9.4	93.6	9.3	92.8	10.0	0.9	ppbv			
Chlorobenzene	7.5	74.9	7.4	74.3	10.0	0.8	ppbv			
Ethylbenzene	7.4	73.5	7.3	72.8	10.0	1.0	ppbv			
m&p-Xylene	15.4	76.8	14.9	74.3	20.0	3.3	ppbv			
Bromoform	11.1	111	11.0	110	10.0	1.1	ppbv			
Styrene	7.6	76.3	7.5	75.3	10.0	1.3	ppbv			
Nonane	12.7	127	12.3	123	10.0	3.0	ppbv			
o-Xylene	9.1	90.7	8.9	88.6	10.0	2.3	ppbv			
1,1,2,2-Tetrachloroethane	7.7	77.3	7.7	77.2	10.0	0.1	ppbv			
Isopropylbenzene	9.4	93.5	9.2	92.2	10.0	1.4	ppbv			
n-Propylbenzene	9.3	93.2	9.1	90.8	10.0	2.6	ppbv			
4-Ethyltoluene	8.7	86.8	8.6	85.8	10.0	1.2	ppbv			
1,3,5-Trimethylbenzene	8.9	88.8	8.8	87.7	10.0	1.2	ppbv			
Tert-Butyl Benzene	10.0	100	10.0	100	10.0	0.6	ppbv			
1,2,4-Trimethylbenzene	8.9	89.2	8.8	88.1	10.0	1.2	ppbv			
Sec-Butyl Benzene	9.5	95.2	9.3	93.2	10.0	2.1	ppbv			
1,3-Dichlorobenzene	8.4	83.9	8.3	82.8	10.0	1.3	ppbv			
Benzyl chloride	8.1	80.5	7.9	79.4	10.0	1.4	ppbv			
1,4-Dichlorobenzene	8.3	82.9	8.3	82.9	10.0	0.0	ppbv			
1,2-Dichlorobenzene	8.3	83.0	8.4	83.8	10.0	1.0	ppbv			
n-Butyl Benzene	9.0	89.7	8.8	88.2	10.0	1.7	ppbv			
1,2,4-Trichlorobenzene	11.6	116	11.8	118	10.0	1.7	ppbv			
Naphthalene	8.3	83.1	8.5	85.2	10.0	2.5	ppbv			
Hexachlorobutadiene	16.3	163	16.0	160	10.0	1.8	ppbv	L5	L5	
Surr: 4-Bromofluorobenzene	12.1	121	12.0	120			%REC			
		70-130%		70-130%						

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011106 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	CAS#
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
1,1,1-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	11/6/2018	71-55-6
1,1,2,2-Tetrachloroethane	< 0.5	0.5	< 3.44	3.44		1	11/6/2018	79-34-5
1,1,2-Trichloroethane	< 0.5	0.5	< 2.73	2.73		1	11/6/2018	79-00-5
1,1-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	11/6/2018	75-34-3
1,1-Dichloroethene	< 0.5	0.5	< 1.99	1.99		1	11/6/2018	75-35-4
1,2,4-Trichlorobenzene	< 2.0	2.0	< 14.8	14.8		1	11/6/2018	120-82-1
1,2,4-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	11/6/2018	95-63-6
1,2-Dibromoethane	< 0.5	0.5	< 3.84	3.84		1	11/6/2018	106-93-4
1,2-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	11/6/2018	95-50-1
1,2-Dichloroethane	< 0.5	0.5	< 2.03	2.03		1	11/6/2018	107-06-2
1,2-Dichloropropane	< 0.5	0.5	< 2.31	2.31		1	11/6/2018	78-87-5
1,3,5-Trimethylbenzene	< 0.5	0.5	< 2.46	2.46		1	11/6/2018	108-67-8
1,3-Butadiene	< 0.5	0.5	< 1.11	1.11		1	11/6/2018	106-99-0
1,3-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	11/6/2018	541-73-1
1,4-Dichlorobenzene	< 0.5	0.5	< 3.01	3.01		1	11/6/2018	106-46-7
1,4-Dioxane	< 2.0	2.0	< 7.20	7.20		1	11/6/2018	123-91-1
2,2,4-Trimethylpentane	< 0.5	0.5	< 2.33	2.33		1	11/6/2018	540-84-1
2-Butanone (MEK)	< 2.0	2.0	< 5.9	5.9		1	11/6/2018	78-93-3
2-Hexanone	< 5.0	5.0	< 20.5	20.5		1	11/6/2018	591-78-6
2-Propanol (IPA)	< 5.0	5.0	< 12.3	12.3		1	11/6/2018	67-63-0
4-Ethyltoluene	< 1.0	1.0	< 4.92	4.92		1	11/6/2018	622-96-8
4-Methyl-2-pentanone (MIK)	< 5.0	5.0	< 20.5	20.5		1	11/6/2018	108-10-1
Acetone	< 5.0	5.0	< 11.9	11.9		1	11/6/2018	67-64-1
Allyl chloride	< 1.0	1.0	< 3.13	3.13		1	11/6/2018	107-05-1
Benzene	< 0.5	0.5	< 1.60	1.60		1	11/6/2018	71-43-2
Benzyl chloride	< 2.0	2.0	< 10.4	10.4		1	11/6/2018	100-44-7
Bromodichloromethane	< 0.5	0.5	< 3.35	3.35		1	11/6/2018	75-27-4
Bromoethene(Vinyl Bromide)	< 0.5	0.5	< 2.19	2.19		1	11/6/2018	593-60-2
Bromoform	< 0.5	0.5	< 5.17	5.17		1	11/6/2018	75-25-2
Bromomethane	< 0.5	0.5	< 1.94	1.94		1	11/6/2018	74-83-9
Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	11/6/2018	104-51-8
Carbon disulfide	< 2.0	2.0	< 6.22	6.22		1	11/6/2018	75-15-0
Carbon tetrachloride	< 0.5	0.5	< 3.15	3.15		1	11/6/2018	56-23-5
Chlorobenzene	< 0.5	0.5	< 2.30	2.30		1	11/6/2018	108-90-7
Chloroethane	< 0.5	0.5	< 1.32	1.32		1	11/6/2018	75-00-3
Chloroform	< 0.5	0.5	< 2.44	2.44		1	11/6/2018	67-66-3
Chloromethane	< 2.0	2.0	< 4.14	4.14		1	11/6/2018	74-87-3
cis-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	11/6/2018	156-59-2
cis-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	11/6/2018	542-75-6
Cyclohexane	< 0.5	0.5	< 1.72	1.72		1	11/6/2018	110-82-7
Dibromochloromethane	< 0.5	0.5	< 4.26	4.26		1	11/6/2018	124-48-1
Dichlorodifluoromethane(F-12)	< 1.0	1.0	< 4.95	4.95		1	11/6/2018	75-71-8
Dichlorotetrafluoroethane(F-114)	< 0.5	0.5	< 3.50	3.50		1	11/6/2018	76-14-2
Ethanol	< 5.0	5.0	< 9.40	9.40		1	11/6/2018	64-17-5
Ethyl Acetate	< 0.5	0.5	< 1.80	1.80		1	11/6/2018	141-78-6
Ethylbenzene	< 0.5	0.5	< 2.17	2.17		1	11/6/2018	100-41-4

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	Blank	**Matrix:**	Nitrogen

Method QC Data

Batch: MS011106 Analyst: JJ

Analyses	ppbv Result	ppbv Limit	ug/M^3 Result	ug/M^3 Limit	Qual	DF	Date Analyzed	
VOLATILE ORGANICS IN AIR		**TO-15**					Analyst: JJ	
Heptane	< 0.5	0.5	< 2.05	2.05		1	11/6/2018	142-82-5
Hexachlorobutadiene	< 1.0	1.0	< 10.7	10.7		1	11/6/2018	87-68-3
Hexane	< 1.0	1.0	< 3.52	3.52		1	11/6/2018	110-54-3
Isopropylbenzene	< 1.0	1.0	< 4.92	4.92		1	11/6/2018	98-82-8
m&p-Xylene	< 1.0	1.0	< 4.34	4.34		1	11/6/2018	179601-23-1
Methyl tert-butyl ether	< 2.0	2.0	< 7.22	7.22		1	11/6/2018	1634-04-4
Methylcyclohexane	< 1.0	1.0	< 4.02	4.02		1	11/6/2018	108-87-2
Methylene chloride	< 2.0	2.0	< 6.94	6.94		1	11/6/2018	75-09-2
Naphthalene	< 2.0	2.0	< 10.5	10.5		1	11/6/2018	91-20-3
Nonane	< 1.0	1.0	< 5.24	5.24		1	11/6/2018	111-84-2
Octane	< 1.0	1.0	< 4.67	4.67		1	11/6/2018	111-65-9
o-Xylene	< 0.5	0.5	< 2.17	2.17		1	11/6/2018	95-47-6
Propene (Propylene)	< 1.0	1.0	< 1.72	1.72		1	11/6/2018	115-07-1
Propylbenzene	< 1.0	1.0	< 4.92	4.92		1	11/6/2018	103-65-1
Sec-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	11/6/2018	135-98-8
Styrene	< 0.5	0.5	< 2.13	2.13		1	11/6/2018	100-42-5
Tert-Butyl benzene	< 1.0	1.0	< 5.49	5.49		1	11/6/2018	98-06-6
Tetrachloroethene	< 1.0	1.0	< 6.78	6.78		1	11/6/2018	127-18-4
Tetrahydrofuran	< 1.0	1.0	< 2.95	2.95		1	11/6/2018	109-99-9
Toluene	< 0.5	0.5	< 1.89	1.89		1	11/6/2018	108-88-3
trans-1,2-Dichloroethene	< 0.5	0.5	< 1.98	1.98		1	11/6/2018	156-60-5
trans-1,3-Dichloropropene	< 0.5	0.5	< 2.27	2.27		1	11/6/2018	542-75-6
Trichloroethene	< 0.5	0.5	< 2.69	2.69		1	11/6/2018	79-01-6
Trichlorofluoromethane(F-11)	< 0.5	0.5	< 2.81	2.81		1	11/6/2018	75-69-4
Trichlorotrifluoroethane(F-113)	< 0.5	0.5	< 3.83	3.83		1	11/6/2018	76-13-1
Vinyl acetate	< 0.5	0.5	< 1.76	1.76		1	11/6/2018	108-05-4
Vinyl chloride	< 0.5	0.5	< 1.28	1.28		1	11/6/2018	75-01-4
Surr: 4-Bromofluorobenzene	83.7	70-130	%REC					

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 11/6/2018 Batch: MS011106 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
Propene (Propylene)	9.4	93.8	9.2	92.4	10.0	1.5	ppbv			
Dichlorodifluoromethane(F-12)	9.2	91.9	8.9	88.9	10.0	3.3	ppbv			
Chloromethane	8.6	86.0	8.6	86.0	10.0	0.0	ppbv			
Dichlorotetrafluoroethane(F-114)	8.1	80.7	8.6	85.5	10.0	5.8	ppbv			
Vinyl Chloride	9.7	97.2	9.7	97.0	10.0	0.2	ppbv			
1,3-Butadiene	9.2	92.1	9.6	95.9	10.0	4.0	ppbv			
Bromomethane	9.4	93.6	8.5	85.2	10.0	9.4	ppbv			
Chloroethane	8.2	81.6	9.2	91.7	10.0	11.7	ppbv			
Ethanol	9.4	94.2	9.8	98.3	10.0	4.3	ppbv			
Bromoethene(Vinyl Bromide)	8.2	81.5	7.8	78.0	10.0	4.4	ppbv			
Trichlorofluoromethane (F-11)	8.7	87.1	8.1	80.9	10.0	7.4	ppbv			
Acetone	10.4	104	9.9	98.5	10.0	5.3	ppbv			
Isopropyl Alcohol (2-Propanol)	11.3	113	10.4	104	10.0	8.0	ppbv			
1,1-Dichloroethene	8.6	86.1	8.5	85.1	10.0	1.2	ppbv			
Trichlorotrifluoroethane (F-113)	9.1	90.9	8.7	86.5	10.0	5.0	ppbv			
Methylene Chloride	8.9	88.5	8.5	84.6	10.0	4.5	ppbv			
Allyl Chloride	9.3	92.7	9.2	92.4	10.0	0.3	ppbv			
Carbon disulfide	9.1	91.1	9.1	90.8	10.0	0.3	ppbv			
trans-1,2-Dichloroethene	9.3	92.7	9.1	90.8	10.0	2.1	ppbv			
Methyl tert-butyl ether	10.3	103	9.5	95.4	10.0	8.0	ppbv			
1,1-Dichloroethane	9.1	91.1	8.8	88.3	10.0	3.1	ppbv			
Vinyl acetate	11.1	111	10.3	103	10.0	7.4	ppbv			
2-Butanone (MEK)	10.6	106	9.4	94.3	10.0	12.0	ppbv			
Hexane	9.0	90.4	8.7	87.1	10.0	3.7	ppbv			
cis-1,2-Dichloroethene	9.9	98.6	9.5	94.6	10.0	4.1	ppbv			
Ethyl Acetate	11.0	110	9.8	97.8	10.0	11.4	ppbv			
Chloroform	9.2	91.6	8.8	88.2	10.0	3.8	ppbv			
Tetrahydrofuran	10.7	107	9.7	97.1	10.0	9.9	ppbv			
1,1,1-Trichloroethane	9.0	90.3	8.7	86.9	10.0	3.8	ppbv			
1,2-Dichloroethane	9.2	91.7	8.5	84.6	10.0	8.1	ppbv			
Benzene	9.7	97.4	9.1	90.6	10.0	7.2	ppbv			
Carbon tetrachloride	9.0	90.4	8.7	87.1	10.0	3.7	ppbv			
Cyclohexane	9.2	91.5	8.6	86.3	10.0	5.8	ppbv			
2,2,4-Trimethylpentane	9.8	98.4	9.5	95.4	10.0	3.1	ppbv			
Heptane	9.6	95.9	8.8	88.4	10.0	8.1	ppbv			
1,2-Dichloropropane	10.3	103	9.6	95.5	10.0	7.6	ppbv			
Trichloroethene	10.6	106	10.2	102	10.0	4.0	ppbv			
Bromodichloromethane	10.1	101	9.4	94.4	10.0	6.7	ppbv			
1,4-Dioxane	9.4	94.1	10.1	101	10.0	7.2	ppbv			
Methylcyclohexane	9.7	96.5	9.4	93.6	10.0	3.1	ppbv			
cis-1,3-Dichloropropene	10.9	109	10.1	101	10.0	7.7	ppbv			
4-methyl-2-pentanone	12.0	120	10.5	105	10.0	13.5	ppbv			
trans-1,3-Dichloropropene	11.5	115	10.8	108	10.0	7.1	ppbv			
Toluene	11.1	111	10.2	102	10.0	8.1	ppbv			

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	N/A
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	N/A
Lab ID:	LCS/LCSD	**Matrix:**	Nitrogen

Method QC Data

Date Analyzed: 11/6/2018 Batch: MS011106 Analyst: JJ

Analyses	LCS Result	LCS %REC	LCSD Result	LCSD %REC	T.V.	%RPD	Unit	Qualifier LCS	Qualifier LCSD	Qualifier RPD
VOLATILE ORGANICS IN AIR	**TO-15**							70-130%		<25%
1,1,2-Trichloroethane	10.8	108	10.1	101	10.0	6.8	ppbv			
2-Hexanone	12.0	120	11.1	111	10.0	8.0	ppbv			
n-Octane	10.4	104	9.6	96.2	10.0	7.9	ppbv			
Dibromochloromethane	11.4	114	10.7	107	10.0	6.2	ppbv			
1,2-Dibromoethane	11.4	114	10.6	106	10.0	8.0	ppbv			
Tetrachloroethene	10.9	109	10.6	106	10.0	3.0	ppbv			
Chlorobenzene	11.0	110	10.3	103	10.0	6.7	ppbv			
Ethylbenzene	11.3	113	10.5	105	10.0	7.1	ppbv			
m&p-Xylene	23.0	115	21.4	107	20.0	7.2	ppbv			
Bromoform	12.4	124	11.5	115	10.0	7.1	ppbv			
Styrene	12.5	125	11.5	115	10.0	7.7	ppbv			
Nonane	10.4	104	9.7	96.9	10.0	6.9	ppbv			
o-Xylene	11.7	117	10.9	109	10.0	6.9	ppbv			
1,1,2,2-Tetrachloroethane	11.3	113	10.7	107	10.0	6.0	ppbv			
Isopropylbenzene	11.7	117	10.8	108	10.0	8.3	ppbv			
n-Propylbenzene	11.8	118	10.9	109	10.0	7.9	ppbv			
4-Ethyltoluene	13.0	130	12.0	120	10.0	7.8	ppbv			
1,3,5-Trimethylbenzene	12.1	121	11.2	112	10.0	7.8	ppbv			
Tert-Butyl Benzene	11.6	116	10.8	108	10.0	7.2	ppbv			
1,2,4-Trimethylbenzene	12.2	122	11.3	113	10.0	7.3	ppbv			
Sec-Butyl Benzene	12.2	122	11.3	113	10.0	7.7	ppbv			
1,3-Dichlorobenzene	12.5	125	11.5	115	10.0	8.9	ppbv			
Benzyl chloride	13.2	132	12.3	123	10.0	7.6	ppbv	L5		
1,4-Dichlorobenzene	12.7	127	11.8	118	10.0	7.2	ppbv			
1,2-Dichlorobenzene	12.5	125	11.6	116	10.0	8.1	ppbv			
n-Butyl Benzene	12.1	121	10.9	109	10.0	10.7	ppbv			
1,2,4-Trichlorobenzene	12.6	126	12.0	120	10.0	4.9	ppbv			
Naphthalene	10.8	108	10.3	103	10.0	5.2	ppbv			
Hexachlorobutadiene	12.1	121	11.2	112	10.0	7.7	ppbv			
Surr: 4-Bromofluorobenzene	9.6	96.3	9.6	95.9			%REC			
		70-130%		70-130%						

Airtech Environmental Laboratories (AEL) - AZ 0740

4620 E.Elwood St., Suite 13, Phoenix, AZ 85040 480-968-5888 Fax 480-966-1888

Client:	Geosyntec	**Client Sample ID:**	NA
Project:	7th St & Missouri	**Project Number:**	SP0172
Lab Order:	18J022	**Collection:**	NA
Lab ID:	Standards	**Matrix:**	Nitrogen

AEL ID#	STD Name	Vendor	SGI Order#	Description	CONC.	Accuracy	Exp.Date
S-180620-03	Stock	Spectra Gases	116447993	TO-14 39 Analytes	1.0 ppmv	± 5%	6/25/2019
S-180620-02	Stock	Spectra Gases	116447993	TO-15 25 Analytes	1.0 ppmv	± 5%	6/22/2019
S-180620-01	Stock	Spectra Gases	116447993	15 Additional Compounds	1.0 ppmv	± 5%	6/20/2019
S-181011-01	Stock	Spectra Gases	116849616	TO-15 IS 4 Compounds	1.0 ppmv	± 5%	10/11/2019
A-181011-01	Working Std	AEL Dilution		TO-15 74 Analytes	10 ppbv	± 5%	1/11/2019
A-181101-01	Working Std	AEL Dilution		TO-15 74 Analytes	10 ppbv	± 5%	2/1/2019
A-181024-01	Working IS	AEL Dilution		TO-15 IS 4 Compounds	50 ppbv	± 5%	1/24/2019

Airtech Environmental Laboratories (AEL)

Chain of Custody

4620 E.Elwood Street, Suite 13, Phoenix, AZ 85040 480-968-5888 (phone) 480-966-1888 (fax)

Customer: Geosyntec	Page 1 of 2	AEL Lab #
Address:	Sampler: L. Walker M. Williams Phone: 480-578-0496	18J022
	Project Name: 7th st & Missouri Project Number: 5P0172	
City, State, Zip: Phoenix AZ	Project location: 7th st & Missouri	
Contact: L. Walker	P.O. Number:	
Phone: Fax:	Fax Results: Y N	
E-Mail Address: lwalker@geosyntec.com	E-Mail Results: (Y) N	

Sample Receipt

Temperature_____ °C
Custody Seals: Yes_____ No_____
Custody Seals Intact: Yes_____ No_____
Total # of Containers:_____

Turn Around Request

_____ 24 Hours _____ 48 Hours
_____ 72 Hours
_____ 5 working Day
✓ Standard 10 Working Days

Sample Type

SVE: soil vapor extraction GW: ground water
A: ambient air WW: waste water
I: indoor air
S: soil vapor
W: water

Analyses Requested

Sample Information

AEL Lab #	Serial # Canister	Serial # Grab	Canister (L) or bag	Grab (Min)	Client's Sample Identification	Sampled Date	Sampled Time	Sample Type	Number of Containers	TO-15 full list	TO-15 TPH(GRO)	TO-15 Selet List	8260B AZ Vapor full list	8260B Vapor select list	8015 GRO	8260B Water			DFA tracer cmpd. as TIC
01	E-23P2		6 (1) bag	1 2 (5)	SP2-20'	10/12/18	12:02	SV Grab	1	X									X
02	E 2352		6 (1) bag	1 2 (5)	SP2-28'	10/12/18	12:59	SV grab	1	X									X
03	E 2290		6 (1) bag	1 2 (5)	SP2-38'	10/12/18	14:05	SV Grab	1	X									X
04	E 1849		6 (1) bag	1 2 (5)	SP2-42'-DUP	10/13/18	07:48	SV grab	1	X									X
05	E1832		6 (1) bag	1 2 (5)	SP2-42'	10/13/18	07:43	SV grab	1	X									X
06	E2305		6 (1) bag	1 2 (5)	SP2-50'	10/13/18	08:30	SV grab	1	X									X
07	E2371		6 (1) bag	1 2 (5)	SP2-60'	10/13/18	09:23	SV grab	1	X									X
08	E1313		6 (1) bag	1 2 (5)	SP2-~~70'~~ 68'	10/13/18	10:08	SV grab	1	X									X
09	E2097		6 (1) bag	1 2 (5)	SP2-80'	10/13/18	11:27	SV grab	1	X									X
10	E2412		6 (1) bag	1 2 (5)	Background ambient	10/13/18	11:03	SV grab	1	X									

Instructions / Special Requirements:

Date:	Time:	Samples Relinquished By:	Received By:
10-17-18	1710	[signature]	[signature] - Airtech

Airtech Environmental Laboratories (AEL)

Chain of Custody

4620 E.Elwood Street, Suite 13, Phoenix, AZ 85040 480-968-5888 (phone) 480-966-1888 (fax)

Customer: Geosyntec	Page 2 of 2	AEL Lab #
Address:	Sampler: Phone:	18J022
	Project Name: Project Number:	
City, State, Zip:	Project location:	
Contact:	P.O. Number:	
Phone: Fax:	Fax Results: Y N	
E-Mail Address:	E-Mail Results: Y N	

Sample Receipt	Turn Around Request	Sample Type
Temperature ____ °C	____ 24 Hours ____ 48 Hours	SVE: soil vapor extraction GW: ground water
Custody Seals: Yes ____ No ____	____ 72 Hours	A: ambient air WW: waste water
Custody Seals Intact: Yes ____ No ____	____ 5 working Day	I: indoor air
Total # of Containers: ____	____ Standard 10 Working Days	S: soil vapor
		W: water

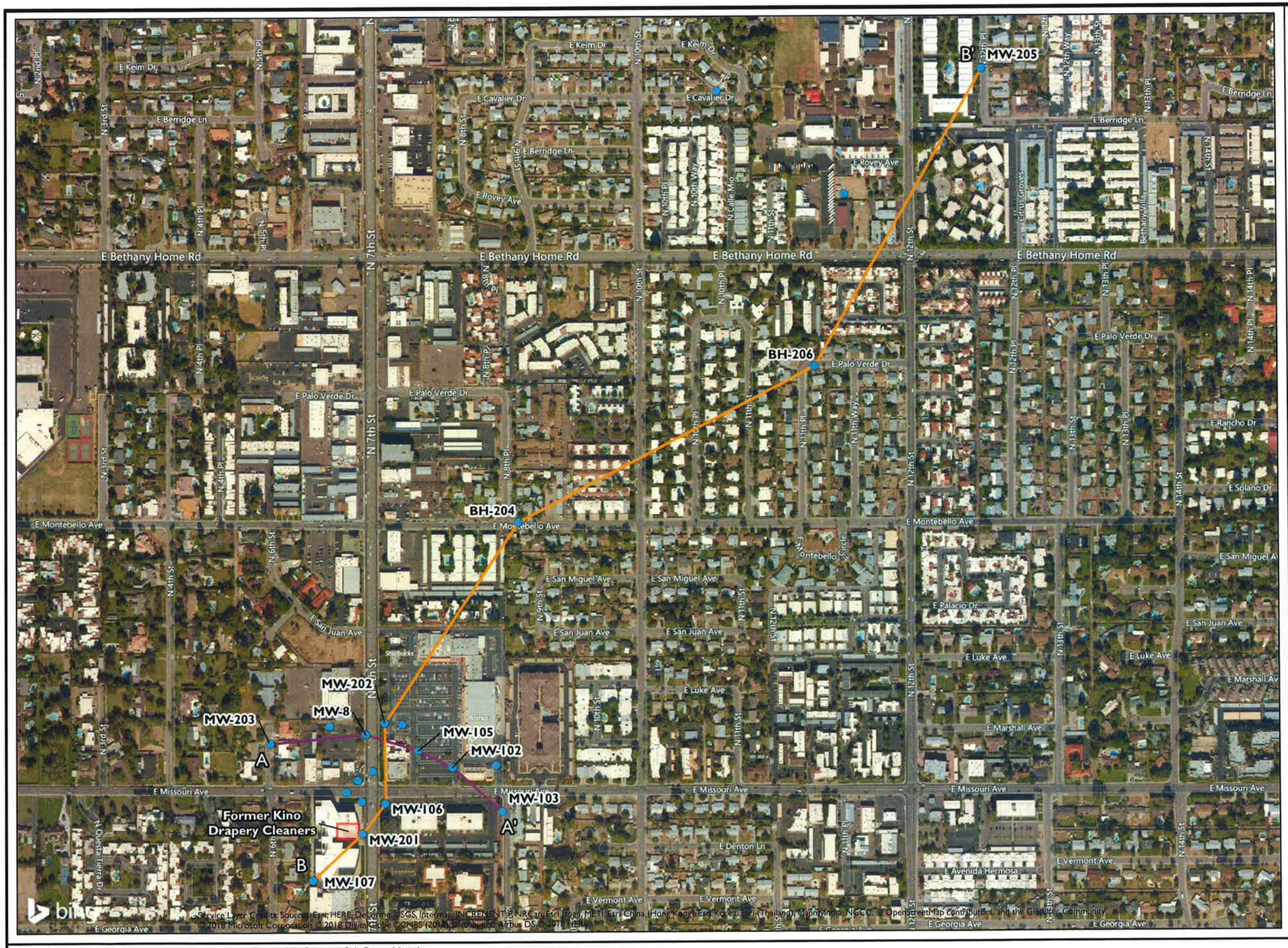
Sample Information

AEL Lab #	Serial # Canister	Serial # Grab	Canister (L) or bag	Grab (Min)	Client's Sample Identification	Sampled Date	Sampled Time	Sample Type	Number of Containers	TO-15 full list	TO-15 TPH(GRO)	TO-15 Selet List	8260B AZ Vapor full list	8260B Vapor select list	8015 GRO	8260B Water			DFA tracer cmpd. as TIC
11	1825	108	6 (1) bag	1 2 (5)	SP1-SV-20	6/12/2018	11:57	S	1	X									X
12	G2297	146	6 (1) bag	1 2 (5)	SP1-SV-28	10-12-2018	12:44	S	1	X									X
13	1860	157	6 (1) bag	1 2 (5)	SP1-SV-38	10-12-2018	13:50	S	1	X									X
	0272	121	6 (1) bag	1 2 (5)	SP1-SV-42	10-12-2018		S	1	X									X
14	1816	186	6 (1) bag	1 2 (5)	SP1-SV-42	10-13-2018	7:20	S											
15	E2372	132	6 (1) bag	1 2 (5)	SP1-SV-42-dup	10-13-2018	7:20	S	1	X									X
16	1847	182	6 (1) bag	1 2 (5)	SP1-SV-50	10-13-2018	8:09	S	1	X									X
17	E2375	036	6 (1) bag	1 2 (5)	SP1-SV-60	10-13-2018	9:01	S	1	X									X
18	E2295	155	6 (1) bag	1 2 (5)	SP1-SV-70	10-13-2018	10:01	S	1	X									X
19	E2099	070	6 (1) bag	1 2 (5)	SP1-SV-80	10-13-2018	11:02	S	1	X									X
20	E2284	119	(1)	(5)	~~SP1~~ MW SP-EB	10-17-2018	1703	S	1	X									X

Instructions / Special Requirements:

Date:	Time:	Samples Relinquished By:	Received By:
10-17-18	1710	[signature]	Jamie Jam - Airtech

APPENDIX B
2018 RI Report Hydrologic Cross Sections



Legend

- Groundwater Well
- Cross Section A-A'
- Cross Section B-B'
- Source Area

1 inch = 550 feet

0 280 560 Feet

Pinyon

LOCATION OF HYDROGEOLOGIC CROSS SECTION

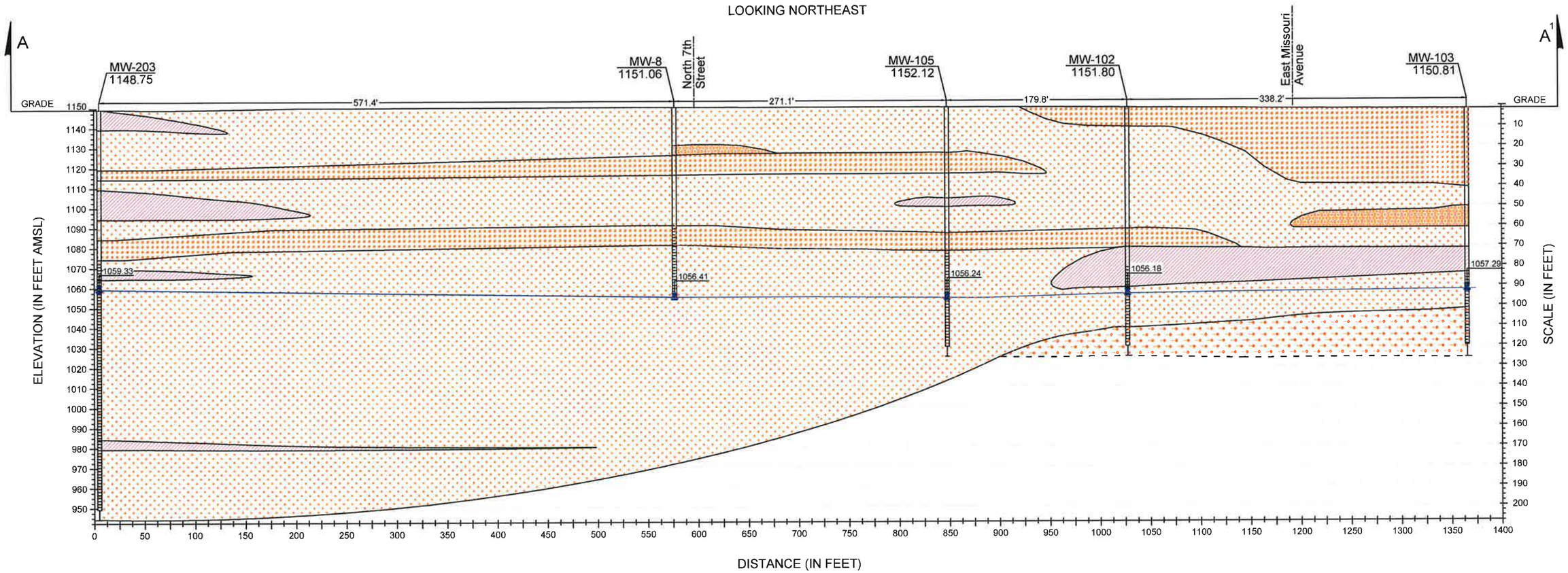
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Drawn By: JAF	Figure: 5
Reviewed By: AMG	Date: 4/23/2018

Site Location: Sections 9, 16 and 17, Township 2N, Range 3E, Gila and Salt River Meridian

Pinyon Project Number: 7/17-1006-03.5206c

Document Path: Z:\PROJECTS\2017\717100603 ADEQ 7th & Missouri\Figures\ArcMap\MXDs\REM05_Hydro Cross Section.mxd



NOTE:
Groundwater elevations collected September 2017
*MW-103 Groundwater elevation from April 2017
AMSL = Above Mean Sea Level

LEGEND

- SAND WITH CLAY
- SAND WITH SILT AND GRAVEL
- SILTY SAND / SANDY SILT
- SAND WITH GRAVEL
- LEAN CLAY
- GRAVELLY SILT
- CLAYEY GRAVEL
- SILTY GRAVEL
- XXXX.XX GROUNDWATER ELEVATION IN FEET AMSL
- CALICHE

Vertical Scale
0 50
Approximate Scale in Feet

Horizontal Scale
0 100
Approximate Scale in Feet

N

Pinyon Environmental, Inc.

HYDROGEOLOGIC CROSS SECTION A-A1

MW-203, MW-8, MW-105, MW-102, and MW-103
North 7th Street and East Missouri Avenue
Phoenix, Arizona

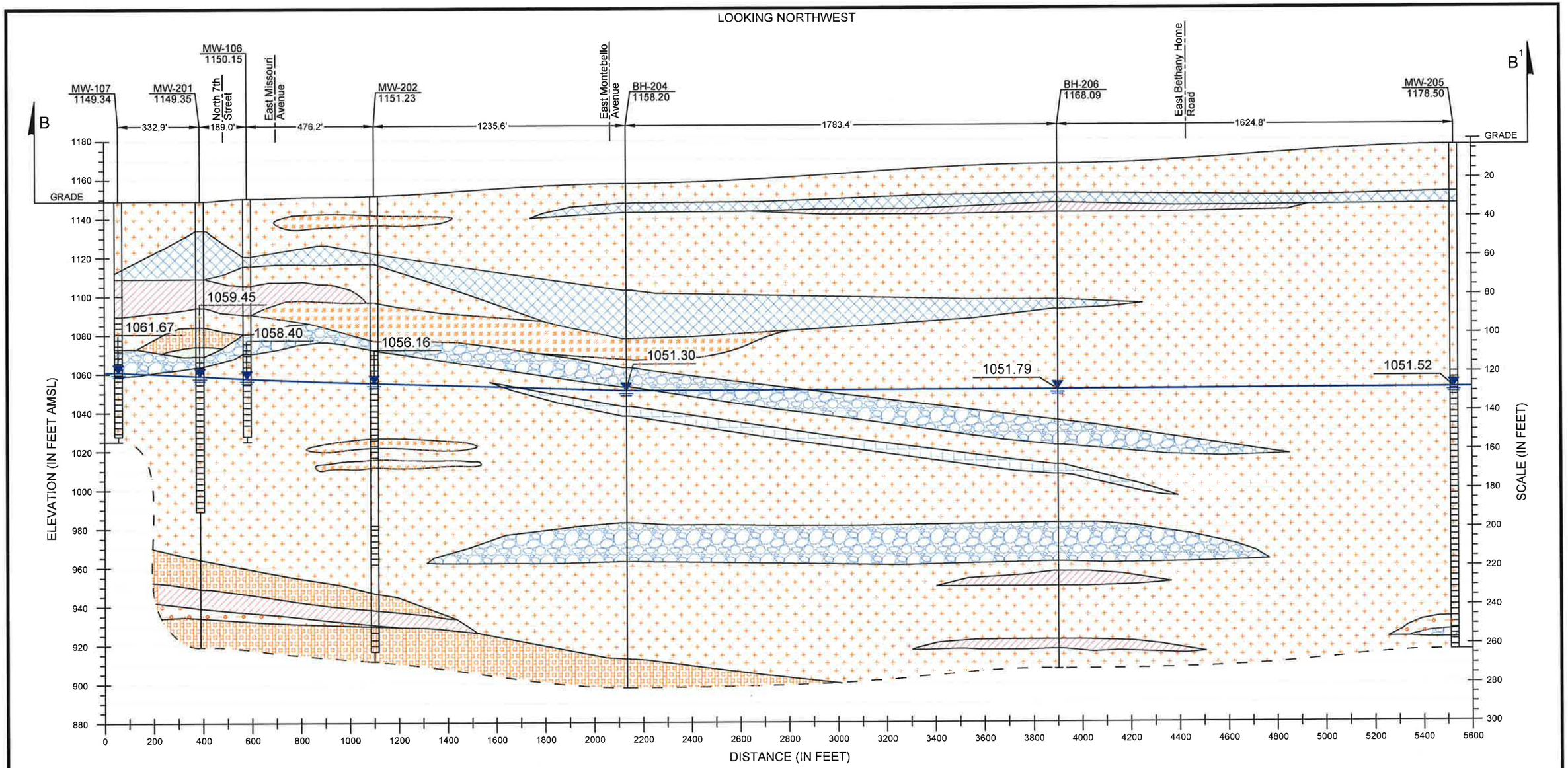
Site Location: North 7th Street and East Missouri Avenue, Phoenix, Arizona

Pinyon Project Number: 7/17-1006-03.5206c

Drawn By: SJA | Figure: 6

Reviewed By: AMG | Rev Date: 4/23/2018

Z:\PROJECTS\2017\717100603 ADEQ 7th & Missouri\Figures\AutoCAD\DWG\CS01_SL.dwg



LEGEND

- SAND WITH CLAY
- SAND WITH SILT AND GRAVEL
- SILTY SAND / SANDY SILT
- SAND WITH GRAVEL
- LEAN CLAY
- GRAVELLY SILT
- CLAYEY GRAVEL
- SILTY GRAVEL
- XXXX.XX GROUNDWATER ELEVATION IN FEET AMSL
- CALICHE

NOTE:
Groundwater elevations collected September 2017
AMSL = Above Mean Sea Level

Vertical Scale
0 50
Approximate Scale in Feet

Horizontal Scale
0 400
Approximate Scale in Feet

N

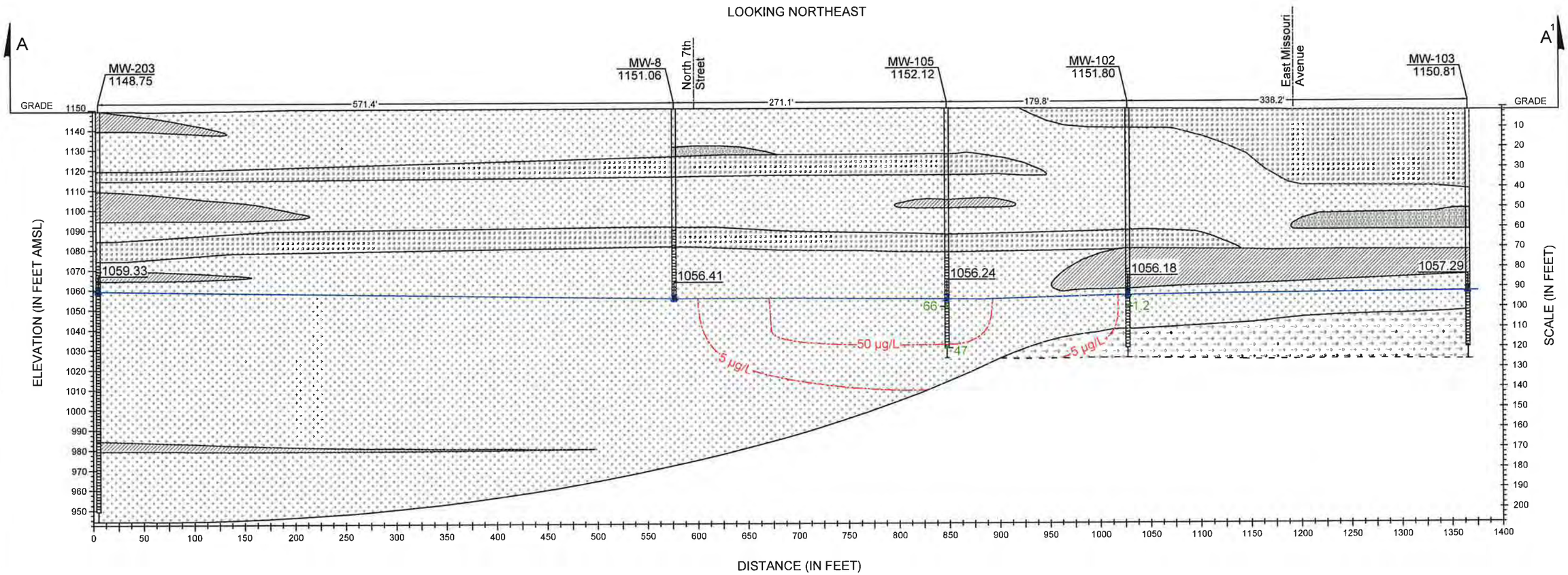
Pinyon Environmental, Inc.

HYDROGEOLOGIC CROSS SECTION B-B1

MW-106, MW-107, MW-201, MW-202, MW-205, BH-204 and BH-206
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Site Location: North 7th Street and East Missouri Avenue, Phoenix, Arizona	Drawn By: SJA / Figure: 7
Pinyon Project Number: 7/17-1006-03.5206c	Reviewed By: AMG / Rev Date: 4/23/2018

Z:\PROJECTS\2017\717100603 ADEQ 7th & Missouri\Figures\AutoCAD\DWG\CS01_SL.dwg



NOTE:
Groundwater elevations collected September 2017
*MW-103 Groundwater elevation from April 2017
AMSL = Above Mean Sea Level

LEGEND

- SAND WITH CLAY
- SAND WITH SILT AND GRAVEL
- SILTY SAND / SANDY SILT
- SAND WITH GRAVEL
- LEAN CLAY
- GRAVELLY SILT
- CLAYEY GRAVEL
- SILTY GRAVEL
- XXXX.XX GROUNDWATER ELEVATION IN FEET AMSL
- CALICHE
- XX µg/L ISOCONCENTRATION LINE
- XX CONCENTRATION OF TETRACHLOROETHENE IN MICROGRAMS PER LITER (SEPTEMBER 2017)

Vertical Scale
0 50
Approximate Scale in Feet

Horizontal Scale
0 100
Approximate Scale in Feet

N

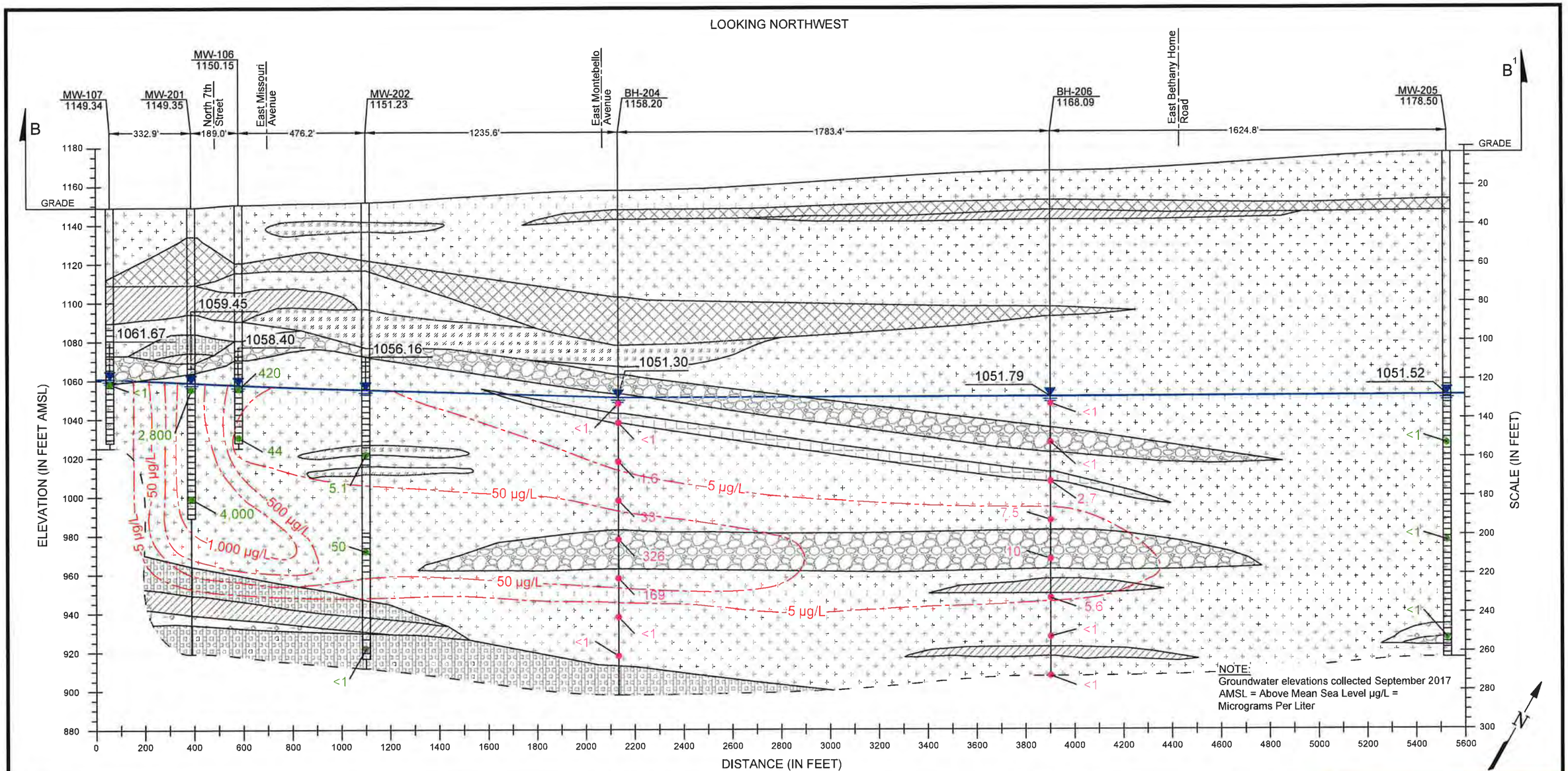
Pinyon Environmental, Inc.

VERTICAL GROUNDWATER PCE IMPACTS A-A1

MW-203, MW-8, MW-105, MW-102, and MW-103
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Site Location: North 7th Street and East Missouri Avenue, Phoenix, Arizona	Drawn By: SJA	Figure: 20
Pinyon Project Number: 7/17-1006-03.5206c	Reviewed By: AMG	Rev Date: 4/23/2018

\\192.168.1.3\Company2\PROJECTS\2017\717100603 ADEQ 7th & Missouri\Figures\AutoCAD\DWG\CS01_SL.dwg



LEGEND

- SAND WITH CLAY
- SAND WITH SILT AND GRAVEL
- SILTY SAND / SANDY SILT
- SAND WITH GRAVEL
- LEAN CLAY
- GRAVELLY SILT
- CLAYEY GRAVEL
- SILTY GRAVEL
- XXXX.XX GROUNDWATER ELEVATION IN FEET AMSL
- CALICHE
- XX µg/L ISOCONCENTRATION LINE
- XX CONCENTRATION OF TETRACHLOROETHENE IN MICROGRAMS PER LITER (SEPTEMBER 2017)
- XX CONCENTRATION OF TETRACHLOROETHENE IN MICROGRAMS PER LITER MW-202/BH-204 (DECEMBER 2016) BH-206 (APRIL 2017)

Vertical Scale 0 50 Approximate Scale in Feet

Horizontal Scale 0 400 Approximate Scale in Feet

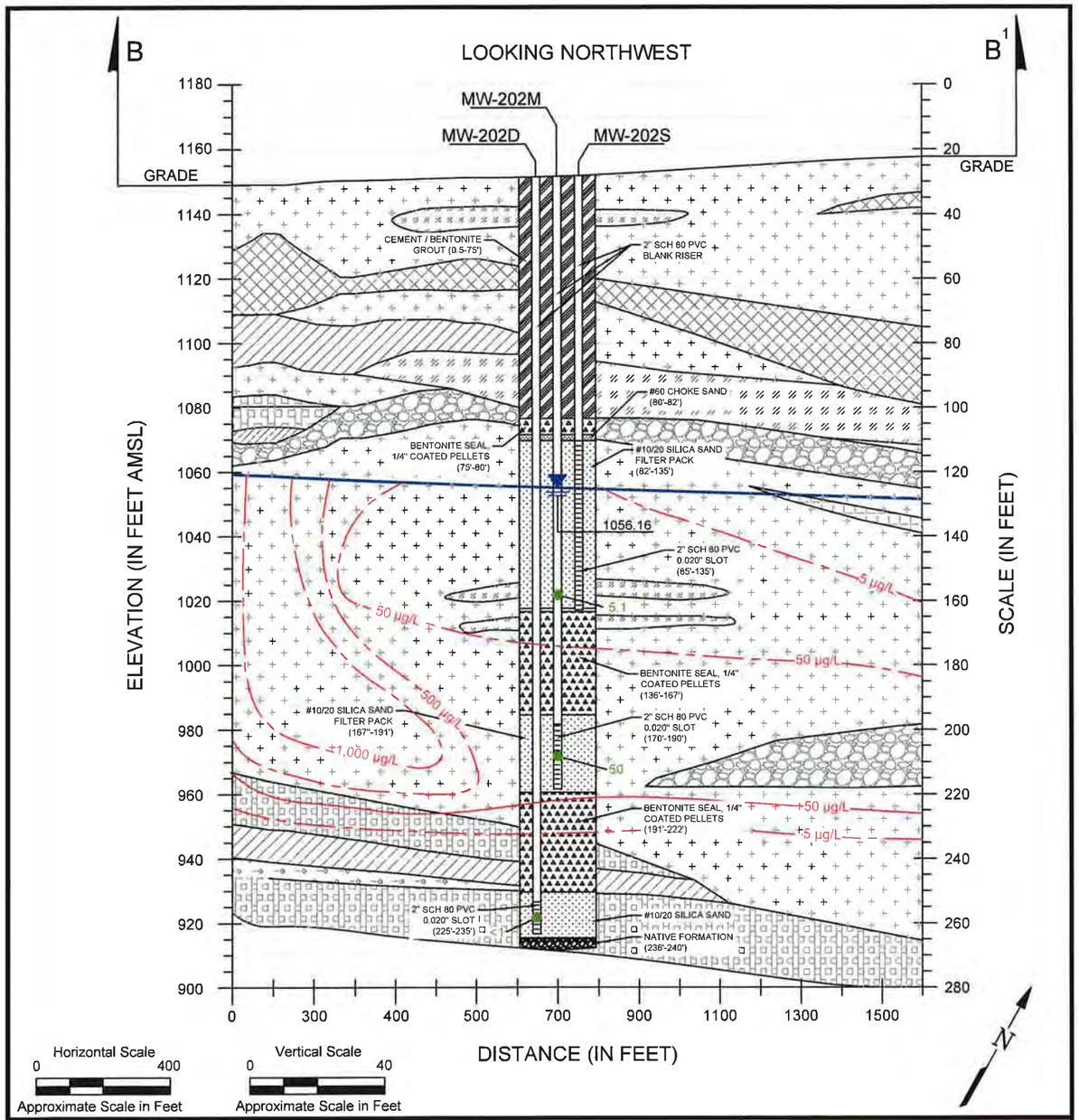
Pinyon Environmental Inc.

VERTICAL GROUNDWATER PCE IMPACTS B-B[1]

MW-106, MW-107, MW-201, MW-202, MW-205, BH-204 and BH-206
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Site Location: North 7th Street and East Missouri Avenue, Phoenix, Arizona	Drawn By: SJA / Figure: 21a
Pinyon Project Number: 7/17-1006-03.REM001.1	Reviewed By: AMG / Rev Date: 4/30/2018

Z:\PROJECTS\2017\717100603 ADEQ 7th & Missouri\Figures\AutoCAD\DWG\CS01_SL.dwg



LEGEND

- SAND WITH CLAY
- SAND WITH SILT AND GRAVEL
- SILTY SAND / SANDY SILT
- SAND WITH GRAVEL
- LEAN CLAY
- GRAVELLY SILT
- CLAYEY GRAVEL
- SILTY GRAVEL
- CALICHE
- XXXX.XX GROUNDWATER ELEVATION IN FEET AMSL
- XX µg/L ISOCONCENTRATION LINE
- XX CONCENTRATION OF TETRACHLOROETHENE IN MICROGRAMS PER LITER (SEPTEMBER 2017)

Pinyon

VERTICAL GROUNDWATER PCE IMPACTS B-B'

MW-202
North 7th Street and East Missouri Avenue
Phoenix, Arizona

Site Location: North 7th Street and East Missouri Avenue, Phoenix, Arizona	Drawn By: SJA	Figure: 21b
Pinyon Project Number: 7/17-1006-03.5206c	Reviewed By: JPM	Rev Date: 4/30/2018

\\192.168.1.3\Company\PROJECTS\2017\7171006\03 ADEQ 7th & Missouri\Figures\AutoCAD\DWG\CS02_SL.dwg

APPENDIX C
Bench Scale Evaluation of Ozone Report and Laboratory Treatability Study Report

Prepared for:

Geosyntec Consultants Inc.
211 Wheeler Street
Saskatoon, SK
S7P 0A4

Final

Laboratory Treatability Study to Assess the Potential for *In-Situ* Chemical Oxidation of Chlorinated Volatile Organic Compounds

7th and Missouri Site, Phoenix, Arizona

Prepared by:

130 Stone Rd W
Guelph, Ontario N1G 3Z2

SiREM Ref: SP01723.01

7 June 2019

siremlab.com

TABLE OF CONTENTS

Page

1 INTRODUCTION 1

2 MATERIALS AND METHODS 1

2.1 Reactor Construction and Incubation 1

2.1.1 Baseline Sample Preparation and Analysis 1

2.1.2 Task 1: Permanganate Oxidant Demand Test 2

2.1.3 Task 2A: Permanganate ISCO Treatability Test 2

2.1.4 Task 2B: Ozone ISCO Treatability Test 2

2.2 Reactor Sampling and Analysis 3

2.2.1 Reactor Sampling 3

2.2.2 Analysis of VOCs 3

2.2.3 Analysis of Permanganate 4

2.2.4 Analysis of pH 4

3 RESULTS 4

4 REFERENCES 4

LIST OF TABLES

Table 1: Summary of Reactor Controls, Treatments and Amendments
Table 2: Summary of Task 1 Permanganate Oxidant Demand Results
Table 3: Summary of Task 2A and 2B Treatability Reactor Permanganate, pH and PCE Results

LIST OF FIGURES

Figure 1: PCE Concentrations in Task 2A and 2B Control and Treatment Reactors

LIST OF APPENDICES

Appendix A: Chain of Custody Documentation
Appendix B: Task 1 Permanganate Detailed Test Results
Appendix C: Task 2B Prima Environmental Laboratory Report

LIST OF ABBREVIATIONS

°C	degrees Celsius
°C/min	degrees Celsius per minute
cVOC	chlorinated volatile organic compound
DI	de-ionized
FID	flame ionization detector
g	grams
g/L	grams per liter
Geosyntec	Geosyntec Consultants Inc.
h	hours
GC	gas chromatograph
ISCO	In-situ Chemical Oxidation
kg	kilograms
M	molar
µg/L	micrograms per liter
µL	microliters
µm	micrometer
mg/L	milligrams per liter
min	minutes
mL	milliliters
mL/min	milliliters per minute
nm	nanometers
O_3	ozone
PCE	tetrachloroethene
QL	quantitation limit
SiREM	SiREM Laboratory
UV/VIS	ultraviolet/visible light

1 INTRODUCTION

Geosyntec Consultants Inc. (Geosyntec) retained SiREM Laboratory (SiREM) to conduct a laboratory treatability study to assess the potential for *in-situ* chemical oxidation (ISCO) using permanganate and ozone (O_3) to oxidize chlorinated volatile organic compounds (cVOCs), primarily tetrachloroethene (PCE) in subsurface samples from the 7th and Missouri Site in Phoenix, Arizona (the Site).

Geologic materials used in this study were collected on 12 and 14 October 2018 from five Site locations labelled SP2 (31'-33'), SP2 (110'-11.5'), SP2 (112'-113'), SP1 (33-34.5) and SP1 (111.5-112). Materials were received by SiREM on 18 October 2018 in good condition at a temperature of 5 degrees Celsius (°C). All materials were stored at 4 °C until required for reactor construction. A copy of the chain of custody received with these samples is provided in Appendix A.

The general scope of the bench scale ISCO tests included the following tasks:

Task 1: Permanganate Oxidant Demand Test
Task 2A: Permanganate Treatability Test
Task 2B: Ozone Treatability Test

The remainder of this report is divided into three sections. Section 2 provides the experimental materials and methods, Section 3 provides the results of the treatability study, and Section 4 provides references.

2 MATERIALS AND METHODS

The following sections describe the materials and methods used for reactor construction and incubation (Section 2.1), and reactor sampling and analysis (Section 2.2).

2.1 Reactor Construction and Incubation

The following sections describe the preparation of the geological materials and sampling for baseline analysis, and reactor construction (Section 2.1.1). Sections 2.1.2 through 2.1.4 provide task specific construction and incubation information for Tasks 1 and 2.

2.1.1 Baseline Sample Preparation and Analysis

Geosyntec advised that cores from the SP1 (110.5-112) location were to be used for the treatability study. On 25 October 2018 the geological materials from the Site were placed in a chemical fume hood and homogenized by manually mixing to improve reproducibility between replicates. Once homogenized, the materials were stored in a cold room at 4 °C until required for the reactor construction in each task.

A 1 kilogram (kg) subsample of the homogenized material was sent to Prima Environmental (Prima) to complete the Ozone analysis portion of the treatability study.

Treatment and control reactors for each task were constructed as described in the sections below. Once prepared, all reactors were stored at room temperature in the dark. Refer to Table 1 for a summary of reactor construction and amendments.

2.1.2 Task 1: Permanganate Oxidant Demand Test

On 26 October 2018 (Day -3), treatment reactors were constructed by adding 50 grams (g) (dry weight) of geological material into sterile 250 milliliters (mL) screw cap Boston round clear bottles (Systems Plus, New Hamburg, ON). On 29 October 2018 (Day 0) treatment and reagent control reactors were amended with a 20 gram per liter (g/L) permanganate stock solution at a volume of 100 mL to yield a one to two ratio by weight with the geological material. At time zero and after 6 and 48 hours (h) the reactors were sampled for analysis of permanganate.

2.1.3 Task 2A: Permanganate Treatability Test

Task 2A was constructed on 12 November 2018 (Day -2). Treatment reactors were constructed using 50 g of geological material and 100 mL of de-ionized (DI) water to yield a one to two ratio by weight with the geological material. All reactors were capped with a Mininert™ closure for repetitive sampling.

Geosyntec advised that a low and high dosage of permanganate were to be evaluated for Task 2A. Based on the Task 1 results, permanganate concentrations to be evaluated for Task 2A were 2.5 g/L and 7.5 g/L. On 14 November 2018 (Day 0) treatment reactors were amended with 1.1 mL and 3.2 mL of a 300 g/L permanganate stock solution to yield concentrations of 2.5 g/L and 7.5 g/L, respectively.

Geosyntec also advised that Site PCE concentrations were observed at 200 micrograms per liter (µg/L). On 13 November 2018 (Day -1), 233 microliters (µL) of a saturated PCE stock solution was amended to all control and treatment reactors to target a 200 µg/L PCE concentration. Refer to Table 1 for a summary of reactor construction and amendments.

Samples were collected from control reactors at time 0 and after 7 days for analysis of PCE and pH. Treatment reactors were sampled at time 0 and after 6 and 24 h for analysis of PCE, permanganate and pH.

2.1.4 Task 2B: Ozone Treatability Test

The Ozone Treatability Test was completed by Prima Environmental in El Dorado Hills, CA. As noted in Section 2.1.1, 1 kg of homogenized geologic material was shipped to Prima on 25 October 2018 and received by Prima on 26 October 2018 in good condition. The report from Prima detailing the materials, methods and results of the Ozone Treatability study are provided in Appendix C.

2.2 Reactor Sampling and Analysis

2.2.1 Reactor Sampling

Aqueous samples were collected from the reactors based on the schedules described above in section 2.1.

Reactors were sampled for cVOCs and pH using gas-tight 1,000 µL Hamilton glass syringes. Separate sets of syringes were used for the different reactors to reduce the potential for cross contamination. Syringes were cleaned with acidified water (pH ~2) and rinsed 10 times with deionized (DI) water between samples, to ensure that cVOCs were not transferred between different samples or reactors.

Reactors were sampled for oxidant analysis using 5 mL disposable syringes. Each sample was filtered through a 0.45 micrometer (µm) syringe filter into a 10 mL glass vial for analysis.

The analytical methods employed by SiREM are described in the following sections.

2.2.2 Analysis of VOCs

This section describes the methods used to quantify cVOCs compounds. The quantitation limits (QL) were typically 10 µg/L in the reactors based on the lowest concentration standards that were included in the linear calibration trend.

Aqueous cVOC concentrations in the microcosms were measured using an Agilent 7890 gas chromatograph (GC) equipped with an Agilent G1888 headspace autosampler programmed to heat each sample vial to 75 °C for 45 minutes (min) prior to headspace injection into a GSQ Plot column (0.53 millimeters x 30 meters, J&W) and a flame ionization detector (FID). Sample vials were heated to ensure that all cVOCs in the aqueous sample would partition into the headspace. The injector temperature was 200°C, and the detector temperature was 250 °C. The oven temperature was programmed as follows: 35 °C for 2 min, increased to 100 °C at 50 degrees Celsius per minute (°C/min), then increased to 185 °C at 25 °C/min and held at 185 °C for 6.80 min. The carrier gas was helium at a flow rate of 11 milliliters per minute (mL/min).

After withdrawing a 1 mL sample from the reactors using a gas-tight Hamilton glass syringe (as described in Section 2.2.1), the sample was injected into a 10 mL auto sampler vial containing 4.7 mL of acidified DI water (pH ~2) and 300 µL of a 1.5 molar (M) ascorbic acid solution. The ascorbic acid was used as a preservative to halt the oxidation reactions by reacting with unreacted permanganate, eliminating the colour in the samples containing permanganate as per the recommendations in Ko et al. (2012). The vial was sealed with an inert Teflon™-coated septum and aluminum crimp cap for automated injection of 3 mL of headspace onto the GC. One cVOC standard was analyzed with each set of samples to verify the instrument five-point calibration curve using methanolic stock solutions containing known concentrations of the target analytes. Calibration was performed using external standards purchased as standard solutions (Sigma, St Louis, Missouri), where known volumes of standard solutions were added to acidified water in

auto sampler vials and analyzed as described above for microcosm samples. Data were integrated using ChemStation Software (Agilent Technologies, Santa Clara, California).

2.2.3 Analysis of Permanganate

Samples were collected from the control and treatment reactors using disposable 5 mL plastic syringes for analysis of permanganate. Permanganate concentration was quantified colourimetrically using a ultraviolet/visible light (UV/VIS) spectrophotometer (Biochrom Ultraspec 1000). Samples (1 mL) were collected from batch reactors, filtered through a 0.45 µm syringe filter and diluted as required so that absorbance readings at 525 nanometers (nm) were less than 2.0 absorbance units. A five point calibration curve was prepared using known concentrations of a standardized permanganate solution at each analysis event. The method detection limit was 0.90 milligrams per liter (mg/L).

2.2.4 Analysis of pH

pH measurements were performed using an Oakton pH spear with combination pH electrode (Oakton, Vernon Hills, Illinois). A 0.5 mL sample was collected using a gas-tight Hamilton glass syringe (as described in section 2.2.1) and the pH was measured on the lab bench. The pH spear was calibrated weekly according to the manufacturer's instructions using pH 4.0, 7.0 and 10 standards.

3 RESULTS

Results are provided by task as follows:

Task 1) A summary of the measured and calculated permanganate oxidant demands are provided in Table 2. The detailed test results are provided in Appendix B.

Task 2A) A summary of permanganate, pH and PCE results from Tasks 2A and 2B are provided in Table 3. The PCE trends from Tasks 2A and 2B are presented together in Figure 1.

Task 2B) All results from Prima are provided in Appendix C.

4 REFERENCES

Ko, Saebom, S.G. Huling and B. Pivetz. 2012. Ground Water Sample Preservation at In-Situ Chemical Oxidation Sites – Recommended Guidelines. EPA/600/R-12/049 August 2012

TABLES

TABLE 1: SUMMARY OF REACTOR CONTROLS, TREATMENTS AND AMENDMENTS
7th and Missouri, Phoenix, Arizona

Treatment/Control	Assigned Microcosm Number	Number of Microcosms	Geological Material (g)	DI Water (mL)	Headspace (mL)	Permanganate Dosage (g/L)	Permanganate (mL)	VOCs
Task 1: Permanganate Oxidant Demand Test								
Reagent Control	1 to 2	2	0	0	125	20	Amended with 100 mL of a 20 g/L permanganate stock solution.	--
20 g/L Permanganate Treatment	3 to 4	2	50	0	125	20	Amended with 100 mL of a 20 g/L permanganate stock solution.	
Task 2A: Permanganate Treatability Test								
Intrinsic Control	1 to 2	2	50	100	125	0	--	Spiked with 233 µL of a saturated PCE stock solution to a target concentration of 200 µg/L.
2.5 g/L Permanganate Treatment	3 to 4	2	50	100	125	2.5	Amended with 1.1 mL of a 300 g/L permanganate stock solution to a target concentration of 2.5 g/L.	
7.5 g/L Permanganate Treatment	5 to 6	2	50	100	125	7.5	Amended with 3.2 mL of a 300 g/L permanganate stock solution to a target concentration of 7.5 g/L.	

Notes:

-- - not applicable
µL - microliter
g - grams
g/L - grams per liter
mL - milliliters
VOCs - volatile organic compounds
µg/L - micrograms per liter
DI - de-ionized
PCE - tetrachloroethene

TABLE 2: SUMMARY OF TASK 1 PERMANGANATE OXIDANT DEMAND RESULTS
7th and Missouri, Phoenix, Arizona

Treatment	Customer Sample ID	Measured MnO_4 Natural Oxidant Demand (g/kg)	Calculated $KMnO_4$ Natural Oxidant Demand (g/kg)	Calculated $NaMnO_4$ Natural Oxidant Demand (g/kg)
Reagent Control	--	0.00	0.00	0.00
20 g/L permanganate Treatment	SP1 110.5-112	0.36	0.47	0.42

Notes:

-- - not applicable
g/kg - grams per kilogram
g/L - grams per liter
KMnO4 - potassium permanganate
MnO4 - permanganate
NaMnO4 - sodium permanganate

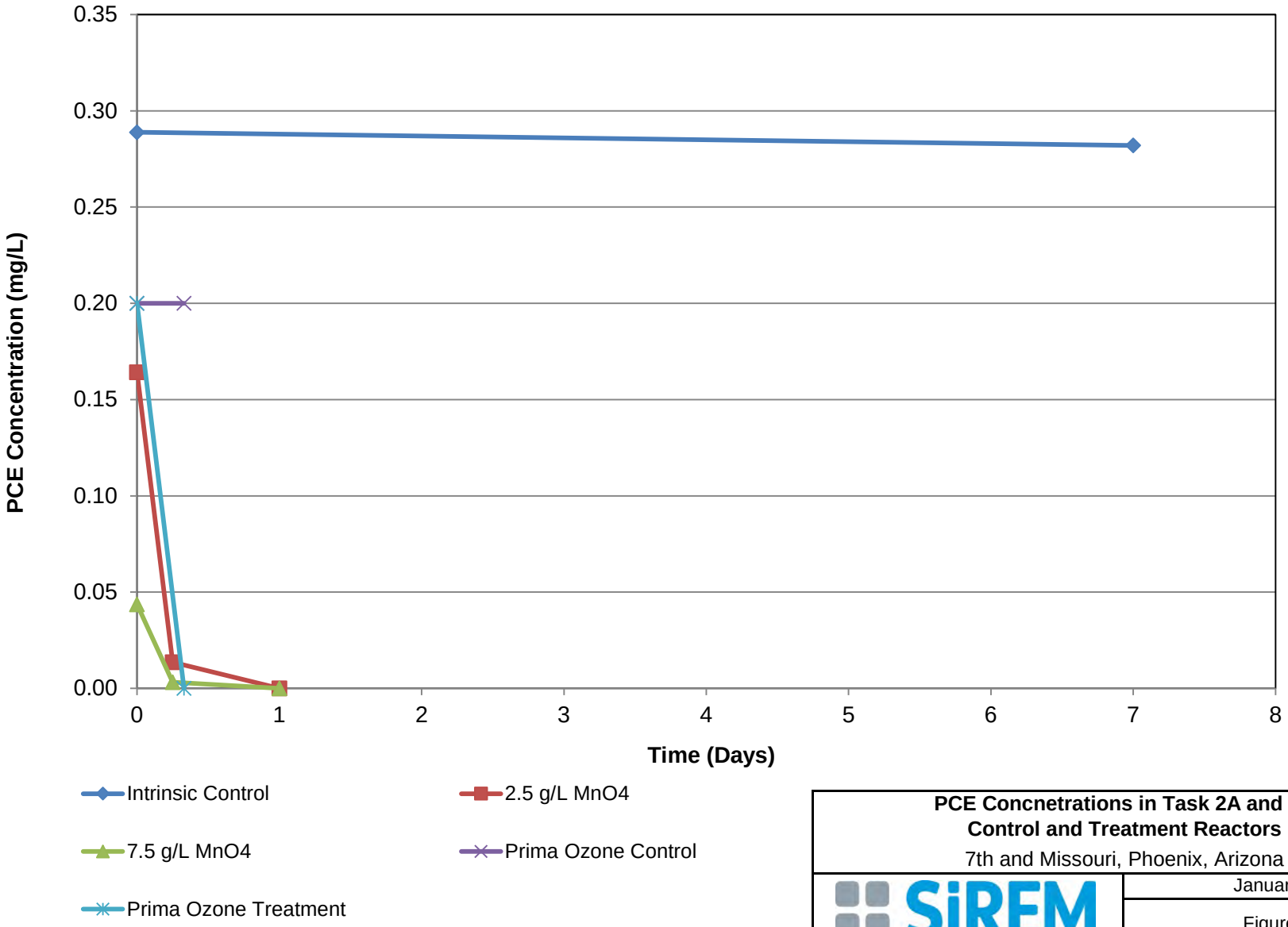
TABLE 3: SUMMARY OF TASK 2A AND 2B TREATABILITY REACTOR PERMANGANATE, pH AND PCE RESULTS
7th and Missouri, Phoenix, Arizona

Treatment	Date	Day	Bottle	Treatment Replicate	Permanganate (g/L)	pH	PCE (mg/L)
Intrinsic Control	14-Nov-18	0	1	IC-1	- -	8.07	0.29
			2	IC-2	- -	8.45	0.28
				Average	***- -***	***8.26***	***0.29***
	21-Nov-18	7	1	IC-1	- -	8.44	0.32
			2	IC-2	- -	8.59	0.25
				Average	***- -***	***8.52***	***0.28***
2.5 g/L Permanganate Treatment	14-Nov-18	0	3	2.5MnO4-1	2.05	8.16	0.17
			4	2.5MnO4-2	2.05	8.05	0.16
				Average	***2.05***	***8.11***	***0.16***
		0.25	3	2.5MnO4-1	1.79	7.60	0.018
			4	2.5MnO4-2	1.59	8.08	0.011
				Average	***1.69***	***7.84***	***0.014***
	15-Nov-18	1	3	2.5MnO4-1	1.90	7.57	<0.010
			4	2.5MnO4-2	1.74	7.59	<0.010
				Average	***1.82***	***7.58***	***ND***
7.5 g/L Permanganate Treatment	14-Nov-18	0	5	7.5MnO4-1	6.87	7.57	0.04
			6	7.5MnO4-2	6.76	7.59	0.05
				Average	***6.82***	***7.58***	***0.04***
		0.25	5	7.5MnO4-1	6.05	7.62	<0.010
			6	7.5MnO4-2	5.94	7.23	<0.010
				Average	***6.00***	***7.43***	***ND***
	15-Nov-18	1	5	7.5MnO4-1	6.51	7.75	<0.010
			6	7.5MnO4-2	6.25	7.87	<0.010
				Average	***6.38***	***7.81***	***ND***
Prima Ozone Control	--	0.33	--	O3C-1	--	--	0.20
				Average	***--***	***--***	***0.20***
Prima Ozone Treatment	--	0.33	--	O3T-1	--	--	<1.0
				Average	***--***	***--***	***ND***

Notes:

IC - intrinsic control
mg/L - milligrams per liter
MnO4 - permanganate
< - compound not detected, the associated value is the detection limit
-- - not applicable
ND - not detected
g/L - grams per liter
PCE - tetrachloroethene

FIGURES



PCE Concnetrations in Task 2A and 2B
Control and Treatment Reactors
7th and Missouri, Phoenix, Arizona

SiREM

January-19

Figure: **1**

APPENDIX A: Chain of Custody Documentation

SiREM

Chain-of-Custody Form

siremlab.com

130 Stone Road West
Guelph ON, Canada N1G 3Z2
(519) 822-2265

Lab # S-5063

*Project Name	7th + Missouri
*Project #	SP0172
*Project Manager	Trevor Carlson
*Company	Geosyntec
*Email Address	tcarlson@geosyntec.com
Address (Street)	211 Wheeler Street
City	Saskatoon
State/Province	SK
Country	Canada
*Phone #	306-808-0449
*Sampler's Signature	Kelsey Hamelin
*Sampler's Printed Name	Kelsey Hamelin

Lee-Anna Walker +

Analysis

Preservative Key: 0. None; ~~1. HCL~~; 2. Other ___; 3. Other ___; 4. Other ___; 5. Other ___; 6. Other ___

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Containers	Gene-Trac DHC	Gene-Trac VC	Gene-Trac DHB	Gene-Trac DHG	Treatability Study	COD						Other Information
SP2-(31'-33')	10/12/18	13:00	soil	4					X	X						
SP2-(110'-115.5')	10/14/18	07:20	soil	3					X	X						{ part of same
SP2-(112'-113')	10/14/18	07:20	soil	2					X	X						{ sample drive
SP1-(33-34.5)	10/12/18	12:30	S	3					X	X						
SP1-(111.5-112)	10/14/18	07:00	S	4					X	X						see below.

Billing Information

P.O. # SP0172

*Bill To: Geosyntec (Trevor Carlson)

Turnaround Time Requested

Normal ☑
Rush ☐

For Lab Use Only

Cooler Condition: GOOD

Cooler Temperature: 5°C.

Custody Seals: Yes ☐ No ☒

For Lab Use Only 4 cores.

SP1-(111.5-112) Labelled.

110-110.5

110.5-111

111-111.5 and 111.5-112

Proposal #:

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name: Lee-Anna Walker	Printed Name: D. Nespoli	Printed Name	Printed Name	Printed Name	Printed Name
Firm: Geosyntec	Firm: SiREM	Firm	Firm	Firm	Firm
Date/Time: 10/18/18 09:30	Date/Time: OCT 18 '18 1:30pm	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - return to Originator; Yellow - Lab Copy; Pink - Retained by Client

* Mandatory Fields

APPENDIX B: Task 1 Permanganate Detailed Test Results

APPENDIX B: TASK 1 PERMANGANATE DETAILED TEST RESULTS
7th and Missouri, Phoenix, Arizona

Lab ID	Client ID
18-2067	SP1 110.5-112

Initial Concentration (g/L)	16.3
Volume of Solution (mL)	98.7
Average Mass of Dry Soil (g)	50.0

Incubation Time (hours)	Concentration of MnO_4 (g/L)			Remaining MnO_4 (g)	Consumed MnO_4(g)	MnO_4 Oxidant Demand (g/kg)
	Rep.1	Rep. 2	Average			
0	16.1	16.4	16.3	1.60	0.00	0.00
6	14.5	14.7	14.6	1.44	0.17	3.30
48	16.1	16.1	16.1	1.59	0.02	0.36

Notes:

g - grams
g/kg - grams per kilogram
g/L - grams per liter
MnO_4 - permanganate
mL - milliliter
Rep - replicate

APPENDIX B: TASK 1 PERMANGANATE DETAILED TEST RESULTS
7th and Missouri, Phoenix, Arizona

Lab ID	Client ID
Reagent Control	--
Initial Concentration (g/L)	16.0
Volume of Solution (mL)	98.5
Average Mass of Dry Soil (g)	0.0

Incubation Time (hours)	Concentration of MnO_4 (g/L)			Remaining MnO_4 (g)	Consumed MnO_4(g)	MnO_4 Oxidant Demand (g/kg)
	Rep.1	Rep. 2	Average			
0	16.1	16.0	16.0	1.58	0.00	0.00
6	15.4	14.9	15.2	1.50	0.08	--
48	16.1	16.1	16.1	1.58	0.00	0.00

Notes:

g - grams
g/kg - grams per kilogram
g/L - grams per liter
MnO_4 - permanganate
mL - milliliter
Rep - replicate
-- - not applicable

APPENDIX C: Task 2B Prima Environmental Laboratory Report

November 29, 2018

Jeff Roberts, M.Sc.
SiREM
130 Stone Rd. West
Guelph, Ontario, Canada N1G 3Z2

RE: Revision2b (PCE Removal) Report of Findings for Bench Scale Evaluation of Ozone, 7th & Missouri site
SiREM Job No. S-5063

Dear Mr. Roberts:

This letter report describes testing conducted on soil from the 7th & Missouri site to assess the ability of ozone to destroy aqueous tetrachloroethene (PCE) in the presence of site soil.

Sample Receipt and Preparation

One soil sample (S-5063 SP1 110.5'-112') was received on October 26, 2018. Prior to testing, the soil was sieved to remove particles greater than 4 mesh (3/16 inches, 4.76 mm) then homogenized. Homogenized soil was analyzed for volatile organic compounds (VOCs) by Alpha Analytical (Sparks, Nevada) using EPA 8260.

Deionized (DI) water was spiked with a methanolic stock solution of PCE to a target concentration of 200 µg/L. A methanolic solution (0.6 mL/L DI water) was used to ensure rapid dissolution of PCE in the water. Spiked DI water was analyzed for VOCs.

Procedures

Two reactors containing soil (0.095 kg) and spiked DI water (0.95 L) were set. One reactor was capped and served as the control. The second reactor was sparged with ozone (75 mg O_3/L O_2) at a flowrate of 51 mL/min for 8 hours. Off-gases were collected in a Tedlar bag. After 8 hours, soil was allowed to settle, then the water was analyzed for VOCs. **Table 1** (attached) summarizes the tests. **Figure 1** (attached) shows the reactors prior to settling.

Results

The concentration of PCE post-treatment in water and off-gases, as well as the corresponding percent removed, is shown in **Table** 2 (attached). PCE was completely removed within 8 hours. No PCE was detected in the off-gases, indicating that less than 5% of the PCE was volatilized. The amount of ozone applied was 1.8 g (1.9 g O_3/L water).

If you have any questions regarding this report, please contact me at 916-939-7300 or cschreier@primaenvironmental.com. Thank you for the opportunity to be of service.

Sincerely,
PRIMA Environmental, Inc.

Cindy G. Schreier, Ph.D.
President and Chief Scientist

Table 1. Summary of PCE Removal Test Conditions.

Test	Soil	Water	Treatment	Ozone Applied	
	kg	L		g	g/L water
Control	0.095	0.95	none	0	0
Ozone	0.095	0.95	sparge with ozone: 75mg/L in O2, 51 mL/min for 8 hours	1.8	1.9

Table 2. PCE Removal Results.

Analyte	Units	Control	Test
Aqueous Concentration			
Acetone	µg/L	< 40	16
Tetrachloroethene	µg/L	200	< 1.0
Volume water	L	0.95	0.95
Off-gas Concentration			
Acetone	µg/L	n.a.	< 4.0
Tetrachloroethene	µg/L	n.a.	< 0.40
Volume off-gas	L	0	24
Percent Remaining in Water			
Acetone		n.a.	unknown*
Tetrachloroethene		n.a.	< 0.5
Percent Volatilized			
Acetone		n.a.	unknown*
Tetrachloroethene		n.a.	< 5.1
Percent Destroyed			
Acetone		n.a.	unknown*
Tetrachloroethene		n.a.	> 94

* Unknown because analyte not detected in the Control.

Figure 1. PCE Removal Reactors Prior to Sampling.

PRIMA ENVIRONMENTAL INC.
5070 Robert J. Mathews Parkway, Suite 300
El Dorado Hills, CA 95762
(916) 939-7300; (916) 939-7398 Fax
www.primaenvironmental.com

CHAIN of CUSTODY

Project Manager: Jeff Roberts/Kela Ashworth
Project Name: 7th & Missouri
Job Number: S-5063
Sampler Signature: Kelaashworth

Phone: 519-822-2265
Fax:
Email: jroberts@siremlab.com/kashworth@siremlab.com
TAT: Regular

SAMPLE ID	Date	Time	Matrix	# Containers	Ozone										Comments
S-5063 SP1 110.5'-112'	25-Oct-18		S	1	X										

Special Instructions	Relinquished by:		Received by:
Sx Rec'd in good Cond. on frozen Ice packs.	Company SiREM	Date 25 Oct 2018	Company PRIMA 10/26/18 - 1100
	Printed Name Kela Ashworth	Time 16:30	Printed Name Catherine Liguori
	Signature Kelaashworth		Signature Catherine Liguori
	Relinquished by:		**Received by:**
	Company	Date	Company
	Printed Name	Time	Printed Name
	Signature		Signature

Matrix key: S - soil/sediment; W - water; OT - other

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

November 12, 2018

Cindy Schreier
Prima Environmental
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
TEL: (916) 939-7300
FAX (916) 939-7398

RE: SIREM-03

Order No.: PES1811047

Dear Cindy Schreier:

There were no problems with the analytical events associated with this report unless noted.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Roger Scholl

Roger Scholl
Laboratory Director
255 Glendale Ave, #21
Sparks, Nevada 89431

Alpha Analytical, Inc.

(775) 355-1044 / (775) 355-0406 FAX / 1-800-283-1183
225 Glendale Ave. - Suite 21 - Sparks, Nevada 89431-5578

Analytical Report

WO#: **PES1811047**
Report Date: **11/12/2018**

CLIENT: Prima Environmental
Collection Date: 11/1/2018 1:00:00 PM
Project: SIREM-03
Lab ID: 1811047-01
Matrix: AQUEOUS
Client Sample ID SPK-D1

Analyses	Result	RL	Qual	Units	Date Analyzed	Method
Chloromethane	ND	12		µg/L	11/2/2018	VOCs by EPA 8260B
Vinyl chloride	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Chloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Bromomethane	ND	12		µg/L	11/2/2018	VOCs by EPA 8260B
Trichlorofluoromethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Acetone	ND	60		µg/L	11/2/2018	VOCs by EPA 8260B
1,1-Dichloroethene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Dichloromethane	ND	12		µg/L	11/2/2018	VOCs by EPA 8260B
trans-1,2-Dichloroethene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,1-Dichloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
cis-1,2-Dichloroethene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Chloroform	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,2-Dichloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,1,1-Trichloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Carbon tetrachloride	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Benzene	ND	1.5		µg/L	11/2/2018	VOCs by EPA 8260B
1,2-Dichloropropane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Trichloroethene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Bromodichloromethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
cis-1,3-Dichloropropene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
trans-1,3-Dichloropropene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,1,2-Trichloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Toluene	ND	1.5		µg/L	11/2/2018	VOCs by EPA 8260B
Dibromochloromethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Tetrachloroethene	260	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Chlorobenzene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Ethylbenzene	ND	1.5		µg/L	11/2/2018	VOCs by EPA 8260B
m,p-Xylene	ND	1.5		µg/L	11/2/2018	VOCs by EPA 8260B
Bromoform	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
o-Xylene	ND	1.5		µg/L	11/2/2018	VOCs by EPA 8260B
1,1,2,2-Tetrachloroethane	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,3-Dichlorobenzene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,4-Dichlorobenzene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
1,2-Dichlorobenzene	ND	3.0		µg/L	11/2/2018	VOCs by EPA 8260B
Surr: 1,2-Dichloroethane-d4	90	70-130		%Rec	11/2/2018	VOCs by EPA 8260B
Surr: Toluene-d8	104	70-130		%Rec	11/2/2018	VOCs by EPA 8260B
Surr: 4-Bromofluorobenzene	85	70-130		%Rec	11/2/2018	VOCs by EPA 8260B

NOTES:
Reporting Limits were increased due to high concentrations of target analytes.

Alpha Analytical, Inc.

(775) 355-1044 / (775) 355-0406 FAX / 1-800-283-1183
225 Glendale Ave. - Suite 21 - Sparks, Nevada 89431-5578

Analytical Report

WO#: **PES1811047**
Report Date: **11/12/2018**

CLIENT: Prima Environmental
Collection Date: 11/1/2018 2:30:00 PM
Project: SIREM-03
Lab ID: 1811047-02
Matrix: SOIL
Client Sample ID Untr-So

Analyses	Result	RL	Qual	Units	Date Analyzed	Method
Chloromethane	ND	80		µg/Kg	11/6/2018	VOCs by EPA 8260B
Vinyl chloride	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Chloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Bromomethane	ND	80		µg/Kg	11/6/2018	VOCs by EPA 8260B
Trichlorofluoromethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Acetone	ND	400		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,1-Dichloroethene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Dichloromethane	ND	80		µg/Kg	11/6/2018	VOCs by EPA 8260B
trans-1,2-Dichloroethene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,1-Dichloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
cis-1,2-Dichloroethene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Chloroform	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,2-Dichloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,1,1-Trichloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Carbon tetrachloride	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Benzene	ND	10		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,2-Dichloropropane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Trichloroethene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Bromodichloromethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
cis-1,3-Dichloropropene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
trans-1,3-Dichloropropene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,1,2-Trichloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Toluene	ND	10		µg/Kg	11/6/2018	VOCs by EPA 8260B
Dibromochloromethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Tetrachloroethene	21	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Chlorobenzene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Ethylbenzene	ND	10		µg/Kg	11/6/2018	VOCs by EPA 8260B
m,p-Xylene	ND	10		µg/Kg	11/6/2018	VOCs by EPA 8260B
Bromoform	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
o-Xylene	ND	10		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,1,2,2-Tetrachloroethane	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,3-Dichlorobenzene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,4-Dichlorobenzene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
1,2-Dichlorobenzene	ND	20		µg/Kg	11/6/2018	VOCs by EPA 8260B
Surr: 1,2-Dichloroethane-d4	106	70-130		%Rec	11/6/2018	VOCs by EPA 8260B
Surr: Toluene-d8	93	70-130		%Rec	11/6/2018	VOCs by EPA 8260B
Surr: 4-Bromofluorobenzene	96	70-130		%Rec	11/6/2018	VOCs by EPA 8260B

NOTES:
Some Reporting Limits were increased due to high concentrations of non-target analytes.

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**
12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_S**

Sample ID:	**MB-5609**	SampType:	**MBLK**	TestCode:	**VOC_S**	Units:	**µg/Kg**
Client ID:	**PBS**	Batch ID:	**A5609**	TestNo:	**SW8260B**		
Prep Date:	**11/1/2018**	RunNo:	**4952**	SeqNo:	**135130**		
Analysis Date:	**11/1/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	ND	40									
Vinyl chloride	ND	20									
Chloroethane	ND	20									
Bromomethane	ND	40									
Trichlorofluoromethane	ND	20									
Acetone	ND	200									
1,1-Dichloroethene	ND	20									
Dichloromethane	ND	40									
trans-1,2-Dichloroethene	ND	20									
1,1-Dichloroethane	ND	20									
cis-1,2-Dichloroethene	ND	20									
Chloroform	ND	20									
1,2-Dichloroethane	ND	20									
1,1,1-Trichloroethane	ND	20									
Carbon tetrachloride	ND	20									
Benzene	ND	5									
1,2-Dichloropropane	ND	20									
Trichloroethene	ND	20									
Bromodichloromethane	ND	20									
cis-1,3-Dichloropropene	ND	20									
trans-1,3-Dichloropropene	ND	20									
1,1,2-Trichloroethane	ND	20									
Toluene	ND	5									
Dibromochloromethane	ND	20									
Tetrachloroethene	ND	20									
Chlorobenzene	ND	20									
Ethylbenzene	ND	5									
m,p-Xylene	ND	5									
Bromoform	ND	20									
o-Xylene	ND	5									
1,1,2,2-Tetrachloroethane	ND	20									
1,3-Dichlorobenzene	ND	20									
1,4-Dichlorobenzene	ND	20									
1,2-Dichlorobenzene	ND	20									
Surr: 1,2-Dichloroethane-d4	210		200		103	69.51	130.49				
Surr: Toluene-d8	180		200		92.1	69.51	130.49				
Surr: 4-Bromofluorobenzene	180		200		92.0	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_S**

Sample ID:	**LCS-5609**	SampType:	**LCS**	TestCode:	**VOC_S**	Units:	**µg/Kg**
Client ID:	**LCSS**	Batch ID:	**A5609**	TestNo:	**SW8260B**		
Prep Date:	**10/29/2018**	RunNo:	**4952**	SeqNo:	**135131**		
Analysis Date:	**11/1/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	312	80	400	0	78.0	5.73	179				
Vinyl chloride	312	40	400	0	77.9	37.8	194				
Chloroethane	54.5	40	400	0	13.6	13.4	120.4				
Bromomethane	301	80	400	0	75.2	7.97	129				
Trichlorofluoromethane	72.5	40	400	0	18.1	2.11	120.4				
Acetone	7700	400	8000	0	96.2	36.4	155				
1,1-Dichloroethene	323	40	400	0	80.7	31.3	154				
Dichloromethane	376	80	400	0	94.1	45.9	180				
trans-1,2-Dichloroethene	417	40	400	0	104	52.1	140				
1,1-Dichloroethane	412	40	400	0	103	53.8	140				
cis-1,2-Dichloroethene	411	40	400	0	103	54.6	133				
Chloroform	378	40	400	0	94.6	53.3	126				
1,2-Dichloroethane	413	40	400	0	103	56.8	132				
1,1,1-Trichloroethane	414	40	400	0	104	44.1	133				
Carbon tetrachloride	411	40	400	0	103	20	133				
Benzene	402	10	400	0	100	59.1	135				
1,2-Dichloropropane	420	40	400	0	105	59	134				
Trichloroethene	444	40	400	0	111	54.8	136				
Bromodichloromethane	421	40	400	0	105	31.5	128				
cis-1,3-Dichloropropene	420	40	400	0	105	32.8	133				
trans-1,3-Dichloropropene	451	40	400	0	113	31.8	134				
1,1,2-Trichloroethane	438	40	400	0	109	61.2	141				
Toluene	403	10	400	0	101	45.6	133				
Dibromochloromethane	403	40	400	0	101	30	133				
Tetrachloroethene	424	40	400	0	106	36.1	139				
Chlorobenzene	424	40	400	0	106	56.4	134				
Ethylbenzene	424	10	400	0	106	50.1	135				
m,p-Xylene	410	10	400	0	103	54.1	137				
Bromoform	397	40	400	0	99.2	35.5	136				
o-Xylene	430	10	400	0	107	59.3	134				
1,1,2,2-Tetrachloroethane	431	40	400	0	108	36.7	184				
1,3-Dichlorobenzene	432	40	400	0	108	55.9	130				
1,4-Dichlorobenzene	421	40	400	0	105	52.6	132				
1,2-Dichlorobenzene	425	40	400	0	106	56.6	127				
Surr: 1,2-Dichloroethane-d4	396		400		98.9	77.4	125				
Surr: Toluene-d8	373		400		93.3	79.5	109				
Surr: 4-Bromofluorobenzene	366		400		91.6	69.8	119				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_S**

Sample ID:	**1810470-01AMSD**	SampType:	**MSD**	TestCode:	**VOC_S**	Units:	**µg/Kg**
Client ID:	**BatchQC**	Batch ID:	**A5609**	TestNo:	**SW8260B**		
Prep Date:	**11/1/2018**	RunNo:	**4952**	SeqNo:	**135133**		
Analysis Date:	**11/1/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	257	80	400	0	64.4	11.3	167	261	1.4	27.1	
Vinyl chloride	271	40	400	0	67.8	21.4	183	256	5.8	27.3	
Chloroethane	56	40	400	0	14.0	2.79	108	56.8	1.5	33.6	
Bromomethane	302	80	400	0	75.5	2.99	142	283	6.7	43.8	
Trichlorofluoromethane	68.2	40	400	0	17.0	13.5	41.8	71.5	4.7	39	
Acetone	7420	400	8000	0	92.7	24.2	149	6630	11	24.8	
1,1-Dichloroethene	313	40	400	0	78.3	12	159	301	4	38.6	
Dichloromethane	366	80	400	0	91.5	57.7	149	342	6.8	29.3	
trans-1,2-Dichloroethene	380	40	400	0	95.0	51	140	370	2.8	34	
1,1-Dichloroethane	378	40	400	0	94.6	58	132	366	3.3	24.6	
cis-1,2-Dichloroethene	384	40	400	0	96.0	57.8	133	368	4.3	24.7	
Chloroform	348	40	400	0	87.0	56.3	127	335	4	23.5	
1,2-Dichloroethane	382	40	400	0	95.4	57.5	126	368	3.6	23.2	
1,1,1-Trichloroethane	380	40	400	0	95.0	49.8	135	363	4.5	27	
Carbon tetrachloride	373	40	400	0	93.2	24.3	147	357	4.3	29.4	
Benzene	368	10	400	0	92.1	62.9	132	354	4.1	24.1	
1,2-Dichloropropane	389	40	400	0	97.3	63	130	371	4.8	23.5	
Trichloroethene	400	40	400	0	99.9	56.3	138	414	3.6	24.2	
Bromodichloromethane	383	40	400	0	95.8	37	135	369	3.8	24.4	
cis-1,3-Dichloropropene	390	40	400	0	97.6	37.3	144	378	3.4	24.3	
trans-1,3-Dichloropropene	415	40	400	0	104	36.5	148	410	1.3	24.3	
1,1,2-Trichloroethane	408	40	400	0	102	64	131	397	2.8	22	
Toluene	364	10	400	0	91.1	56.4	133	353	3.2	24.1	
Dibromochloromethane	361	40	400	0	90.3	37.4	139	353	2.4	26	
Tetrachloroethene	381	40	400	0	95.2	42.2	146	369	3.1	26.5	
Chlorobenzene	388	40	400	0	96.9	65.1	134	373	3.8	23.1	
Ethylbenzene	386	10	400	0	96.6	60.6	137	372	3.7	24.4	
m,p-Xylene	372	10	400	0	92.9	60.8	143	360	3.2	23.7	
Bromoform	357	40	400	0	89.3	47.1	127	351	1.9	26.6	
o-Xylene	385	10	400	0	96.2	63.6	145	375	2.5	24.9	
1,1,2,2-Tetrachloroethane	401	40	400	0	100	49.8	160	346	15	27.9	
1,3-Dichlorobenzene	392	40	400	0	98.1	62.1	138	396	0.89	24.8	
1,4-Dichlorobenzene	382	40	400	0	95.5	59.2	140	385	0.69	23.8	
1,2-Dichlorobenzene	388	40	400	0	96.9	63	129	376	3	24.7	
Surr: 1,2-Dichloroethane-d4	402		400		100	69.51	130.49	401	0	0	
Surr: Toluene-d8	370		400		92.4	69.51	130.49	368	0	0	
Surr: 4-Bromofluorobenzene	359		400		89.8	69.51	130.49	388	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**
12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_S**

Sample ID:	**1810470-01AMS**	SampType:	**MS**	TestCode:	**VOC_S**	Units:	**µg/Kg**
Client ID:	**BatchQC**	Batch ID:	**A5609**	TestNo:	**SW8260B**		
Prep Date:	**11/1/2018**	RunNo:	**4952**	SeqNo:	**135132**		
Analysis Date:	**11/1/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	261	80	400	0	65.3	11.3	167				
Vinyl chloride	256	40	400	0	64.0	21.4	183				
Chloroethane	56.8	40	400	0	14.2	2.79	110				
Bromomethane	283	80	400	0	70.6	2.99	142				
Trichlorofluoromethane	71.5	40	400	0	17.9	13.5	41.8				
Acetone	6630	400	8000	0	82.8	24.2	149				
1,1-Dichloroethene	301	40	400	0	75.2	12	159				
Dichloromethane	342	80	400	0	85.5	57.7	149				
trans-1,2-Dichloroethene	370	40	400	0	92.4	51	140				
1,1-Dichloroethane	366	40	400	0	91.5	58	132				
cis-1,2-Dichloroethene	368	40	400	0	92.0	57.8	133				
Chloroform	335	40	400	0	83.6	56.3	127				
1,2-Dichloroethane	368	40	400	0	92.0	57.5	126				
1,1,1-Trichloroethane	363	40	400	0	90.8	49.8	135				
Carbon tetrachloride	357	40	400	0	89.3	24.3	147				
Benzene	354	10	400	0	88.4	62.9	132				
1,2-Dichloropropane	371	40	400	0	92.7	63	130				
Trichloroethene	414	40	400	0	104	56.3	138				
Bromodichloromethane	369	40	400	0	92.2	37	135				
cis-1,3-Dichloropropene	378	40	400	0	94.4	37.3	144				
trans-1,3-Dichloropropene	410	40	400	0	102	36.5	148				
1,1,2-Trichloroethane	397	40	400	0	99.3	64	131				
Toluene	353	10	400	0	88.3	56.4	133				
Dibromochloromethane	353	40	400	0	88.2	37.4	139				
Tetrachloroethene	369	40	400	0	92.2	42.2	146				
Chlorobenzene	373	40	400	0	93.3	65.1	134				
Ethylbenzene	372	10	400	0	93.1	60.6	137				
m,p-Xylene	360	10	400	0	90.0	60.8	143				
Bromoform	351	40	400	0	87.6	47.1	127				
o-Xylene	375	10	400	0	93.8	63.6	145				
1,1,2,2-Tetrachloroethane	346	40	400	0	86.6	49.8	160				
1,3-Dichlorobenzene	396	40	400	0	98.9	62.1	138				
1,4-Dichlorobenzene	385	40	400	0	96.2	59.2	140				
1,2-Dichlorobenzene	376	40	400	0	94.1	63	129				
Surr: 1,2-Dichloroethane-d4	401		400		100	69.51	130.49				
Surr: Toluene-d8	368		400		92.0	69.51	130.49				
Surr: 4-Bromofluorobenzene	388		400		97.1	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**MB-5677**	SampType:	**MBLK**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**PBW**	Batch ID:	**A5677**	TestNo:	**SW8260B**		
Prep Date:	**11/2/2018**	RunNo:	**4979**	SeqNo:	**136044**		
Analysis Date:	**11/2/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	ND	2									
Vinyl chloride	ND	1									
Chloroethane	ND	1									
Bromomethane	ND	2									
Trichlorofluoromethane	ND	1									
Acetone	ND	10									
1,1-Dichloroethene	ND	1									
Dichloromethane	ND	2									
trans-1,2-Dichloroethene	ND	1									
1,1-Dichloroethane	ND	1									
cis-1,2-Dichloroethene	ND	1									
Chloroform	ND	1									
1,2-Dichloroethane	ND	1									
1,1,1-Trichloroethane	ND	1									
Carbon tetrachloride	ND	1									
Benzene	ND	0.5									
1,2-Dichloropropane	ND	1									
Trichloroethene	ND	1									
Bromodichloromethane	ND	1									
cis-1,3-Dichloropropene	ND	1									
trans-1,3-Dichloropropene	ND	1									
1,1,2-Trichloroethane	ND	1									
Toluene	ND	0.5									
Dibromochloromethane	ND	1									
Tetrachloroethene	ND	1									
Chlorobenzene	ND	1									
Ethylbenzene	ND	0.5									
m,p-Xylene	ND	0.5									
Bromoform	ND	1									
o-Xylene	ND	0.5									
1,1,2,2-Tetrachloroethane	ND	1									
1,3-Dichlorobenzene	ND	1									
1,4-Dichlorobenzene	ND	1									
1,2-Dichlorobenzene	ND	1									
Surr: 1,2-Dichloroethane-d4	9.2		10		91.6	69.51	130.49				
Surr: Toluene-d8	10		10		103	69.51	130.49				
Surr: 4-Bromofluorobenzene	9.1		10		91.4	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**LCS-5677**	SampType:	**LCS**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**LCSW**	Batch ID:	**A5677**	TestNo:	**SW8260B**		
Prep Date:	**11/2/2018**	RunNo:	**4979**	SeqNo:	**136043**		
Analysis Date:	**11/2/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	8.15	2	10	0	81.5	30.3	130				
Vinyl chloride	9.82	1	10	0	98.2	60.1	134				
Chloroethane	6.24	1	10	0	62.4	62.3	168				
Bromomethane	8.38	2	10	0	83.8	7.3	151				
Trichlorofluoromethane	10.7	1	10	0	107	76.5	148				
Acetone	199	10	200	0	99.3	63.6	118				
1,1-Dichloroethene	9.55	1	10	0	95.5	28.8	209				
Dichloromethane	9.37	2	10	0	93.7	77	120				
trans-1,2-Dichloroethene	9.62	1	10	0	96.2	79.5	127				
1,1-Dichloroethane	8.81	1	10	0	88.1	78.6	131				
cis-1,2-Dichloroethene	9.78	1	10	0	97.8	79.5	122				
Chloroform	8.64	1	10	0	86.4	75	122				
1,2-Dichloroethane	9.27	1	10	0	92.7	74.2	130				
1,1,1-Trichloroethane	9.46	1	10	0	94.6	79.2	128				
Carbon tetrachloride	8.7	1	10	0	87.0	79.5	125				
Benzene	9.45	0.5	10	0	94.5	79.5	126				
1,2-Dichloropropane	8.53	1	10	0	85.3	78.1	131				
Trichloroethene	9.93	1	10	0	99.3	79.3	121				
Bromodichloromethane	9.07	1	10	0	90.7	79.5	122				
cis-1,3-Dichloropropene	9.24	1	10	0	92.4	79.5	123				
trans-1,3-Dichloropropene	8.86	1	10	0	88.6	77.3	128				
1,1,2-Trichloroethane	9.2	1	10	0	92.0	75.1	122				
Toluene	10.1	0.5	10	0	101	79.7	121				
Dibromochloromethane	11.3	1	10	0	113	79.2	127				
Tetrachloroethene	11.4	1	10	0	114	74.9	121				
Chlorobenzene	11.2	1	10	0	112	79.5	119				
Ethylbenzene	11	0.5	10	0	110	79.5	120				
m,p-Xylene	10.3	0.5	10	0	103	79.5	122				
Bromoform	12.4	1	10	0	124	68.8	129				
o-Xylene	10.4	0.5	10	0	104	79.1	123				
1,1,2,2-Tetrachloroethane	11	1	10	0	110	73.8	135				
1,3-Dichlorobenzene	11	1	10	0	110	79.5	120				
1,4-Dichlorobenzene	11.2	1	10	0	112	79.5	119				
1,2-Dichlorobenzene	11.1	1	10	0	111	75.7	121				
Surr: 1,2-Dichloroethane-d4	9.79		10		97.9	69.51	130.49				
Surr: Toluene-d8	10.3		10		103	69.51	130.49				
Surr: 4-Bromofluorobenzene	9.01		10		90.1	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**1811043-01AMSD**	SampType:	**MSD**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**BatchQC**	Batch ID:	**A5677**	TestNo:	**SW8260B**		
Prep Date:	**11/2/2018**	RunNo:	**4979**	SeqNo:	**136670**		
Analysis Date:	**11/2/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	45.7	10	50	0	91.5	37.7	121	45.2	1.1	22.5	
Vinyl chloride	53.6	5	50	0	107	60.4	140	53.7	0.17	23.9	
Chloroethane	34.6	5	50	0	69.2	43.1	206	31.7	8.6	22.9	
Bromomethane	53.2	10	50	0	106	12.6	168	40.4	27	48	
Trichlorofluoromethane	51.1	5	50	0	102	58.6	163	50.1	2	33.3	
Acetone	1100	50	1000	0	110	37.3	152	1070	3.2	50	
1,1-Dichloroethene	52.6	5	50	0	105	69.8	158	50.9	3.3	21.7	
Dichloromethane	53.2	10	50	0	106	71.7	132	52	2.3	20	
trans-1,2-Dichloroethene	52.3	5	50	0	105	72	136	51.5	1.6	19.2	
1,1-Dichloroethane	49.3	5	50	0	98.7	76.9	140	48.4	2	18	
cis-1,2-Dichloroethene	55.5	5	50	0	111	73.9	133	53.8	3.1	20.1	
Chloroform	48.9	5	50	0	97.8	74.3	130	48	1.9	18	
1,2-Dichloroethane	52.4	5	50	0	105	72.6	144	50.6	3.6	17.1	
1,1,1-Trichloroethane	52.6	5	50	0	105	70.2	138	51.7	1.7	22.2	
Carbon tetrachloride	48.9	5	50	0	97.7	58.2	141	47.1	3.7	31.9	
Benzene	53	2.5	50	0	106	67.8	140	51.8	2.4	18.1	
1,2-Dichloropropane	48.2	5	50	0	96.5	75.3	144	46.9	2.8	19.7	
Trichloroethene	54.2	5	50	0	108	65.7	131	52.8	2.8	25.3	
Bromodichloromethane	51.1	5	50	0	102	70.2	141	49.1	3.8	20.5	
cis-1,3-Dichloropropene	48.8	5	50	0	97.6	56.9	132	47.2	3.4	25.8	
trans-1,3-Dichloropropene	50.1	5	50	0	100	72	131	47.5	5.2	26.4	
1,1,2-Trichloroethane	52.5	5	50	0	105	74	130	53	0.95	21.9	
Toluene	59.3	2.5	50	0	118	67.2	131	56.8	4.1	18.3	
Dibromochloromethane	67.4	5	50	0	135	71.5	134	63.8	5.4	24.1	S
Tetrachloroethene	61.3	5	50	0	123	45.9	138	59	3.9	30.9	
Chlorobenzene	66	5	50	0	132	73.7	120	63.3	4.3	23.1	S
Ethylbenzene	59.9	2.5	50	0	120	70.3	122	58	3.3	25.3	
m,p-Xylene	56.6	2.5	50	0	113	52.9	136	54.5	3.7	26.6	
Bromoform	73.8	5	50	0	148	61.5	141	69.4	6.2	25	S
o-Xylene	60.2	2.5	50	0	120	67.3	129	57.5	4.6	25	
1,1,2,2-Tetrachloroethane	64.7	5	50	0	129	62.4	153	61.2	5.5	24.6	
1,3-Dichlorobenzene	55.7	5	50	0	111	64.5	122	53.3	4.4	28.6	
1,4-Dichlorobenzene	57.1	5	50	0	114	63.7	121	53.9	5.7	27.7	
1,2-Dichlorobenzene	59	5	50	0	118	66.7	122	55.7	5.8	24.5	
Surr: 1,2-Dichloroethane-d4	48.6		50		97.1	69.51	130.49	49	0	0	
Surr: Toluene-d8	55.2		50		110	69.51	130.49	54.6	0	0	
Surr: 4-Bromofluorobenzene	41.6		50		83.2	69.51	130.49	40.8	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811047**

12-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**1811043-01AMS**	SampType:	**MS**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**BatchQC**	Batch ID:	**A5677**	TestNo:	**SW8260B**		
Prep Date:	**11/2/2018**	RunNo:	**4979**	SeqNo:	**136669**		
Analysis Date:	**11/2/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	45.2	10	50	0	90.5	37.7	121				
Vinyl chloride	53.7	5	50	0	107	60.4	140				
Chloroethane	31.7	5	50	0	63.5	43.1	206				
Bromomethane	40.4	10	50	0	80.8	12.6	168				
Trichlorofluoromethane	50.1	5	50	0	100	58.6	163				
Acetone	1070	50	1000	0	106	37.3	152				
1,1-Dichloroethene	50.9	5	50	0	102	69.8	158				
Dichloromethane	52	10	50	0	104	71.7	132				
trans-1,2-Dichloroethene	51.5	5	50	0	103	72	136				
1,1-Dichloroethane	48.4	5	50	0	96.7	76.9	140				
cis-1,2-Dichloroethene	53.8	5	50	0	108	73.9	133				
Chloroform	48	5	50	0	96.0	74.3	130				
1,2-Dichloroethane	50.6	5	50	0	101	72.6	144				
1,1,1-Trichloroethane	51.7	5	50	0	103	70.2	138				
Carbon tetrachloride	47.1	5	50	0	94.2	58.2	141				
Benzene	51.8	2.5	50	0	104	67.8	140				
1,2-Dichloropropane	46.9	5	50	0	93.8	75.3	144				
Trichloroethene	52.8	5	50	0	106	65.7	131				
Bromodichloromethane	49.1	5	50	0	98.3	70.2	141				
cis-1,3-Dichloropropene	47.2	5	50	0	94.3	56.9	132				
trans-1,3-Dichloropropene	47.5	5	50	0	95.1	72	131				
1,1,2-Trichloroethane	53	5	50	0	106	74	130				
Toluene	56.8	2.5	50	0	114	67.2	131				
Dibromochloromethane	63.8	5	50	0	128	71.5	134				
Tetrachloroethene	59	5	50	0	118	45.9	138				
Chlorobenzene	63.3	5	50	0	127	73.7	120				S
Ethylbenzene	58	2.5	50	0	116	70.3	122				
m,p-Xylene	54.5	2.5	50	0	109	52.9	136				
Bromoform	69.4	5	50	0	139	61.5	141				
o-Xylene	57.5	2.5	50	0	115	67.3	129				
1,1,2,2-Tetrachloroethane	61.2	5	50	0	122	62.4	153				
1,3-Dichlorobenzene	53.3	5	50	0	107	64.5	122				
1,4-Dichlorobenzene	53.9	5	50	0	108	63.7	121				
1,2-Dichlorobenzene	55.7	5	50	0	111	66.7	122				
Surr: 1,2-Dichloroethane-d4	49		50		98.0	69.51	130.49				
Surr: Toluene-d8	54.6		50		109	69.51	130.49				
Surr: 4-Bromofluorobenzene	40.8		50		81.6	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

Definition Only

WO#: **1811047**

Date:

Definitions:

ND = Not Detected

C = Reported concentration includes additional compounds uncharacteristic of common fuels and lubricants.

D = Reporting Limits were increased due to high concentrations of non-target analytes.

H = Reporting Limits were increased due to the hydrocarbons present in the sample.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

K = DRO concentration may include contributions from lighter-end hydrocarbons (e.g. gasoline) that elute in the DRO range.

L = DRO concentration may include contributions from heavier-end hydrocarbons (e.g. motor oil) that elute in the DRO range.

O = Reporting Limits were increased due to sample foaming.

V = Reporting Limits were increased due to high concentrations of target analytes.

X = Reporting Limits were increased due to sample matrix interferences.

Z = DRO concentration may include contributions from lighter-end (e.g. gasoline) and heavier-end (e.g. motor oil) hydrocarbons that elute in the DRO range.

S50 = The analysis of the sample required a dilution such that the surrogate concentration was diluted below the laboratory acceptance criteria. The laboratory control sample was acceptable.

S51 = Surrogate recovery could not be determined due to the presence of co-eluting hydrocarbons.

S52 = Surrogate recovery was above laboratory acceptance limits. Probable matrix effect.

S53 = Surrogate recovery was below laboratory acceptance limits. Probable matrix effect.

S54 = Surrogate recovery was below laboratory acceptance limits.

S55 = Surrogate recovery was above laboratory acceptance limits.

Report CC's Cindy Schreier

CHAIN-OF-CUSTODY RECORD

CA

RUSH

Alpha Analytical, Inc.

255 Glendale Ave, #21 Sparks, Nevada 89431

TEL: (775) 355-1044 FAX: (775) 355-0406

WorkOrder: PES1811047
Report Due By: 06-Nov-18
EDD Required: NO

Report Attention: Cindy Schreier

Client:
Prima Environmental
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762

TEL: 9169397300
FAX: 9169397398
ProjectNo: SIREM-03

Date Received: 02-Nov-18

Alpha Sample ID	Client Sample ID	Matrix	Collection Date	No. of Bottles Alpha	Sub	TAT	Requested Tests VOC_S	VOC_W						Sample Remarks
PES1811047-01	SPK-D1	AQ	11/1/2018 1:00:00 PM	3	0	2		A - 8260/Acetone_Cs						
PES1811047-02	Untr-So	SO	11/1/2018 2:30:00 PM	1	0	2	A - 8260/Acetone_Cs							

Comments: 48 HR TAT.

	Signature	Print Name	Company	Date/Time
Logged in by:		Brittany Cisneros	Alpha Analytical, Inc.	11/2/18 10:41

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

CHAIN OF CUSTODY

PRIMA ENVIRONMENTAL, Inc.
5070 Robert J. Mathews Parkway, Suite 300
El Dorado Hills, CA 95762
PH: 916-939-7300 FAX: 916 939 7398
data@primaenvironmental.com

Alpha Analytical, Inc.
Main Laboratory: 255 Glendale Ave, Suite 21 Sparks, NV 89431 — Phone: 775-355-1044, Fax: 775-355-0406

Satellite Service Centers:
Northern CA: 9891 Horn Road, Suite C, Rancho Cordova, CA 95827 — Phone: 916-366-9089
Southern CA: Fountain Valley, CA 92708 — Phone: 714-386-2901
Northern NV: Elko, NV 89801 — Phone: 775-388-7043

001897

Consultant/ Client Info:
Company:
Address:
City, State, Zip:

Job and Purchase Order Info:
Job #
Job Name: SIREM-03
P.O. #:

Report Attention/Project Manager:
Name:
Email Address:
Phone #:
Cell #:

QC Deliverable Info:
EDD Required? Yes / No EDF Required? Yes / No
Global ID:
Data Validation Packages: III or IV

Samples Collected from which State? (circle one) AR CA KS NV OR WA DOD Site Other

Time Sampled (HHMM)	Date Sampled (MM/DD)	Matrix* (See Key Below)	Lab ID Number (For Lab Use Only)	Sample Description	TAT	# Containers** (See Key Below)	Field Filtered? Yes	Field Filtered? No	VOCs	Remarks
1300	11/1/18	AR	RES1811047-01	SPR-P1	48hr	3V		X	X	
1430	11/1/18	SO	-02	untr-SO	48hr	1S		X	X	

ADDITIONAL INSTRUCTIONS:

I (field sampler) attest to the validity and authenticity of this sample(s). I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. NAC 445.0636 (c) (2).

Sampled By: CR

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
[signature]	11/1/18	1500	[signature]	11/2/18	10:41

* Key: AQ - Aqueous AR-Air OT - Other So-Soil WA - Waste ** B - Brass L - Liter O - Orbo OT - Other P - Plastic S-Soil Jar T - Tedlar V - VOA

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this COC. The liability of the laboratory is limited to the amount paid for the report.

12/17

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

November 26, 2018

Cindy Schreier
Prima Environmental
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
TEL: (916) 939-7300
FAX (916) 939-7398

RE: SIREM-03

Order No.: PES1811319

Dear Cindy Schreier:

There were no problems with the analytical events associated with this report unless noted.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Roger Scholl

Roger Scholl
Laboratory Director
255 Glendale Ave, #21
Sparks, Nevada 89431

Alpha Analytical, Inc.

(775) 355-1044 / (775) 355-0406 FAX / 1-800-283-1183
225 Glendale Ave. - Suite 21 - Sparks, Nevada 89431-5578

Analytical Report

WO#: **PES1811319**
Report Date: **11/26/2018**

CLIENT: Prima Environmental
Collection Date: 11/8/2018 6:30:00 PM
Project: SIREM-03
Lab ID: 1811319-01
Matrix: AQUEOUS
Client Sample ID SIREM-03-Con

Analyses	Result	RL	Qual	Units	Date Analyzed	Method
Chloromethane	ND	8.0		µg/L	11/20/2018	VOCs by EPA 8260B
Vinyl chloride	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Bromomethane	ND	8.0		µg/L	11/20/2018	VOCs by EPA 8260B
Trichlorofluoromethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Acetone	ND	40		µg/L	11/20/2018	VOCs by EPA 8260B
1,1-Dichloroethene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Dichloromethane	ND	8.0		µg/L	11/20/2018	VOCs by EPA 8260B
trans-1,2-Dichloroethene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1-Dichloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
cis-1,2-Dichloroethene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chloroform	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,1-Trichloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Carbon tetrachloride	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Benzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichloropropane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Trichloroethene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Bromodichloromethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
cis-1,3-Dichloropropene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
trans-1,3-Dichloropropene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,2-Trichloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Toluene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Dibromochloromethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Tetrachloroethene	200	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chlorobenzene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Ethylbenzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
m,p-Xylene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Bromoform	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
o-Xylene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,3-Dichlorobenzene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,4-Dichlorobenzene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichlorobenzene	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Surr: 1,2-Dichloroethane-d4	87	70-130		%Rec	11/20/2018	VOCs by EPA 8260B
Surr: Toluene-d8	109	70-130		%Rec	11/20/2018	VOCs by EPA 8260B
Surr: 4-Bromofluorobenzene	93	70-130		%Rec	11/20/2018	VOCs by EPA 8260B

NOTES:
Some Reporting Limits were increased due to high concentrations of target analytes.

Alpha Analytical, Inc.

(775) 355-1044 / (775) 355-0406 FAX / 1-800-283-1183
225 Glendale Ave. - Suite 21 - Sparks, Nevada 89431-5578

Analytical Report

WO#: **PES1811319**
Report Date: **11/26/2018**

CLIENT: Prima Environmental
Collection Date: 11/8/2018 6:35:00 PM
Project: SIREM-03
Lab ID: 1811319-02
Matrix: AQUEOUS
Client Sample ID SIREM-03

Analyses	Result	RL	Qual	Units	Date Analyzed	Method
Chloromethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Vinyl chloride	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Bromomethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
Trichlorofluoromethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Acetone	16	10		µg/L	11/20/2018	VOCs by EPA 8260B
1,1-Dichloroethene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Dichloromethane	ND	2.0		µg/L	11/20/2018	VOCs by EPA 8260B
trans-1,2-Dichloroethene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1-Dichloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
cis-1,2-Dichloroethene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chloroform	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,1-Trichloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Carbon tetrachloride	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Benzene	ND	0.50		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichloropropane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Trichloroethene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Bromodichloromethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
cis-1,3-Dichloropropene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
trans-1,3-Dichloropropene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,2-Trichloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Toluene	ND	0.50		µg/L	11/20/2018	VOCs by EPA 8260B
Dibromochloromethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Tetrachloroethene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Chlorobenzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Ethylbenzene	ND	0.50		µg/L	11/20/2018	VOCs by EPA 8260B
m,p-Xylene	ND	0.50		µg/L	11/20/2018	VOCs by EPA 8260B
Bromoform	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
o-Xylene	ND	0.50		µg/L	11/20/2018	VOCs by EPA 8260B
1,1,2,2-Tetrachloroethane	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,3-Dichlorobenzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,4-Dichlorobenzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
1,2-Dichlorobenzene	ND	1.0		µg/L	11/20/2018	VOCs by EPA 8260B
Surr: 1,2-Dichloroethane-d4	86	70-130		%Rec	11/20/2018	VOCs by EPA 8260B
Surr: Toluene-d8	108	70-130		%Rec	11/20/2018	VOCs by EPA 8260B
Surr: 4-Bromofluorobenzene	92	70-130		%Rec	11/20/2018	VOCs by EPA 8260B

Alpha Analytical, Inc.

(775) 355-1044 / (775) 355-0406 FAX / 1-800-283-1183
225 Glendale Ave. - Suite 21 - Sparks, Nevada 89431-5578

Analytical Report

WO#: **PES1811319**
Report Date: **11/26/2018**

CLIENT: Prima Environmental
Collection Date: 11/8/2018 5:15:00 PM
Project: SIREM-03
Lab ID: 1811319-03
Matrix: AIR
Client Sample ID SIREM-03 (T)

Analyses	Result	RL	Qual	Units	Date Analyzed	Method
Chloromethane	ND	0.80		mg/m³	11/21/2018	VOCs by EPA 8260
Vinyl chloride	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Chloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Bromomethane	ND	0.80		mg/m³	11/21/2018	VOCs by EPA 8260
Trichlorofluoromethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Acetone	ND	4.0		mg/m³	11/21/2018	VOCs by EPA 8260
1,1-Dichloroethene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Dichloromethane	ND	0.80		mg/m³	11/21/2018	VOCs by EPA 8260
trans-1,2-Dichloroethene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,1-Dichloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
cis-1,2-Dichloroethene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Chloroform	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,2-Dichloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,1,1-Trichloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Carbon tetrachloride	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Benzene	ND	0.20		mg/m³	11/21/2018	VOCs by EPA 8260
1,2-Dichloropropane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Trichloroethene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Bromodichloromethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
cis-1,3-Dichloropropene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
trans-1,3-Dichloropropene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,1,2-Trichloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Toluene	ND	0.20		mg/m³	11/21/2018	VOCs by EPA 8260
Dibromochloromethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Tetrachloroethene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Chlorobenzene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Ethylbenzene	ND	0.20		mg/m³	11/21/2018	VOCs by EPA 8260
m,p-Xylene	ND	0.20		mg/m³	11/21/2018	VOCs by EPA 8260
Bromoform	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
o-Xylene	ND	0.20		mg/m³	11/21/2018	VOCs by EPA 8260
1,1,2,2-Tetrachloroethane	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,3-Dichlorobenzene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,4-Dichlorobenzene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
1,2-Dichlorobenzene	ND	0.40		mg/m³	11/21/2018	VOCs by EPA 8260
Surr: 1,2-Dichloroethane-d4	106	70-130		%Rec	11/21/2018	VOCs by EPA 8260
Surr: Toluene-d8	90	70-130		%Rec	11/21/2018	VOCs by EPA 8260
Surr: 4-Bromofluorobenzene	86	70-130		%Rec	11/21/2018	VOCs by EPA 8260

NOTES:
Note: Concentrations of air in a Tedlar Bag are at 25 degrees Celsius and 25.79 inches of mercury.

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**

26-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_A**

Sample ID:	**MB-5973**	SampType:	**MBLK**	TestCode:	**VOC_A**	Units:	**mg/m³**
Client ID:	**PBW**	Batch ID:	**A5973**	TestNo:	**SW8260B**		
Prep Date:	**11/21/2018**	RunNo:	**5204**	SeqNo:	**145109**		
Analysis Date:	**11/21/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	ND	0.4									
Vinyl chloride	ND	0.2									
Chloroethane	ND	0.2									
Bromomethane	ND	0.4									
Trichlorofluoromethane	ND	0.2									
Acetone	ND	2									
1,1-Dichloroethene	ND	0.2									
Dichloromethane	ND	0.4									
trans-1,2-Dichloroethene	ND	0.2									
1,1-Dichloroethane	ND	0.2									
cis-1,2-Dichloroethene	ND	0.2									
Chloroform	ND	0.2									
1,2-Dichloroethane	ND	0.2									
1,1,1-Trichloroethane	ND	0.2									
Carbon tetrachloride	ND	0.2									
Benzene	ND	0.1									
1,2-Dichloropropane	ND	0.2									
Trichloroethene	ND	0.2									
Bromodichloromethane	ND	0.2									
cis-1,3-Dichloropropene	ND	0.2									
trans-1,3-Dichloropropene	ND	0.2									
1,1,2-Trichloroethane	ND	0.2									
Toluene	ND	0.1									
Dibromochloromethane	ND	0.2									
Tetrachloroethene	ND	0.2									
Chlorobenzene	ND	0.2									
Ethylbenzene	ND	0.1									
m,p-Xylene	ND	0.1									
Bromoform	ND	0.2									
o-Xylene	ND	0.1									
1,1,2,2-Tetrachloroethane	ND	0.2									
1,3-Dichlorobenzene	ND	0.2									
1,4-Dichlorobenzene	ND	0.2									
1,2-Dichlorobenzene	ND	0.2									
Surr: 1,2-Dichloroethane-d4	2.2		2		108	69.51	130.49				
Surr: Toluene-d8	1.8		2		91.5	69.51	130.49				
Surr: 4-Bromofluorobenzene	1.8		2		89.5	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**

26-Nov-18

Client: Prima Environmental
Project: SIREM-03

TestCode: **VOC_A**

Sample ID:	**LCS-5973**	SampType:	**LCS**	TestCode:	**VOC_A**	Units:	**mg/m³**
Client ID:	**LCSW**	Batch ID:	**A5973**	TestNo:	**SW8260B**		
Prep Date:	**11/21/2018**	RunNo:	**5204**	SeqNo:	**145262**		
Analysis Date:	**11/21/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	9.67	2	10	0	96.7	25.4	156				
Vinyl chloride	9.37	1	10	0	93.7	53	147				
Chloroethane	10.8	1	10	0	108	24.8	218				
Bromomethane	13.4	2	10	0	134	7.3	151				
Trichlorofluoromethane	8.18	1	10	0	81.8	79.1	145				
Acetone	239	10	200	0	119	58.9	129				
1,1-Dichloroethene	13.5	1	10	0	135	44.5	159				
Dichloromethane	10.9	2	10	0	109	68.9	131				
trans-1,2-Dichloroethene	10.9	1	10	0	109	82.3	123				
1,1-Dichloroethane	10.5	1	10	0	105	83.4	126				
cis-1,2-Dichloroethene	10.6	1	10	0	106	74.7	122				
Chloroform	9.55	1	10	0	95.5	74.8	119				
1,2-Dichloroethane	10.8	1	10	0	108	78.1	126				
1,1,1-Trichloroethane	10.4	1	10	0	104	80.2	134				
Carbon tetrachloride	10.5	1	10	0	105	73.7	132				
Benzene	10.1	0.5	10	0	101	82.3	123				
1,2-Dichloropropane	10.3	1	10	0	103	77.9	132				
Trichloroethene	10.9	1	10	0	109	72.9	121				
Bromodichloromethane	10.8	1	10	0	108	70.3	126				
cis-1,3-Dichloropropene	11.3	1	10	0	113	73.8	126				
trans-1,3-Dichloropropene	12.1	1	10	0	121	66.2	137				
1,1,2-Trichloroethane	11.5	1	10	0	115	68.8	123				
Toluene	10.3	0.5	10	0	103	75.9	125				
Dibromochloromethane	10.5	1	10	0	105	69.6	129				
Tetrachloroethene	10.8	1	10	0	108	67	129				
Chlorobenzene	11	1	10	0	110	71.5	123				
Ethylbenzene	10.7	0.5	10	0	107	75.5	128				
m,p-Xylene	10	0.5	10	0	101	75.8	126				
Bromoform	10.6	1	10	0	106	59.5	129				
o-Xylene	10.4	0.5	10	0	104	66.3	126				
1,1,2,2-Tetrachloroethane	12	1	10	0	120	68.3	133				
1,3-Dichlorobenzene	10.7	1	10	0	107	75.6	128				
1,4-Dichlorobenzene	10.5	1	10	0	106	73.9	129				
1,2-Dichlorobenzene	10.7	1	10	0	107	75.4	120				
Surr: 1,2-Dichloroethane-d4	10.5		10		105	69.51	130.49				
Surr: Toluene-d8	9.33		10		93.3	69.51	130.49				
Surr: 4-Bromofluorobenzene	9.05		10		90.5	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**
26-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**MB-5933**	SampType:	**MBLK**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**PBW**	Batch ID:	**A5933**	TestNo:	**SW8260B**		
Prep Date:	**11/20/2018**	RunNo:	**5177**	SeqNo:	**143921**		
Analysis Date:	**11/20/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	ND	2									
Vinyl chloride	ND	1									
Chloroethane	ND	1									
Bromomethane	ND	2									
Trichlorofluoromethane	ND	1									
Acetone	ND	10									
1,1-Dichloroethene	ND	1									
Dichloromethane	ND	2									
trans-1,2-Dichloroethene	ND	1									
1,1-Dichloroethane	ND	1									
cis-1,2-Dichloroethene	ND	1									
Chloroform	ND	1									
1,2-Dichloroethane	ND	1									
1,1,1-Trichloroethane	ND	1									
Carbon tetrachloride	ND	1									
Benzene	ND	0.5									
1,2-Dichloropropane	ND	1									
Trichloroethene	ND	1									
Bromodichloromethane	ND	1									
cis-1,3-Dichloropropene	ND	1									
trans-1,3-Dichloropropene	ND	1									
1,1,2-Trichloroethane	ND	1									
Toluene	ND	0.5									
Dibromochloromethane	ND	1									
Tetrachloroethene	ND	1									
Chlorobenzene	ND	1									
Ethylbenzene	ND	0.5									
m,p-Xylene	ND	0.5									
Bromoform	ND	1									
o-Xylene	ND	0.5									
1,1,2,2-Tetrachloroethane	ND	1									
1,3-Dichlorobenzene	ND	1									
1,4-Dichlorobenzene	ND	1									
1,2-Dichlorobenzene	ND	1									
Surr: 1,2-Dichloroethane-d4	8.6		10		86.4	69.51	130.49				
Surr: Toluene-d8	11		10		107	69.51	130.49				
Surr: 4-Bromofluorobenzene	9.4		10		93.9	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**
26-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**LCS-5933**	SampType:	**LCS**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**LCSW**	Batch ID:	**A5933**	TestNo:	**SW8260B**		
Prep Date:	**11/19/2018**	RunNo:	**5177**	SeqNo:	**143920**		
Analysis Date:	**11/19/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	6.61	2	10	0	66.1	30.3	130				
Vinyl chloride	6.88	1	10	0	68.8	60.1	134				
Chloroethane	7.7	1	10	0	77.0	62.3	168				
Bromomethane	5.03	2	10	0	50.3	7.3	151				
Trichlorofluoromethane	7.54	1	10	0	75.4	76.5	148				S
Acetone	184	10	200	0	92.0	63.6	118				
1,1-Dichloroethene	9.21	1	10	0	92.1	28.8	209				
Dichloromethane	9.27	2	10	0	92.7	77	120				
trans-1,2-Dichloroethene	9.89	1	10	0	98.9	79.5	127				
1,1-Dichloroethane	9.16	1	10	0	91.6	78.6	131				
cis-1,2-Dichloroethene	9.85	1	10	0	98.5	79.5	122				
Chloroform	9.09	1	10	0	90.9	75	122				
1,2-Dichloroethane	8.91	1	10	0	89.1	74.2	130				
1,1,1-Trichloroethane	9.49	1	10	0	94.9	79.2	128				
Carbon tetrachloride	9.06	1	10	0	90.6	79.5	125				
Benzene	9.75	0.5	10	0	97.5	79.5	126				
1,2-Dichloropropane	9.65	1	10	0	96.5	78.1	131				
Trichloroethene	10.5	1	10	0	105	79.3	121				
Bromodichloromethane	9.61	1	10	0	96.1	79.5	122				
cis-1,3-Dichloropropene	9.35	1	10	0	93.5	79.5	123				
trans-1,3-Dichloropropene	9.49	1	10	0	94.9	77.3	128				
1,1,2-Trichloroethane	10.3	1	10	0	103	75.1	122				
Toluene	11.5	0.5	10	0	115	79.7	121				
Dibromochloromethane	11.2	1	10	0	112	79.2	127				
Tetrachloroethene	11	1	10	0	110	74.9	121				
Chlorobenzene	11.1	1	10	0	111	79.5	119				
Ethylbenzene	11	0.5	10	0	110	79.5	120				
m,p-Xylene	11	0.5	10	0	110	79.5	122				
Bromoform	11.4	1	10	0	114	68.8	129				
o-Xylene	11.5	0.5	10	0	115	79.1	123				
1,1,2,2-Tetrachloroethane	10.9	1	10	0	109	73.8	135				
1,3-Dichlorobenzene	10.5	1	10	0	105	79.5	120				
1,4-Dichlorobenzene	9.96	1	10	0	99.6	79.5	119				
1,2-Dichlorobenzene	10.2	1	10	0	102	75.7	121				
Surr: 1,2-Dichloroethane-d4	9.84		10		98.4	69.51	130.49				
Surr: Toluene-d8	10.6		10		106	69.51	130.49				
Surr: 4-Bromofluorobenzene	9.43		10		94.3	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**
26-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**1811293-02AMSD**	SampType:	**MSD**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**BatchQC**	Batch ID:	**A5933**	TestNo:	**SW8260B**		
Prep Date:	**11/20/2018**	RunNo:	**5177**	SeqNo:	**143906**		
Analysis Date:	**11/20/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	38.8	10	50	0	77.5	37.7	121	39.3	1.3	22.5	
Vinyl chloride	36	5	50	0	71.9	60.4	140	39.4	9.1	23.9	
Chloroethane	39.1	5	50	0	78.3	43.1	206	44.3	12	22.9	
Bromomethane	32.4	10	50	0	64.8	12.6	168	23.7	31	48	
Trichlorofluoromethane	33.4	5	50	0	66.8	58.6	163	44.3	28	33.3	
Acetone	1040	50	1000	0	104	37.3	152	970	6.9	50	
1,1-Dichloroethene	43.9	5	50	0	87.9	69.8	158	53.6	20	21.7	
Dichloromethane	51	10	50	0	102	71.7	132	51.7	1.4	20	
trans-1,2-Dichloroethene	48.1	5	50	0	96.3	72	136	55.4	14	19.2	
1,1-Dichloroethane	48.8	5	50	0	97.5	76.9	140	51.7	5.8	18	
cis-1,2-Dichloroethene	51.8	5	50	0	104	73.9	133	55.2	6.3	20.1	
Chloroform	47.7	5	50	0	95.3	74.3	130	50.6	6	18	
1,2-Dichloroethane	47.9	5	50	0	95.7	72.6	144	47.3	1.2	17.1	
1,1,1-Trichloroethane	43.8	5	50	0	87.7	70.2	138	53.6	20	22.2	
Carbon tetrachloride	37.7	5	50	0	75.4	58.2	141	51.1	30	31.9	
Benzene	48.9	2.5	50	0	97.8	67.8	140	54.6	11	18.1	
1,2-Dichloropropane	51	5	50	0	102	75.3	144	52.6	3.1	19.7	
Trichloroethene	44.1	5	50	0	88.1	65.7	131	54.8	22	25.3	
Bromodichloromethane	49.8	5	50	0	99.5	70.2	141	51.1	2.6	20.5	
cis-1,3-Dichloropropene	44.1	5	50	0	88.3	56.9	132	45.8	3.8	25.8	
trans-1,3-Dichloropropene	45.7	5	50	0	91.4	72	131	46.6	2.1	26.4	
1,1,2-Trichloroethane	54.8	5	50	0	110	74	130	54.5	0.46	21.9	
Toluene	53.3	2.5	50	0	107	67.2	131	64.7	19	18.3	R
Dibromochloromethane	59.1	5	50	0	118	71.5	134	59	0.17	24.1	
Tetrachloroethene	42.7	5	50	0	85.4	45.9	138	59.9	33	30.9	R
Chlorobenzene	51.2	5	50	0	102	73.7	120	60.8	17	23.1	
Ethylbenzene	45.2	2.5	50	0	90.3	70.3	122	60.2	29	25.3	R
m,p-Xylene	45	2.5	50	0	89.9	52.9	136	59.5	28	26.6	R
Bromoform	57.7	5	50	0	115	61.5	141	56.5	2.1	25	
o-Xylene	50.3	2.5	50	0	101	67.3	129	62.2	21	25	
1,1,2,2-Tetrachloroethane	62.7	5	50	0	125	62.4	153	59.9	4.6	24.6	
1,3-Dichlorobenzene	44.8	5	50	0	89.6	64.5	122	53.2	17	28.6	
1,4-Dichlorobenzene	42.9	5	50	0	85.8	63.7	121	50.4	16	27.7	
1,2-Dichlorobenzene	46.6	5	50	0	93.2	66.7	122	51.7	10	24.5	
Surr: 1,2-Dichloroethane-d4	43.1		50		86.2	69.51	130.49	43.5	0	0	
Surr: Toluene-d8	53.9		50		108	69.51	130.49	53.6	0	0	
Surr: 4-Bromofluorobenzene	47.4		50		94.8	69.51	130.49	47	0	0	

Qualifiers:
- B Analyte detected in the associated Method Blank
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

QC SUMMARY REPORT

WO#: **1811319**
26-Nov-18

Client: Prima Environmental
Project: SIREM-03 **TestCode:** **VOC_W**

Sample ID:	**1811293-02AMS**	SampType:	**MS**	TestCode:	**VOC_W**	Units:	**µg/L**
Client ID:	**BatchQC**	Batch ID:	**A5933**	TestNo:	**SW8260B**		
Prep Date:	**11/20/2018**	RunNo:	**5177**	SeqNo:	**143905**		
Analysis Date:	**11/20/2018**						

Analyte	Result	PQL	SPK Value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	39.3	10	50	0	78.6	37.7	121				
Vinyl chloride	39.4	5	50	0	78.8	60.4	140				
Chloroethane	44.3	5	50	0	88.6	43.1	206				
Bromomethane	23.7	10	50	0	47.4	12.6	168				
Trichlorofluoromethane	44.3	5	50	0	88.6	58.6	163				
Acetone	970	50	1000	0	97.0	37.3	152				
1,1-Dichloroethene	53.6	5	50	0	107	69.8	158				
Dichloromethane	51.7	10	50	0	103	71.7	132				
trans-1,2-Dichloroethene	55.4	5	50	0	111	72	136				
1,1-Dichloroethane	51.7	5	50	0	103	76.9	140				
cis-1,2-Dichloroethene	55.2	5	50	0	110	73.9	133				
Chloroform	50.6	5	50	0	101	74.3	130				
1,2-Dichloroethane	47.3	5	50	0	94.6	72.6	144				
1,1,1-Trichloroethane	53.6	5	50	0	107	70.2	138				
Carbon tetrachloride	51.1	5	50	0	102	58.2	141				
Benzene	54.6	2.5	50	0	109	67.8	140				
1,2-Dichloropropane	52.6	5	50	0	105	75.3	144				
Trichloroethene	54.8	5	50	0	110	65.7	131				
Bromodichloromethane	51.1	5	50	0	102	70.2	141				
cis-1,3-Dichloropropene	45.8	5	50	0	91.7	56.9	132				
trans-1,3-Dichloropropene	46.6	5	50	0	93.3	72	131				
1,1,2-Trichloroethane	54.5	5	50	0	109	74	130				
Toluene	64.7	2.5	50	0	129	67.2	131				
Dibromochloromethane	59	5	50	0	118	71.5	134				
Tetrachloroethene	59.9	5	50	0	120	45.9	138				
Chlorobenzene	60.8	5	50	0	122	73.7	120				S
Ethylbenzene	60.2	2.5	50	0	120	70.3	122				
m,p-Xylene	59.5	2.5	50	0	119	52.9	136				
Bromoform	56.5	5	50	0	113	61.5	141				
o-Xylene	62.2	2.5	50	0	124	67.3	129				
1,1,2,2-Tetrachloroethane	59.9	5	50	0	120	62.4	153				
1,3-Dichlorobenzene	53.2	5	50	0	106	64.5	122				
1,4-Dichlorobenzene	50.4	5	50	0	101	63.7	121				
1,2-Dichlorobenzene	51.7	5	50	0	103	66.7	122				
Surr: 1,2-Dichloroethane-d4	43.5		50		87.0	69.51	130.49				
Surr: Toluene-d8	53.6		50		107	69.51	130.49				
Surr: 4-Bromofluorobenzene	47		50		94.0	69.51	130.49				

Qualifiers:

B	Analyte detected in the associated Method Blank
ND	Not Detected at the Reporting Limit
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits

Alpha Analytical, Inc
255 Glendale Ave, #21
Sparks, Nevada 89431
TEL: (775) 355-1044 FAX: (775) 355-0406
Website: www.alpha-analytical.com

Definition Only

WO#: **1811319**

Date:

Definitions:

ND = Not Detected

C = Reported concentration includes additional compounds uncharacteristic of common fuels and lubricants.

D = Reporting Limits were increased due to high concentrations of non-target analytes.

H = Reporting Limits were increased due to the hydrocarbons present in the sample.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

K = DRO concentration may include contributions from lighter-end hydrocarbons (e.g. gasoline) that elute in the DRO range.

L = DRO concentration may include contributions from heavier-end hydrocarbons (e.g. motor oil) that elute in the DRO range.

O = Reporting Limits were increased due to sample foaming.

V = Reporting Limits were increased due to high concentrations of target analytes.

X = Reporting Limits were increased due to sample matrix interferences.

Z = DRO concentration may include contributions from lighter-end (e.g. gasoline) and heavier-end (e.g. motor oil) hydrocarbons that elute in the DRO range.

S50 = The analysis of the sample required a dilution such that the surrogate concentration was diluted below the laboratory acceptance criteria. The laboratory control sample was acceptable.

S51 = Surrogate recovery could not be determined due to the presence of co-eluting hydrocarbons.

S52 = Surrogate recovery was above laboratory acceptance limits. Probable matrix effect.

S53 = Surrogate recovery was below laboratory acceptance limits. Probable matrix effect.

S54 = Surrogate recovery was below laboratory acceptance limits.

S55 = Surrogate recovery was above laboratory acceptance limits.

Report CC's Cindy Schreier

CHAIN-OF-CUSTODY RECORD

CA

AMENDED

Alpha Analytical, Inc.

255 Glendale Ave, #21 Sparks, Nevada 89431

TEL: (775) 355-1044 FAX: (775) 355-0406

WorkOrder: PES1811319
Report Due By: 26-Nov-18
EDD Required: NO

Report Attention: Cindy Schreier

Client:
Prima Environmental
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762

TEL: 9169397300
FAX: 9169397398
ProjectNo: SIREM-03

Date Received: 09-Nov-18

Alpha Sample ID	Client Sample ID	Matrix	Collection Date	No. of Bottles Alpha	Sub	TAT	Requested Tests VOC_A	VOC_W						Sample Remarks
PES1811319-01	SIREM-03-Con	AQ	11/8/2018 6:30:00 PM	3	0	10		A - 8260/Acetone_Cs						
PES1811319-02	SIREM-03	AQ	11/8/2018 6:35:00 PM	3	0	10		A - 8260/Acetone_Cs						
PES1811319-03	SIREM-03 (T)	AR	11/8/2018 5:15:00 PM	1	0	10	A - 8260/Acetone_S							TEDLAR

Comments: Tedlar contains Ozone. To correct sample -03a ID due to login error. BC

	Signature	Print Name	Company	Date/Time
Logged in by:	[signature]	Brittany Cisneros	Alpha Analytical, Inc.	11/12/18 10:57

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

Report CC's Cindy Schreier

CHAIN-OF-CUSTODY RECORD

CA

Alpha Analytical, Inc.

255 Glendale Ave, #21 Sparks, Nevada 89431

TEL: (775) 355-1044 FAX: (775) 355-0406

WorkOrder: PES1811319
Report Due By: 26-Nov-18
EDD Required: NO

Report Attention: Cindy Schreier

Client:
Prima Environmental
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762

TEL: 9169397300
FAX: 9169397398
ProjectNo: SIREM-03

Date Received: 09-Nov-18

Alpha Sample ID	Client Sample ID	Matrix	Collection Date	No. of Bottles Alpha	Sub	TAT	Requested Tests VOC_A	VOC_W						Sample Remarks
PES1811319-01	SIREM-03-Con	AQ	11/8/2018 6:30:00 PM	3	0	10		A - 8260/Acetone_Cs						
PES1811319-02	SIREM-03	AQ	11/8/2018 6:35:00 PM	3	0	10		A - 8260/Acetone_Cs						
PES1811319-03	SIREM-03 G)	AR	11/8/2018 5:15:00 PM	1	0	10	A - 8260/Acetone_S							TEDLAR

Comments: Tedlar contains Ozone

	Signature	Print Name	Company	Date/Time
Logged in by:		Bittany Amery	Alpha Analytical, Inc.	11/9/18 10:45

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

CHAIN OF CUSTODY

Con PRIMA ENVIRONMENTAL, Inc.
Attn 5070 Robert J. Mathews Parkway, Suite 300
Add El Dorado Hills, CA 95762
City PH: 916-939-7300 FAX: 916 939 7398
Pho data@primaenvironmental.com

Alpha Analytical, Inc.
Main Laboratory: 255 Glendale Ave, Suite 21 Sparks, NV 89431 Phone: 775-355-1044 Fax: 775-355-0406

Satellite Service Centers:
Northern CA: 9891 Horn Road, Suite C, Rancho Cordova, CA 95827 Phone: 916-366-9089
Southern CA: Fountain Valley, CA 92708 Phone: 714-386-2901
Northern NV: Elko, NV 89801 Phone: 775-388-7043

001899

Page # 1 of 1

Consultant/ Client Info:
Company:
Address:
City, State, Zip:

Job and Purchase Order Info:
Job #
Job Name: SIREM -03
P.O. #:

Report Attention/Project Manager:
Name:
Email Address:
Phone #:
Cell #:

QC Deliverable Info:
EDD Required? Yes / No EDF Required? Yes / No
Global ID:
Data Validation Packages: III or IV

Samples Collected from which State? (circle one) AR CA KS NV OR WA DOD Site Other

Time Sampled (HHMM)	Date Sampled (MM/DD)	Matrix* (See Key Below)	Lab ID Number (For Lab Use Only)	Sample Description	TAT	# Containers** (See Key Below)	Field Filtered? Yes	Field Filtered? No	VOCs										Remarks
1830	11/8/18	AQ	PES181319 -01	SIREM-03-Con	STD	3V		X	X										
1835	11/8/18	AQ	-02	SIREM-03	↓	3V		X	X										
1715	11/8/18	AR	-03	SIREM-03 (G)	↓	1T		X	X										

ADDITIONAL INSTRUCTIONS: Tedlar contains ozone- run by 8260.

I (field sampler) attest to the validity and authenticity of this sample(s). I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. NAC 445.0636 (c) (2).

Sampled By:

Relinquished by: (Signature/Affiliation):	Date:	Time:	Received by: (Signature/Affiliation):	Date:	Time:
	11/8/18	~1930	Drop off - Alpha		
				11/9/18	10:32

* Key: AQ - Aqueous AR-Air OT - Other So-Soil WA - Waste ** B - Brass L - Liter O - Orbo OT - Other P - Plastic S-Soil Jar T - Tedlar V - VOA

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this COC. The liability of the laboratory is limited to the amount paid for the report.

12/17

APPENDIX D
Cost Sheets for Remedial Alternatives

Table D-1
Estimated Costs for Reference Remedy
7th Street and Missouri Avenue WQARF Site
Phoenix, Arizona

	Quantity	Unit	Unit Cost	Total Cost	Estimated Low Range (-30%)	Estimated Upper Range (+50%)
Vadose Zone (VOCs) - Expansion of SVE System and Operation						
Estimated Capital Costs						
Installation of 300 CFM SVE Unit	1	LS	$25,000	$25,000	$18,000	$38,000
Capital Costs Subtotal				**$25,000**	**$18,000**	**$38,000**
Estimated Vadose Zone Annual O&M Costs						
Air Permit Fee	1	LS	$2,000	$2,000	$2,000	$3,000
Routine Monitoring/Sampling/Reporting	1	LS	$33,000	$33,000	$24,000	$50,000
Repair and Maintenance	1	LS	$7,000	$7,000	$5,000	$11,000
Utilities (Electric)	12	MO	$1,000	$12,000	$9,000	$18,000
VGAC Changeout (assumes 1 changeout a year)	1	LS	$5,000	$5,000	$4,000	$8,000
Miscellaneous Field Supplies	1	LS	$6,000	$6,000	$5,000	$9,000
Project Management/Administration	15%	n/a	n/a	$10,000	$7,000	$15,000
Annual O&M Subtotal				**$75,000**	**$53,000**	**$113,000**
Total O&M Costs for 3 Years (Net Present Value - Discounted 5%)				**$204,000**	**$144,000**	**$308,000**
Estimated Vadose Zone Contingency Costs						
ERA Vadose Zone Contingencies:						
SVE Well Installation (1) and Associated Capital Improvements	1	LS	$65,000	$65,000	$46,000	$98,000
O&M Costs (1 Additional Year)	1	YR	$75,000	$75,000	$53,000	$113,000
DEUR	1	LS	$15,000	$15,000	$11,000	$23,000
Off-site SVE Contingency at Circle K						
Installation of two wells, SVE System Installation and O&M (Up to 1 Year)	1	YR	$220,000	$220,000	$154,000	$330,000
Vadose Zone Contingency Costs Subtotal				**$375,000**	**$264,000**	**$564,000**
Total Estimated Vadose Zone Capital, O&M and Contingency Costs				**$604,000**	**$423,000**	**$906,000**
Groundwater (GW) - Source and Extended Area Ozone Sparge and MNA Monitoring of Existing Well Network						
Estimated Groundwater Capital Costs						
Ozone System:						
Ozone System Remedy Final Design	1	LS	$50,000	$50,000	$35,000	$75,000
Source area IWs (Installation, Development, Survey and Oversight) West of 7th St. and South of Missouri Avenue	2	EA	$50,000	$100,000	$70,000	$150,000
Extended Area IWs (Installation, Development, Survey and Oversight) East of 7th St. and South of Missouri Avenue	5	EA	$50,000	$250,000	$175,000	$375,000
IDW Disposal	1	LS	$10,000	$10,000	$7,000	$15,000
Ozone Generator Purchase (Including Conex Box and Telemetry)	1	LS	$150,000	$150,000	$105,000	$225,000
Earthwork, Trenching and Pipe Installation	550	FT	$150	$82,500	$58,000	$124,000
Asphalt Repair	200	FT	$50	$10,000	$7,000	$15,000
Related Appurtenances, Equipment and Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Project Management/Administration	15%	n/a	n/a	$103,000	$73,000	$155,000
Crossgradinet Monitoring Wells (MW-301 and -302)						
Monitoring Well Installation and Oversight	1	LS	$100,000	$100,000	$70,000	$150,000
Vertical Profile, Survey, Permitting, Traffic Control, IDW Disposal, Tech Memo	1	LS	$25,000	$25,000	$18,000	$38,000
Capital Costs Subtotal				**$911,000**	**$639,000**	**$1,367,000**
Estimated Ozone O&M and Groundwater Monitoring Annual Costs						
Ozone System Annual O&M	1	YR	$30,000	$30,000	$21,000	$45,000
Semiannual GW Monitoring/Reporting	2	EA	$40,000	$80,000	$56,000	$120,000
Miscellaneous Sampling & Field Supplies	1	YR	$6,000	$6,000	$4,000	$9,000
Equipment Repairs (as needed)	1	YR	$10,000	$10,000	$7,000	$15,000
Project Management/Administration	15%	n/a	n/a	$19,000	$13,000	$29,000
Annual Costs for Ozone O&M Subtotal				**$30,000**	**$21,000**	**$45,000**
Annual Costs for GW Monitoring O&M Subtotal				**$115,000**	**$81,000**	**$173,000**
6-Year Costs Life Cycle (3-Yrs. Ozone O&M + 6 GW Monitoring)				**$780,000**	**$546,000**	**$1,170,000**
Total GW Monitoring Costs for 6 Years (Net Present Value - Discounted 5%)				**$666,000**	**$466,000**	**$1,000,000**
GW Capital, Monitoring, and O&M Costs				**$1,577,000**	**$1,104,000**	**$2,366,000**
Estimated GW Contingency Costs						
Ozone System O&M and GW Monitoring for 1 Additional Year	1	LS	$115,000	$115,000	$81,000	$173,000
Ozone System Remedy Design	1	EA	$50,000	$50,000	$35,000	$75,000
Ozone Sparge IWs Installation North of Cinema Park Village Shopping Center (assumed use of source area generator and O&M for 1 year).	5	LS	$50,000	$250,000	$175,000	$375,000
IDW Disposal	1	LS	$10,000	$10,000	$7,000	$15,000
Earthwork, Trenching and Pipe Installation	250	FT	$150	$37,500	$26,000	$56,000
Asphalt Repair	250	FT	$50	$12,500	$9,000	$19,000
Equipment/Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Use of Source Area Generator and O&M for 1 Year	2	LS	$40,000	$80,000	$56,000	$120,000
Ozone Sparge IWs Installation Near COP Well 57 or SRP Well 14.0E-9.6N Area IWs (Installation, Development, Survey and Oversight)	2	EA	$50,000	$100,000	$70,000	$150,000
IDW Disposal	1	LS	$5,000	$5,000	$4,000	$8,000
Earthwork, Trenching and Pipe Installation	100	FT	$150	$15,000	$11,000	$23,000
Asphalt Repair	100	FT	$50	$5,000	$4,000	$8,000
Equipment/Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Use of Source Area Generator and O&M for 1 Year	2	LS	$40,000	$80,000	$56,000	$120,000
Wellhead Treatment						
Engineering Design/Procurement Services	15%	n/a	$228,000	$228,000	$160,000	$342,000
Treatment Compound (Foundation, Fencing, Mechanical, Instrumentation and Controls, Site Improvements, etc.)	1	LS	$500,000	$500,000	$350,000	$750,000
Estimated 2,000 gpm Treatment System (Two LGAC Vessels [including offload/installation[, Bag Filtration System, Interconnecting Piping)	1	LS	$985,000	$985,000	$690,000	$1,478,000
Conveyance Piping Modifications	1	LS	$30,000	$30,000	$21,000	$45,000
System Commissioning and Startup	1	LS	$35,000	$35,000	$25,000	$53,000
Construction Services (System Installation, Oversight, etc.)	15%	n/a	n/a	$233,000	$163,000	$350,000
O&M costs (assuming 20 Years Net Present Value - Discounted 5%)	1	LS	$1,200,000	$1,200,000	$840,000	$1,800,000
GW Contingency Costs Subtotal				**$4,031,000**	**$2,822,000**	**$6,047,000**
GW Capital, Monitoring, O&M and Contingency Costs				**$5,608,000**	**$3,926,000**	**$8,400,000**
Total Vadose Zone and GW Reference Remedy Costs (Including Contingencies)				**$6,200,000**	**$4,300,000**	**$9,300,000**

Abbreviations:

$ = United States dollars
% = percent
ERA - early response action
GW - groundwater
IDW - Investigation Derived-Wastes
IW - injection well
LF = linear feet
LGAC = liquid phase granular activated carbon
LS = lump sum
MNA = monitored natural attenuation
MO - month
O&M = operations and maintenance
PLC = programmable logic controller
SVE = soil vapor extraction
VGAC = vapor phase granular activated carbon
VOCs = volatile organic compounds
WQARF = Water Quality Assurance Revolving Fund

Notes:

1. Costs line items are rounded up to the nearest thousand dollars ($1000).
2. Pricing is subject to commodity pricing increases. Contingencies for possible price escalation due to steel or other tariffs is not included.
3. No estimated costs have been included for taxes or other fees relative to the project.
4. Net Present Value - The labor, materials or equipment value in the present of a sum of money, in contrast to a future value when it is invested at compound interest (assumed at 5%).
5. SVE labor and utility costs are based on relative current SVE operational costs.

Wellhead Treatment Assumptions:

1. Wellhead treatment system installation would be adjacent to SRP Well 14.0E-9.6N within available existing property with adequate footprint.
2. Estimated costs do not include land acquisition and/or access agreements.
3. Estimated costs do not include permitting.
4. LGAC system includes two, 20,000-pound lead/lag systems in parallel for maximum flowrate of up to 2,200 gallons per minute.
5. Treated water recipient will accept a system flowrate of 2,200 gpm.
6. The existing production well pump will have enough capacity to overcome hydraulic head of wellhead treatment system.
7. No production well pump, booster pumps, effluent discharge pumps, or inclusion of equalization tanks will be required for wellhead treatment.
8. Treated water discharge will be tied in to the existing production well conveyance pipeline.
9. Treatment system concrete slab will be 1-foot thick on grade with secondary containment curbing.
10. Treatment system metal mesh fencing will be 8-feet in height.
11. Treatment system would have at minimum a gravel pathway to the treatment compound from the nearest paved roadway.
12. Installation of a new electrical service/transformer will not be required.
13. Instrumentation and controls will be connected to existing PLC.
14. No modifications will be needed for existing wellhead instrumentation and controls.
15. O&M costs assume monthly bag filter changeouts, quarterly sampling, and biannial carbon vessel changeouts for a total of 80,000 pounds of LGAC per year.
16. O&M costs exclude utility costs.

Table D-2
Estimated Costs for More Aggressive Remedy
North 7th Street East Missouri Avenue WQARF Site
Phoenix, Arizona

	Quantity	Units	Cost Per Unit	Total Cost	Total Cost (-30%)	Total Cost (+50%)
Vadose Zone (VOCs) - Expansion of SVE System and Operation						
Estimated Capital Costs						
Installation of 5 additional SVE Wells	1	LS	$40,000	$40,000	$28,000	$60,000
Installation of 500 CFM SVE Unit	1	LS	$35,000	$35,000	$25,000	$53,000
Capital Costs Subtotal				**$75,000**	**$53,000**	**$113,000**
Estimated Annual O&M Costs						
Annual Air Permit Fee	1	LS	$2,000	$2,000	$2,000	$3,000
Routine Monitoring/Sampling/Reporting	1	LS	$35,000	$35,000	$25,000	$53,000
Repair and Maintenance	1	LS	$7,000	$7,000	$5,000	$11,000
Utilities (electric)	12	MO	$2,000	$24,000	$17,000	$36,000
VGAC Changeout (assumes 1 changeout a year)	1	LS	$5,000	$5,000	$4,000	$8,000
Miscellaneous Field Supplies	1	LS	$6,000	$6,000	$5,000	$9,000
Project Management/Administration	15%	n/a	n/a	$12,000	$9,000	$18,000
Annual O&M Subtotal				**$91,000**	**$64,000**	**$137,000**
Total O&M Costs for 1 Year (Net Present Value - Discounted 5%)				**$87,000**	**$174,000**	**$373,000**
Estimated Vadose Zone Contingency Costs						
ERA Vadose Zone Contingencies:						
Installation of one additional SVE well and SVE capital improvements	1	LS	$65,000	$65,000	$46,000	$98,000
O&M Costs for 1 Additional Year	1	LS	$91,000	$91,000	$64,000	$137,000
DEUR	1	LS	$15,000	$15,000	$11,000	$23,000
Off-site SVE Contingency at Circle K						
Installation of two wells, SVE System Installation and O&M (Up to 1 Year)	1	LS	$220,000	$220,000	$154,000	$330,000
Vadose Zone Contingency Costs Subtotal				**$400,000**	**$280,000**	**$600,000**
Total Estimated Vadose Zone Capital, O&M and Contingency Costs				**$562,000**	**$393,000**	**$843,000**
Groundwater - Source Area Ozone Sparge, GETS and Groundwater Monitoring						
Estimated Capital Costs						
Downgradient Extraction Wells						
Installation and Development of 2 Downgradient Extraction Wells (Drilling, Oversight, IDW, Survey, Traffic Control, Permitting)	1	LS	$160,000	$160,000	$112,000	$240,000
Miscellaneous Equipment /Repairs	1	LS	$8,000	$8,000	$6,000	$12,000
Project Management/Administration	15%	n/a	n/a	$26,000	$18,000	$39,000
GETS System						
Land Acquisition	1	LS	$200,000	$200,000	$140,000	$300,000
Treatment Compound within SRP Compound (foundation, fence, power, etc.)	1	LS	$100,000	$100,000	$70,000	$150,000
Groundwater extraction wells (well, pump, power)	2	EA	$100,000	$200,000	$140,000	$300,000
LGAC system (vessels, bag filter, break tank, piping)	1	LS	$90,000	$90,000	$63,000	$135,000
Conveyance piping from extraction wells to compound	700	LF	$200	$140,000	$98,000	$210,000
Crossgradinet Monitoring Wells (MW-301 and -302)						
Monitoring Well Installation and Oversight	1	LS	$100,000	$100,000	$70,000	$150,000
Vertical Profile, Survey, Permitting, Traffic Control, IDW Disposal, Tech Memo	1	LS	$25,000	$25,000	$18,000	$38,000
Capital Costs Subtotal				**$1,049,000**	**$734,000**	**$1,574,000**
Estimated Annual Costs for O&M						
Source Area Ozone Sparge & GETS O&M/Reporting	1	LS	$100,000	$100,000	$70,000	$150,000
Electric Power	12	Monthly	$3,000	$36,000	$25,000	$54,000
LGAC Changeout (per vessel)	1	LS	$20,000	$20,000	$14,000	$30,000
Field Supplies, & GETS/ISCO Supplies	1	LS	$14,000	$14,000	$10,000	$21,000
Miscellaneous Equipment /Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Project Management/Administration	15%	n/a	n/a	$30,000	$21,000	$45,000
Annual O&M and Monitoring Subtotal				**$230,000**	**$161,000**	**$345,000**
10-Year Life Cycle (3-Years Ozone O&M + 10 Years GETS O&M)				**$1,600,000**	**$1,120,000**	**$2,400,000**
Total O&M and Monitoring for 10 Years (Net Present Value - Discounted 5%)				**$1,300,000**	**$910,000**	**$1,950,000**
Estimated Annual Costs for Groundwater Monitoring						
Semiannual Groundwater Monitoring/Reporting	2	Ea	$40,000	$80,000	$56,000	$120,000
Miscellaneous Sampling & Field Supplies	1	LS	$6,000	$6,000	$4,000	$9,000
Project Management/Administration	15%	n/a	n/a	$13,000	$9,000	$20,000
Annual MNA Groundwater Monitoring Subtotal				**$99,000**	**$69,000**	**$149,000**
Total Groundwater Monitoring for 10 Years (Net Present Value - Discounted 5%				**$760,000**	**$532,000**	**$1,140,000**
Groundwater O&M and Monitoring Costs				**$2,060,000**	**$1,442,000**	**$3,090,000**
Groundwater Capital, O&M, and Monitoring Costs				**$3,109,000**	**$2,176,000**	**$4,664,000**
Estimated Groundwater Contingency Costs						
Installation of One Additional Extraction Well and Connection to GETS	1	LS	$200,000	$200,000	$140,000	$300,000
MNA Monitoring for 10 Additional Years (Net Present Value - Discounted 5%)	1	LS	$760,000	$760,000	$532,000	$1,140,000
Ozone Sparge IWs Installation Near COP Well 57 or SRP Well 14.0E-9.6N Area IWs (Installation, Development, Survey and Oversight)	2	EA	$50,000	$100,000	$70,000	$150,000
IDW Disposal	1	LS	$5,000	$5,000	$4,000	$8,000
Earthwork, Trenching and Pipe Installation	100	FT	$150	$15,000	$11,000	$23,000
Asphalt Repair	100	FT	$50	$5,000	$4,000	$8,000
Equipment/Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Use of Source Area Generator and O&M for 1 Year	2	LS	$40,000	$80,000	$56,000	$120,000
Wellhead Treatment						
Engineering Design/Procurement Services	15%	n/a	$228,000	$228,000	$160,000	$342,000
Treatment compound (foundation, fence, instrumentation and controls, site improvements, etc.)	1	LS	$500,000	$500,000	$350,000	$750,000
LGAC system (vessels, bag filter system, interconnective piping)	1	LS	$985,000	$985,000	$690,000	$1,478,000
Conveyance piping modifications	200	LF	$200	$40,000	$28,000	$60,000
System Commissioning and Startup	1	LS	$35,000	$35,000	$25,000	$53,000
Construction services (system installation oversight, etc.)	15%	n/a	n/a	$234,000	$164,000	$351,000
O&M costs (assuming 20 Years Net Present Value - Discounted 5%)	1	LS	$1,200,000	$1,200,000	$840,000	$1,800,000
Groundwater Contingency Costs Subtotal				**$4,500,000**	**$3,150,000**	**$6,750,000**
Groundwater Capital, Monitoring Costs, and Contingency Costs				**$7,609,000**	**$5,326,000**	**$11,414,000**
MORE AGGRESSIVE REMEDY COSTS (INCLUDING CONTINGENCY)				**$8,200,000**	**$5,700,000**	**$12,300,000**

Abbreviations:

WQARF = Water Quality Assurance Revolving Fund
% = percent
LS = lump sum
$ = United States dollars
VOCs = volatile organic compounds
SVE = soil vapor extraction
O&M = operations and maintenance
GETS = groundwater extraction and treatment system
EA = each
LGAC = liquid phase granular activated carbon
LF = linear feet
SRP = Salt River Project
EISB = enhanced in-situ bioremediation
PLC = programmable logic controller

Notes:

1. Costs line items are rounded up to the nearest thousand dollars ($1000).
2. Pricing is subject to commodity pricing increases. Contingencies for possible price escalation due to steel or other tariffs is not included.
3. No estimated costs have been included for taxes or other fees relative to the project.
4. Net Present Value - The labor, materials or equipment value in the present of a sum of money, in contrast to a future value when it is invested at compound interest (assumed at 5%).
5. SVE labor and utility costs are based on relative current SVE operational costs.
6. Expansion of the GETS treatment system (i.e., additional carbon vessels or treatment systems) would not be required.
7. Additional extraction wells will be within 1,600 and 2,600 linear feet of GETS in new trenches.

Wellhead Treatment Assumptions

1. Wellhead treatment system installation would be adjacent to SRP Well 14.0E-9.6N within available existing property with adequate footprint.
2. Estimated costs do not include land acquisition and/or access agreements.
3. Estimated costs do not include permitting.
4. LGAC system includes two, 20,000-pound lead/lag systems in parallel for maximum flowrate of up to 2,200 gallons per minute.
5. Treated water recipient will accept a system flowrate of 2,200 gpm.
6. The existing production well pump will have enough capacity to overcome hydraulic head of wellhead treatment system.
7. No production well pump, booster pumps, effluent discharge pumps, or inclusion of equalization tanks will be required for wellhead treatment.
8. Treated water discharge will be tied in to the existing production well conveyance pipeline.
9. Treatment system concrete slab will be 1-foot thick on grade with secondary containment curbing.
10. Treatment system metal mesh fencing will be 8-feet in height.
11. Treatment system would have at minimum a gravel pathway to the treatment compound from the nearest paved roadway.
12. Installation of a new electrical service/transformer will not be required.
13. Instrumentation and controls will be connected to existing PLC.
14. No modifications will be needed for existing wellhead instrumentation and controls.
15. O&M costs assume monthly bag filter changeouts, quarterly sampling, and biannial carbon vessel changeouts for a total of 80,000 pounds of LGAC per year.
16. O&M costs exclude utility costs.

Table D-3
Estimated Costs for Less Aggressive Remedy
North 7th Street East Missouri Avenue WQARF Site
Phoenix, Arizona

	Quantity	Units	Cost Per Unit	Total Cost	Total Cost (-30%)	Total Cost (+50%)
Vadose Zone (VOCs) - Expansion of SVE System and Operation						
Estimated Capital Costs						
Installation of 300 CFM SVE Unit	1	LS	$25,000	$25,000	$18,000	$38,000
Capital Costs Subtotal				**$25,000**	**$18,000**	**$38,000**
Estimated Annual O&M Costs						
Annual Air Permit Fee	1	LS	$2,000	$2,000	$1,400	$3,000
Routine Monitoring/Sampling/Reporting	1	LS	$33,000	$33,000	$23,000	$50,000
Repair and Maintenance	1	LS	$7,000	$7,000	$5,000	$11,000
Utilities (electric)	12	months	$1,000	$12,000	$8,000	$18,000
VGAC Changeout (assumes 1 changeout a year)	1	LS	$5,000	$5,000	$4,000	$8,000
Miscellaneous Field Supplies	1	LS	$6,000	$6,000	$4,000	$9,000
Project Management/Administration	15%	n/a	n/a	$10,000	$7,000	$15,000
Annual O&M Subtotal				**$75,000**	**$53,000**	**$113,000**
Total O&M Costs for 2 Years (Net Present Value - Discounted 5%)				**$140,000**	**$98,000**	**$210,000**
Estimated Vadose Zone Contingency Costs						
ERA Vadose Zone Contingencies:						
Installation of one additional SVE well and SVE capital improvements	1	LS	$65,000	$65,000	$46,000	$98,000
O&M Costs for 1 Additional Year	1	LS	$75,000	$75,000	$53,000	$113,000
DEUR	1	LS	$15,000	$15,000	$11,000	$23,000
Off-site SVE Contingency at Circle K						
Installation of two wells, SVE System Installation and O&M (Up to 1 Year)	1	LS	$220,000	$220,000	$154,000	$330,000
Vadose Zone Contingency Costs Subtotal				**$380,000**	**$266,000**	**$570,000**
Total Estimated Vadose Zone Capital, O&M and Contingency Costs				**$550,000**	**$385,000**	**$825,000**
Groundwater - Limited Source Area Ozone Sparge and MNA Monitoring Limited Well Network Annually						
Estimated MNA Capital Cost						
Crossgradinet Monitoring Wells (MW-301 and -302)						
Monitoring Well Installation and Oversight	1	LS	$100,000	$100,000	$70,000	$150,000
Vertical Profile, Survey, Permitting, Traffic Control, IDW Disposal, Tech Memo	1	LS	$25,000	$25,000	$18,000	$38,000
Capital Costs Subtotal				**$125,000**	**$88,000**	**$188,000**
Estimated Ozone O&M Costs						
Ozone System Annual O&M	1	YR	$30,000	$30,000	$21,000	$45,000
Miscellaneous Sampling & Field Supplies	1	YR	$6,000	$6,000	$4,000	$9,000
Equipment Repairs (as needed)	1	YR	$5,000	$5,000	$4,000	$8,000
Project Management/Administration	15%	n/a	n/a	$7,000	$5,000	$11,000
Annual Costs for Ozone O&M Subtotal				**$30,000**	**$21,000**	**$45,000**
2-Year Costs Life Cycle				**$60,000**	**$42,000**	**$90,000**
Total Ozone O&M Costs (Net Present Value - Discounted 5%)				**$112,000**	**$78,000**	**$170,000**
Estimated Annual Costs for Groundwater Monitoring						
Semiannual Groundwater Monitoring/Reporting	2	LS	$40,000	$80,000	$56,000	$120,000
Miscellaneous Sampling & Field Supplies	1	LS	$6,000	$6,000	$4,000	$9,000
Project Management/Administration	15%	n/a	n/a	$13,000	$9,000	$20,000
Annual Groundwater Monitoring Subtotal				**$99,000**	**$69,000**	**$149,000**
30-Year Life Cycle				**$2,970,000**	**$2,079,000**	**$4,455,000**
Total Groundwater Monitoring Costs for 30 Years (Net Present Value - Discounted 5%)				**$1,520,000**	**$1,064,000**	**$2,280,000**
Groundwater Monitoring Capitol and O&M Costs				**$1,757,000**	**$1,230,000**	**$2,636,000**
Estimated Groundwater Contingency Costs						
Installation of two additional monitoring wells in the event of a shift of groundwater plume (installation, development, survey, traffic control, permitting, and oversight)	1	LS	$100,000	$100,000	$70,000	$150,000
MNA Monitoring for 10 Additional Years (Net Present Value - Discounted 5%)	1	LS	$760,000	$760,000	$532,000	$1,140,000
Ozone Sparge IWs Installation Near COP Well 57 or SRP Well 14.0E-9.6N Area IWs (Installation, Development, Survey and Oversight)	2	EA	$50,000	$100,000	$70,000	$150,000
IDW Disposal	1	LS	$5,000	$5,000	$4,000	$8,000
Earthwork, Trenching and Pipe Installation	100	FT	$150	$15,000	$11,000	$23,000
Asphalt Repair	100	FT	$50	$5,000	$4,000	$8,000
Equipment/Repairs	1	LS	$30,000	$30,000	$21,000	$45,000
Use of Source Area Generator and O&M for 1 Year	2	LS	$40,000	$80,000	$56,000	$120,000
Wellhead Treatment						
Engineering Design/Procurement Services	15%	n/a	n/a	$228,000	$160,000	$342,000
Treatment compound (foundation, fence, instrumentation and controls, site improvements, etc.)	1	LS	$500,000	$500,000	$350,000	$750,000
LGAC system (vessels, bag filter system, interconnective piping)	1	LS	$985,000	$985,000	$690,000	$1,478,000
Conveyance piping modifications	200	LF	$200	$40,000	$28,000	$60,000
System Commissioning and Startup	1	LS	$35,000	$35,000	$25,000	$53,000
Construction services (system installation oversight, etc.)	15%	n/a	n/a	$234,000	$164,000	$351,000
O&M costs (assuming 20 Years Net Present Value - Discounted 5%)	1	LS	$1,200,000	$1,200,000	$840,000	$1,800,000
Groundwater Contingency Costs Subtotal				**$4,400,000**	**$3,080,000**	**$6,600,000**
Groundwater Monitoring Costs, and Contingency Costs				**$6,157,000**	**$4,310,000**	**$9,236,000**
LESS AGGRESSIVE REMEDY COSTS (INCLUDING CONTINGENCY)				**$6,800,000**	**$4,800,000**	**$10,200,000**

Abbreviations:

WQARF = Water Quality Assurance Revolving Fund
% = percent
LS = lump sum
$ = United States dollars
VOCs = volatile organic compounds
SVE = soil vapor extraction
O&M = operations and maintenance
Qtrly = quarterly
MNA = monitored natural attenuation
LGAC = liquid phase granular activated carbon
LF = linear feet
PLC = programmable logic controller

Notes:

1. Net Present Value - The labor, materials or equipment value in the present of a sum of money, in contrast to a future value when it is invested at compound interest (assumed at 5%).
2. Costs line items are rounded up to the nearest thousand dollars ($1000).

Wellhead Treatment Assumptions

1. Wellhead treatment system installation would be adjacent to SRP Well 14.0E-9.6N within available existing property with adequate footprint.
2. Estimated costs do not include land acquisition and/or access agreements.
3. Estimated costs do not include permitting.
4. LGAC system includes two, 20,000-pound lead/lag systems in parallel for maximum flowrate of up to 2,200 gallons per minute.
5. Treated water recipient will accept a system flowrate of 2,200 gpm.
6. The existing production well pump will have enough capacity to overcome hydraulic head of wellhead treatment system.
7. No production well pump, booster pumps, effluent discharge pumps, or inclusion of equalization tanks will be required for wellhead treatment.
8. Treated water discharge will be tied in to the existing production well conveyance pipeline.
9. Treatment system concrete slab will be 1-foot thick on grade with secondary containment curbing.
10. Treatment system metal mesh fencing will be 8-feet in height.
11. Treatment system would have at minimum a gravel pathway to the treatment compound from the nearest paved roadway.
12. Installation of a new electrical service/transformer will not be required.
13. Instrumentation and controls will be connected to existing PLC.
14. No modifications will be needed for existing wellhead instrumentation and controls.
15. O&M costs assume monthly bag filter changeouts, quarterly sampling, and biannial carbon vessel changeouts for a total of 80,000 pounds of LGAC per year.
16. O&M costs exclude utility costs.